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# Network-Centric Warfare: its promises and problems

**Network Centric Warfare (NCW) ist eines der Schlüsselemente in der Transformation der US-Streitkräfte. Der Autor argumentiert, dass, entgegen den Verlautbarungen gewisser Exponenten des Pentagons und anderer Befürworter von NCW, namentlich die von Clausewitz betonten menschlichen und psychologischen Komponenten des Krieges zu kurz kämen. Zudem habe NCW auf taktischer, operativer und strategischer Stufe mitnichten die gleichen Konsequenzen. So brauche der Kommandeur auf taktischer Stufe (zuweilen) Echtzeitdaten; derjenige einer höheren Stufe hingegen verdichtete und ausgewertete Daten – also Informationen. Nichtsdestotrotz könne NCW, so Vego, sofern es richtig implementiert wurde, viele Vorteile bieten. NCW führe aber auch, und das ist die internationale Dimension der Transformation der US-Streitkräfte, zu mehr Alleingängen der einzig verbliebenen Supermacht, weil Interoperabilitätsschwierigkeiten aufgrund der technischen Kluft zunähmen.**

Milan Vego

Network-centric warfare (NCW) is a new and emerging concept that according to its most enthusiastic proponents promises to revolutionize warfare. Claims are made that NCW represents not only the new way of warfare but also a new theory of war. NCