REALIZING THE PROMISE OF NETWORK-CENTRIC WARFARE

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Team Biographies

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Lieutenant Commander Joseph A. Smith, U.S. Navy. LCDR Smith just completed a tour as Intelligence Systems Officer (J-27) and Intelligence Experimentation and Innovations Officer (J-29) for Commander, U.S. Third Fleet, in San Diego, California. In these capacities, he oversaw the intelligence architecture configuration for deploying carrier battle groups and amphibious readiness groups, and directed experimentation for targeting and intelligence, surveillance and reconnaissance (ISR) for the Navy's Sea-Based Battle Lab, which he helped stand up. LCDR Smith crafted or participated in three Fleet Battle Experiments, two Joint Warfighting Experiments, Millennium Challenge 2002 and over a dozen Limited Objective Experiments (LOEs). He led the fleet spiral development of Naval Fires Network (NFN) and the initial operational testing of the Multi-Domain Dissemination System (MDDS). Currently, LCDR Smith is assigned to the Directorate of Intelligence (J-2) for the Chairman of the Joint Chiefs of Staff. He is the ISR Systems and Intelligence Integration Plans Officer, overseeing joint intelligence interoperability issues.

REALIZING THE PROMISE OF NETWORK-CENTRIC WARFARE

The technological wave that spawned Network-Centric Warfare (NCW) has created conditions that threaten to remove the initiative of subordinate commanders—the antithesis of the original goal of empowering them through enhanced speed of command and self-synchronization.

Introduction

In the January 2003 issue of the *United States Naval Institute's Proceedings*, Dr. Milan Vego, Professor of Operations at the Naval War College, warns, "Network Centric Warfare (NCW) increasingly is becoming a new orthodoxy – a set of beliefs that cannot seriously be challenged."[1] He and many other critics contend that NCW theorists fail to consider "Clausewitzian thoughts on the nature of war, the relationship between policy and use of military power, and the effect of fog of war and friction."[2] They lament the perceived emphasis on tactics and targeting to the apparent exclusion of operational art, and warn that command and control (C^2) is becoming increasingly centralized.[3] What they don't say is that NCW is a bad idea, that it is unachievable, or that there is an alternate path for the transformation of the Defense Department advocated by the current administration. One look at the Secretary of Defense's transformation plan (including his choice for heading the Office of Transformation), at recent defense authorization figures, or at any of the emerging joint and Service operational concepts will confirm that NCW plays a prominent (if not dominant) role in the reshaping of the military. General Richard B. Myers, Chairman of the Joint Chiefs of Staff, defined the magnitude of the commitment to trans-

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[1] Dr. Milan Vego, "Net-Centric is Not Decisive," *U.S. Naval Institute Proceedings*, January 2003, available online at http://www.usni.org/proceedings/articles03/provego01.htm

[2] Ibid.

[3] Vego, available online at http://www.usni.org/proceedings/articles03/provego01.htm.

formation, noting, "[f]or fiscal year 2003, the Department of Defense has requested nearly $128 billion for current and future weapons systems and capabilities."[4] But history is littered with numerous examples of good ideas executed poorly, sometimes with catastrophic consequences. Some proponents of NCW seem to believe that simply "netting the force" will accrue the benefits promised by the Information Age. Nothing could be further from the truth. Critics like Dr. Vego have identified some serious consequences that, unless addressed, threaten to nullify the advantages of NCW.

The Winds of Change

The predominant theme thus far in Donald Rumsfeld's second tenure as Secretary of Defense has been transformation. The secretary has sought to implement forces, concepts and platforms that fully exploit the U.S. advantage in technology at a time when there is no true peer competitor to the United States. In part, the secretary was responding to a Congressional requirement outlined in Section 934 of the Fiscal Year 2001 Defense Authorization Act (Public Law 106-398). That section called for the Secretary of Defense, in consultation with the Chairman of the Joint Chiefs of Staff (CJCS), "to develop a report on the development and implementation of network-centric warfare concepts within the Department of Defense." Specifically, the act stipulated that the secretary and CJCS address the following areas: (1) a clear definition of NCW; (2) an accounting of NCW-related activities; and (3) a discussion of how the concept of network-centric warfare is related to the strategy of transformation as outlined in Joint Vision 2020 (JV 2020).

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[4] GEN Richard B. Myers, "Understanding Transformation," *U.S. Naval Institute Proceedings*, February 2003, pp. 39-40.

The 2001 annual Defense Planning Guidance tasked U.S. Joint Forces Command (JFCOM) to "develop new joint operational concepts that support transformation" and that "exploit U.S. asymmetric military advantages and…joint synergies."[5] These concepts would facilitate achieving the concepts in JV 2020, the Joint Chiefs of Staff view of future warfighting capability. JFCOM responded with "Toward a Joint Warfighting Concept: Rapid Decisive Operations (RDO)," an overarching operational concept that provides a focus and joint context for the many concepts currently under development by the Services.[6] The Chairman recently reiterated his desire for a coherent way ahead, stating "[T]he Joint Chiefs of Staff are developing a Joint Capstone Concept to better describe how we will operate across the range of military operations and to better evaluate how individual service capabilities fit into the joint operational framework."[7] The common denominator at some level in all of these future concepts is the theory of Network-Centric Warfare, first espoused in the seminal 1998 article by VADM Arthur Cebrowski and John J. Garstka.[8] NCW is the kernel from which RDO sprang. In fact, NCW has been the centerpiece of discussions (both inside the military and in the civilian organizations that oversee the military) on the future of warfighting since the mid-1990s.

The Sea of Change

Retired Vice Admiral Cebrowski, instrumental in sparking the dialogue on the future of warfare, noted: "Network-centric warfare…[grows out of and draws]…power from the fundamental changes in American society. These changes have been dominated by the co-evolution of

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[5] U.S. Joint Forces Command, *Toward a Joint Warfighting Concept: Rapid Decisive Operations*. Norfolk,Virginia, July 18, 2001, p. iii.

[6] Ibid. p. ii.

[7] Myers, p. 40.

economics, information technology, and business processes and organizations...."[9] Few dispute

that the industrial age gave way to this new epoch commonly called the Information Age. The

exponential increase in computer processing speed, combined with the decreasing costs of asso-

ciated technologies (mass storage, miniaturization, communications, etc.) has revolutionized

business practices and changed the way people work, play, and live. Dr. Richard O. Mason, Pro-

fessor of Management Information Sciences at Southern Methodist University, offered this so-

bering characterization of the information society:

> Today in western societies more people are employed collecting, handling and
> distributing information than in any other occupation. Millions of computers in-
> habit the earth and many millions of miles of optical fiber, wire and airwaves link
> people, their computers and the vast array of information handling devices to-
> gether. Our society is truly an information society, our time an Information
> Age.[10]

The impact of the Information Age on the military is just as striking. In the "Sense of the Re-

port" to Congress on NCW, former Assistant Secretary of Defense for Command, Control

Communications and Intelligence (ASD C^3I) Arthur Money noted, "[W]arfare takes on the char-

acteristics of its Age. Network Centric Warfare (NCW) continues this trend – it is the military

response to the opportunities created by the Information Age."[11] This "response" reveals three

indicators of increased focus on higher levels of command.

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[8] See VADM Arthur K. Cebrowski, and John J. Garstka, "Network-Centric Warfare--Its Origin and Future," *U.S. Naval Institute Proceedings*, January 1998, pp. 28-35. VADM Cebrowski has since retired and is currently the Director of the Secretary of Defense's Office of Transformation.

[9] Ibid. p. 28.

[10] Richard O. Mason, "Four Ethical Issues of the Information Age," *Management Information Systems Quarterly*, Volume 10, Number 1, March, 1986, available online at http://www.misq.org/archivist/vol/no10/issue1/vol10no1mason.html

[11] Arthur L. Money, *Report to Congress on Network Centric Warfare*, Office of the Assistant Secretary of Defense (Command Control Communications and Intelligence), Pentagon, Washington, D.C. March 2001, p. 4.

IT Proliferation

The common element in all the discussions of NCW is information technology (IT) (especially networking), the impetus for this "new age."[12] NCW proponents have provided considerable ammunition to critics who charge that the majority of NCW dialogue to date has been very IT-heavy. DOD officials maintain "[a] critical mass of the Joint Force must be robustly networked as the entry fee for NCW and transformation."[13] IT expenditures for this "critical mass" are staggering. The costs of the Global Information Grid are in the tens of billions of dollars. The Navy-Marine Corps Intranet (NMCI) alone carries a price tag of $6.9 billion — $4.1 billion for the first five years, followed by a three-year option worth $2.8 billion.[14] Each Global Hawk UAV system, which includes an aircraft, ground station and integrated sensor suite, has grown from an initial level of $18-20 million to a current price of about $48 million. If nonrecurring expenses are added, the price tag for each system rises to more than $70 million.[15] The Predator Unmanned Aerial Vehicle (UAV) carries a $40 million per unit cost.[16] The Navy plans to purchase between nine and twelve Global Hawk UAVs, an undetermined number of Predator (or Predator-like) UAVs, and developmental unmanned combat aerial vehicles (UCAV) for its own inventory between now and 2012. Even European defense industry analysts are forecasting

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[12] In fact, the entire drive toward transformation in the Department of Defense (DOD) is really an extension of the revolution in military affairs (RMA) of the 1990s. While the moniker was changed to "the less unsettling term transformation," the changes sought by the Secretary of Defense are the epitome of the Information Systems RMA. See William A. Owens, "The Once and Future Revolution in Military Affairs," *Joint Force Quarterly*, Summer 2002, p.58.

[13] Money, p. ii.

[14] Lieutenant Commander Ernest Fagan, SC, USN, "'Wired for the Future' - The Navy Marine Corps Intranet," available on-line at http://www.navsup.navy.mil/lintest/marapr01/fagan.htm.

[15] Leona C. Bull, "Air Force Wants Northrop to Cut Global Hawk Costs," *Journal of Aerospace and Defense Industry News*, May 17, 2002, available online at http://www.aerotechnews.com/starc/2002/051702/ global_Hawk.html.

[16] *U.S. Air Force Fact Sheet - RQ-1 Predator Unmanned Aerial Vehicle*, May 2002, available online at http://www.af.mil/news/factsheets/RQ_1_Predator_Unmanned_Aerial.html

"a marked increase in investments in datalinks and communication networks as militaries strive to bond sensors and strike platforms together."[17] Expenditures on hardware and software to transport, display and share the volumes of information generated by the network rival those for the sensors and shooters in the NCW concept.

The top priority of John Stenbit, the current ASD C[3]I and DOD's Chief Information Officer, is fielding information systems to bridge the gap between the "sensors" and the "shooters" so that "anybody can get any information at any time."[18] Commanders are taking him up on his offer. Having "the picture" on the admiral's desk used to mean getting him a good print from that day's F-14 Tomcat reconnaissance flight. Now it means having the COP (common operational picture) on the high-definition flatscreen display that dominates his desktop. Today's COP (as controversial a topic as NCW itself) can range from situational displays with unsophisticated symbols (e.g., NTDS, the Navy Tactical Data System) to theater quality audiovisual experiences incorporating 3-D graphic symbols, video, and real-time feeds from UAVs and troops on the ground (e.g., the Navy's Area Air Defense Coordinator (AADC) System). In command centers throughout the military, more manpower is spent on maintaining and updating these displays (manually and automatically) for the commander than is spent actually analyzing the enemy's actions.[19] For now, netting the force means ensuring that the COP (accurate or not) looks the same throughout the force.

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[17] Ben Moores, "The Dawn of Network Centric Warfare?" *Defence Systems Daily*, 22 January 2002, available online at http://www.defence-data.com/features/fpage48.htm

[18] Christopher J. Dorobek, "CIO Pushes Network-Centric Warfare, " *Federal Computer Week*, Aug. 28, 2001, available online at http://www.fcw.com/fcw/articles/2001/0827/web-dod-08-28-01.asp

[19] LCDR Joseph A. Smith, *RIMPAC 2000 Lessons Learned: Information Systems (Staff Working Papers)*, August 2000.

The Information Age has also enabled a greater degree of coordination, both inside DOD and between DOD and other government and civilian agencies. This coordination is evident in two trends in military operations: reachback and interagency coordination. Reachback, increasing the leverage of resources located outside of the military theater, is not new. But the effectiveness of reachback has definitely been enhanced by IT, especially the advances in the Internet and long-haul communications. Now, military forces around the globe can access the vast resources of stateside DOD activities such as the Defense Intelligence Agency (DIA), the National Imagery and Mapping Agency (NIMA) or the Joint Warfare Analysis Center (JWAC). Yet, instead of the information anarchy predicted by some IT naysayers—an environment where very junior and inexperienced (but savvy and technically astute) military personnel hog bandwidth and retask scarce national assets on a whim—the current reachback architecture is a tightly regulated resource that supports primarily high-level activities. Though significant funds have been expended to develop, test and field IT tools that can enable geographically dispersed "worker-bees" to collaborate over vast distances, these nascent capabilities are only now migrating to military users in large numbers. Furthermore, because of the bandwidth tax incurred by these tools, priority for their use normally goes to the commander and his staff, not front line troops. Any requirement in competition with the general's daily video teleconference (VTC) will lose.

On the positive side, these collaborative tools helped foster closer working relationships between DOD and other government agencies. In fact, the invention of the Internet (the watershed event of the Information Age) was conceived by MIT's J.R.C. Licklider, the first head of the computer research program at the Defense Advanced Research Projects Agency (DARPA),

as "a globally interconnected set of computers through which everyone [i.e., all research agencies in the government and academia] could quickly access data and programs from any site."[20]

The concept of interagency coordination was gaining steam during the second Clinton Administration.[21] In the wake of the terrorist attacks on September 11, 2001, President George W. Bush issued Presidential Directive-1 establishing the Homeland Security Council (HSC) and expressly directed increased information sharing among agencies at all levels of government. President Bush felt that securing Americans from terrorist threats or attacks is a critical national security function that "requires extensive coordination across a broad spectrum of Federal, State, and local agencies to reduce the potential for terrorist attacks and to mitigate damage should such an attack occur."[22] General Myers recognizes the value of networking as well, noting, "Improved C^4ISR connectivity is more than a military issue. It must extend to information and knowledge sharing with other federal agencies and with U.S. coalition partners."[23]

Yet, even the attempts at increased coordination seem to be focused at the higher end of the decision tree. The HSC comprises principally senior cabinet officials, and decisions are made at the same level. Further, a look at the JFCOM RDO Concept's solution to ensure interagency support to the warfighter shows that it is focused at the regional combatant commanders' level and specifically reduces informal (i.e., ad hoc) coordination:

> The Concept for Improving Interagency Operational Planning and Coordination is supported by a Joint Interagency Coordination Group in each combatant command headquarters that is linked to the interagency community. This reduces the

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[20] Barry M. Leiner, et.al., "A Brief History of the Internet," available online at http://www.isoc.org/internet/history/brief.shtml#Origins (clarification added).

[21] *United States Government Interagency Domestic Terrorism Concept of Operations Plan*, January 2001, available online at http://www.fbi.gov/publications/conplan/conplan.pdf.

[22] George W. Bush, "Homeland Security Presidential Directive 1: Organization and Operation of the Homeland Security Council," October 29, 2001, available online at http://www.iacsp.com/presidential_directive-1.html.

[23] Myers, p. 40.

ad hoc nature of the interagency community involvement in political and military coordination and enables…collaboration to integrate all elements of national power to more effectively engage the enemy.[24]

Thus, in both these IT-enabled trends (reachback and interagency), authority is migrating to the level where the coordination is done, instead of down to the levels where IT has enabled increased collaboration. Other factors, especially political factors, also have contributed to this trend.

Warfare's New Face

In the latter half of the 20th century, the world entered an era of Limited War with increasing levels of political oversight. Due to the era of its birth, America is intimately familiar with the concept of Total War. The American Revolution, the American Civil War and the Great Wars of the first half of the 20th century gripped our nation in total war, but World War II was the last time that the United States was willing to use its entire might in conflict, culminating with the destruction of Hiroshima and Nagasaki by atomic bombs.[25] The two devastating blasts preceded the surrender of Japan, bringing to an end the last total war in the modern era. The Nuclear Age produced weapons of such destructive power that their use would be reserved for only the direst of circumstances.

In the Korean conflict, President Truman withheld the full capacity of the U.S. military in order to avoid an escalation to full-scale confrontation with the Soviet Union.[26] This trend continued during the Vietnam conflict, in which the decision authority on operational matters, such

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[24] U.S. Joint Forces Command, *Toward a Joint Warfighting Concept: Rapid Decisive Operations*. Norfolk,Virginia, July 18, 2001, p. 13.

[25] *Enola Gay*, piloted by then Lt Col Paul Tibbets, dropped *Little Boy* on Hiroshima on August 6, 1945. Three days later, *Boch's Car*, piloted by Maj Charles Sweeney, dropped *Fat Man* on Nagasaki.

[26] William Stueck, *Rethinking the Korean War: A New Diplomatic and Strategic History* (Princeton: Princeton University Press, 2002), p. 124.

as the selection of targets for Air Force and Navy air strikes, was retained by the political leader-

ship in Washington, D.C.[27] Once again, the heavy oversight was intentional—put in place to

keep the conflict from escalating to a total war with China or the Soviet Union.

During operations in Bosnia and Kosovo, fear of escalation was replaced by other politi-

cal concerns. In its report to Congress, the Government Accounting Office noted that political

concerns caused air operations in Kosovo to depart from established doctrinal concepts. These

departures were driven by the overarching desire to maintain alliance cohesion. That cohesion

was based on the priorities of limiting collateral damage and alliance casualties, as well as limit-

ing the duration of the campaign.[28]

While the Nuclear Age spawned a return to limited war, the Information Age has had its

own unique impact on the conduct of military operations. The widespread availability of IT is

adding weight to the perceived requirement of commanders at all levels to have a high-fidelity,

"ground truth" picture of the battlespace. The provision of tactical information offers upper-

level commanders a tempting opportunity not only to monitor operations as they unfold, but to

add their own "two-cents worth," as well. Lieutenant Commander Curt Copley, a senior intelli-

gence director at U.S. European Command Headquarters in Stuttgart, Germany, points out the

dangers of this well-intentioned "help":

> Each level of war is complex, and if a decision maker abandons his level even
> briefly to make decisions at a lower level, effectiveness will be lost. This problem
> is not new to warfare, but the vast amount of information that network-centric op-
> erations provides raises the stakes.[29]

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[27] George C. Herring, *LBJ and Vietnam: A Different Kind of War* (Austin: University of Texas, 1994), p. 44.

[28] United States Government Printing Office, *Kosovo Air Operations: Need to Maintain Alliance Cohesion Resulted in Doctrinal Departures* (GAO-01-784, July 27, 2001), pp. 5-6.

[29] LCDR Curt Copley, "A Commander's Network-Centric Odyssey," *U.S. Naval Institute Proceedings*, p. 59.

This phenomenon has not been limited to U.S. forces. In a recent interview, Group Captain Richard Jenner, one of the British Royal Air Force's most experienced air battle managers, noted that the RAF developed the capability to provide the Recognized Air Picture to the RAF Strike Commander-in-Chief's desk around 20 years ago. Although the commander could not contact controllers or pilots directly, he was tempted to make the occasional call to the commander of a unit whose controllers were in the middle of a Soviet Bear or MiG intercept to ask why it was running late.[30]

As senior leaders wrestle with the political implications of their operations, they are being provided with information of a much higher fidelity than ever before. However, CNN and other news media outlets continue to provide timely coverage of world events via their communications channels. These phenomena are exacerbating the propensity for senior leaders to pull decision authority up the chain of command. Dr. Vego noted at least one aspect of this situation:

> Having a common operating picture [provided by the proliferation of IT] will lead operational commanders to be increasingly involved in purely tactical decisions, instead of focusing on the operational and strategic aspects of the situation within their respective areas of responsibility.[31]

Today, real-time streaming video from Predator UAVs orbiting over Afghanistan is available at U.S. Central Command Headquarters at MacDill Air Force Base in Tampa, Florida, where the commander has been known to take a personal interest in the video and then provide immediate direction to forces in the theater.[32]

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[30] Richard Jenner, Group Captain, RAF, UK, Response to questions (via e-mail), March 4, 2003. As the Chief of the Air C2 Branch in SHAPE's Operations Division, Group Captain Jenner is Allied Command Europe's senior Air Battle Manager.

[31] Vego, available online at http://www.usni.org/proceedings/articles03/provego01.htm

[32] Vego, available online at http://www.usni.org/proceedings/articles03/provego01.htm

The Bow Wave of Decision Authority

This systematic centralization of execution-level decision authority at higher echelons in the chain of command has caused a "Bow Wave of Decision Authority." Commanders have been pursuing this practice for the reasons noted earlier. These factors have increased the tendency for operational commanders to wrest decision authority from their subordinates. Alarmingly, this tendency appears to be evolving U.S. C^2 orientation toward the heavily centralized behemoth employed by the Soviet Union. To maintain the U.S. advantage in C^2, a course correction is required.

Blown Off Course: Dysfunctional Command Orientation

The first impact of the Bow Wave is dysfunctional command orientation, which negates potential advantages of NCW—speed of command and self-synchronization. Since Cebrowski and Garstka's original article was published in 1998, there have been no fewer than ten experiments related in some way to NCW concepts, including mega-sized experiments like Kernel Blitz-Experimental 2001 and Millennium Challenge 2002 (MC02). While helpful in some limited respects, none of these experiments has suggested or exercised any command construct that is more than cosmetically different from current C^2 structures. The DOD's response to Congress recognized that "simply inserting new technology into existing organizations and processes…will inexorably lead to incremental or marginal improvement."[33] LtGen Paul K. Van Riper, USMC (ret.), refers to this putting of new wine into old skins as "being in command but out of control," and likens the military of the future to a society of ants performing tasks like gathering food and building structures with no apparent hierarchy. The key, he contends, is for the whole organization to understand the intent of the operation and organize itself to accomplish

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[33] Money, p. 18.

that task.[34] Lt Col Gregory Roman, USAF, is even more critical, contending that the IT prolif-

eration within the current military C^2 orientation may result in technology being used completely

counter to the manner most desired. He notes:

> The seductiveness of information technology stimulates military organizational
> orientation towards greater centralized control and more rigid hierarchical organi-
> zations instead of the desired orientation of decentralized control and more flexi-
> ble organizations.[35]

Thus, in the absence of any new organizational constructs, the proliferation of IT, coupled with

perceived needs for greater centralization of authority and the promises of networking to mitigate

that centralization, has nudged execution authority up the chain of command in the construct we

use today: the joint task force (JTF). Recent military operations bear this out. During Operation

ALLIED FORCE, control of air operations seemed overly centralized and politicized, causing

missed tactical opportunities. Rebecca Grant, a fellow of the Eaker Institute for Aerospace Con-

cepts, observed, "Pilots naturally wondered if the commanders at the CAOC understood their

urgency. Just one step removed, the battle rhythm seemed different."[36] Similarly, in Operation

ENDURING FREEDOM, Grant and other military observers noted that CENTCOM Com-

mander General Tommy Franks or CENTCOM senior staff at MacDill AFB, Florida, often

granted or withheld approval for tactical execution of a specific strike in Afghanistan.[37]

Roman traces this bow wave effect back to the conditions—fog of war and friction—

identified by Clausewitz more than a century ago:

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[34] Daintry Duffy, "Information is a Weapon," *Darwin Magazine*, November 2001, available on-line at
http://www.darwinmag.com/read/110101/weapon_content.html

[35] Lt Col Gregory A. Roman, USAF. *The Command or Control Dilemma: When Technology and Organizational
Orientation Collide*. Maxwell AFB, Alabama: Air University Press, February 1997, p.3.

[36] Grant, p. 46.

[37] Grant, pp. 43-44.

Organizational orientation determines the degree of uncertainty a commander is willing to tolerate. Van Creveld declares that the history of warfare is an endless quest of decreasing the "realm of uncertainty, resulting in a race between more information and the ability of technology to keep up with it." Thus the choice between centralized and decentralized control involves the distribution of uncertainty.[38]

The bow wave dysfunction specifically undermines perhaps the most attractive elements of the NCW concept—speed of command and self-synchronization. Cebrowski and Garstka define these concepts as follows:

Speed of Command is the process by which a superior information position is turned into a competitive advantage. **Self-Synchronization** is the ability of a well-informed force to organize and synchronize complex warfare activities from the bottom up.[39]

Both of these concepts hinge on decentralized control and information sharing to create opportunities for leverage based on the effects desired by the commander. Those opportunities are not necessarily available in a top-down command orientation.

The Wake of Inexperienced Decision Makers

In the wake of the ever-increasing tendency to centralize decision authority is a condition that threatens to stifle the initiative of lower-echelon decision-makers. This centralization strips away the opportunity for lower-echelon officers to hone their skills in applying operational art. The advances in IT that caused the bow wave of decision authority will not be able to transplant the experiences of current senior commanders to their subordinates who will someday take their place. As the pool of knowledge in the lower echelons dries up, fewer officers will be available to contribute to evolving operational art for the 21st century.

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[38] Roman, p. 10.

[39] Cebrowski, pp. 28-35

Cutting Through the Bow Wave

The latest edition of Joint Pub 01-2, The DOD Dictionary of Military and Associated

Terms, has no definition for NCW. Most of the definitions of NCW advanced so far are meta-

phorical, anecdotal or circular. That fact alone probably accounts for the congressional direction

to define NCW noted in section 934. The ASD C³I report to Congress defined Network Centric

Operations as: "…military operations that are enabled by the networking of the force. When

these military operations take place in the context of warfare, the term network-centric warfare is

applicable."[40] These definitions indicate the need for serious development in NCW's school of

thought. If simply *connecting* the entire force would result in speed of command and self-

synchronization, NCW would be reality today. A roadmap for focus of effort reveals the follow-

ing areas of immediate promise.

Change of Command: Organizational Change

In the Autumn 2000 issue of *Joint Force Quarterly*, Major Bruce H. McClintock, USAF,

noted:

> "It is not merely the tools of warfare but the organizations that wield them that
> make for revolutionary change in war." While technological changes have cata-
> lyzed some innovations, they are not necessary or sufficient for transformation.[41]

For NCW to fulfill its promise, today's commanders and doctrine czars must fight the bow wave

and create organizational structures that exploit the power of networked forces. They must em-

power lower command levels in the JTF or create something different than a JTF for joint force

employment. Above all, they must accept uncertainty at their level to facilitate greater certainty

at the warfighting end. This approach has proven successful in the past:

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[40] Money, p. 5.

[41] Major Bruce H. McClintock, "Transformation Trinity: Vision, Culture Assessment," *Joint Force Quarterly*, Au-
tumn 2000, p. 31.

Following the breakout at St Lo, France, generals Collins and Quesada created a shortcut in the targeting procedures to support VII Corps' exploitation of the fluid battlefield. General Quesada gave some of his pilots FM radios and had them ride with lead Army tanks. In the process, they reduced the role of the upper chain of command. General Collins and Quesada delegated the target approval to the lowest level. No one told these soldiers they had to do this. These commanders assumed risk. Without approved procedures or prescriptive doctrine, Generals Quesada and Collins demonstrated flexibility and adaptability. They succeeded because they trusted each other's judgment and experience. As a result, they accomplished the mission and saved American lives.[42]

While the JTF has proven a reliable joint force employment mechanism, several efforts have looked at less static forms of C^2 structures to better employ the power of a truly net-centric force. Some of these efforts, such as JFCOM's Standing Joint Forces Headquarters (SJFHQ) concept, focus on improving the way JTFs are stood up. Others take a more *tabula rasa* approach. The 18th session of the Chief of Naval Operations Strategic Studies Group (CNO SSG XVIII) developed Command 2030, an organic command structure that "grew" mission packages as needed to meet the objectives of the force commander. Once the objective was achieved, these forces became available for additional tasks as the commander might direct. Finally, the Naval Post-graduate School's Adaptive Architectures for Command and Control (A2C2) is an ongoing study of the "best" C^2 organizations for complex missions. A2C2 examines a variety of C^2 structures and the factors that make them successful.[43] Efforts like these must be encouraged and supported to create new organizational structures for NCW.

Trimming the Sails: Information Tailoring

In its final report to the CNO, SSG XVIII stated:

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[42] Myers, p. 39.

[43] See Frederick J. Diedrich and Susan P. Hocevar, et.al., *Adaptive Architectures for Command and Control: Toward An Empirical Evaluation of Organizational Congruence and Adaptation* available online at http://www.dodccrp.org/Activities/Symposia/2002CCRTS/ Proceedings/Tracks/pdf/035.PDF. See also *Adaptive Architectures for Command and Control (A2C2)* available online at http://www.aptima.com/Projects/ Adaptive_Architectures.html.

> [E]ngagement decisions in a fully netted system can only be successful if the decision-maker can craft a tailored presentation of the infospace, and share that information with other decision-makers throughout the force. The decisions which allow these commanders to operate in spite of uncertainty are the keys to success.[44]

For NCW to work, commanders must be willing to accept a certain level of uncertainty (and therefore risk) at their level to enable their subordinates to create opportunities at the tactical level. While many DOD organizations focus on the information technology part of NCW, the information itself receives anemic attention. With the emphasis on battlespace knowledge and shared situational awareness, the pursuit of the COP places a premium on ensuring information availability and information delivery, not on information content and information tailoring.

General Myers recently commented:

> Moving data faster is no longer the issue—getting the right data to the right people is. When this is achieved, **components** gain the insight needed to fulfill the commander's intent in an unpredictable environment. Improved joint C^4ISR will allow U.S. forces to exploit a decision cycle—to observe, decide, and act—faster than an adversary. And as history documents, the side that does this faster, wins.[45]

In *Command Concepts*, a RAND study conducted in 1999 for the Secretary of Defense, Carl H. Builder concurred, theorizing that:

> The most essential functions of command and control are conveying (to subordinates) and altering (for superiors) command concepts. Ideally, then, battle commanders need only convey their vision of the operation to their subordinates. And the only information subordinates need provide their superiors is what would alter their superior's vision of the operation.[46]

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[44] LCDR Joseph A. Smith, "Information Presentation for Decision-Making in Integrated Engagement," in *Sea Strike: Attacking Land Targets From the Sea*. Newport, Rhode Island: CNO Strategic Studies Group XVIII, October 1999, p. 64.

[45] Myers, p. 40 (emphasis added).

[46] Carl H. Builder, et.al., *Command Concepts: A Theory Derived from the Practice of Command and Control.* Santa Monica, California: RAND, 1999, p. 14.

Nelson's victory at Trafalgar and Nimitz's victory at Midway are examples of how clear communication of commander's intent can shape the information requirements at multiple levels.[47] By knowing what the commander needs, subordinates one level down can then fashion their own information requirements, creating a cascading effect of information sharing. Empowered by IT, information tailoring energizes self-synchronization. This information strategy ultimately serves the commander better than a centralized orientation, since he gets information in context of his command concept and can manage his infosphere more effectively.

Harnessing the Power of the Wave: Smart IT Investments

Top DOD leaders have made clear their support for fielding the tools needed to enable NCW. Picking the best initial investments for a truly transformational approach to NCW is the imperative. Ideally, these investment choices should allow commanders at all levels to operate effectively within acceptable levels of uncertainty. One area where uncertainty should not be tolerated is in the knowledge of blue force locations. This *prima facie* information is key to conducting net-centric operations on the joint battlefield in the 21st century. Lack of this information alone can negate an otherwise superior position on the battlefield, as demonstrated during DESERT STORM:

> Lieutenant General [Freddie] Franks, VII Corps Commander, was criticized in the Gulf War for not pursuing Iraqi ground forces more vigorously. During the initial ground assault, he halted the western prong of his attack because of the difficulty in synchronizing his large forces under darkness. He thought the risk of fratricide was too high.[48]

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[47] See LCDR John D. Zimmerman, "Net-Centric is About Choices," *U.S. Naval Institute Proceedings*, January 2002, p. 38, and Builder, pp. 25-42.

[48] LCDR Curt Copley, "A Commander's Network-Centric Odyssey," *U.S. Naval Institute Proceedings*, January 2003, p. 58.

Lack of a reliable blue force tracking (BFT) capability prevented General Franks from taking full advantage of a superior battlefield position, since he could not distinguish enemy targets from his own forces. Using basic tenets of NCW and equipped with BFT, General Franks' subordinate commanders would have known where all the forces (enemy and friendly) were located, and:

> could have leveraged the breach in the Iraqi fortifications to continue the attack. In addition, as the fighting progressed, if General Franks had glimpsed General Norman Schwarzkopf's situation map, he would have realized earlier that the Republican Guard was not preparing a counterattack but was in full retreat.[49]

Developing a true NCW capability requires developing joint systems that can relate blue force positions to sensor information to enable decisive engagements. The commander's vision (or command concept) should be embedded in the systems' doctrine, so that subordinates can execute engagements without a "mother-may-I" call to higher authority.

Several candidate technologies are already being tested and fielded by the Services. Grenadier Brat, a BFT capability, received high praise during Operation ENDURING FREEDOM for its ability to keep track of Special Forces and other ground units in Afghanistan, permitting U.S. bombers and cruise missiles to strike targets in close proximity to friendly forces. These technologies are key to enabling future forces to grab NCW's brass rings of speed of command and self-synchronization.

Charting A New Course

The Bow Wave of Decision Authority is a predictable outcome of a haphazard approach to operationalizing Network-Centric Warfare. By concentrating on the information technology drivers for innovation, the military has created the dreaded 10,000-mile screwdriver. To temper the temptation to tinker from afar, new organizational structures and information tailoring tech-

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[49] Ibid, p. 59.

niques need to be conceived, developed and tested through experimentation. Since netted forces are a key enabler to the Rapid Decisive Operations and Effects Based Operations Concepts, JFCOM should take the lead in this development by identifying the critical components necessary to achieve NCW's concepts of speed of command and self-synchronization. JFCOM should fully investigate these concepts in its Pinnacle, Olympic and Zenith series of joint experiments. JFCOM should also encourage and support the Service efforts aimed at realizing the promise of Network-Centric Warfare. Admiral Cebrowski's theory was visionary in its scope. It will take visionaries to see it through to fruition.

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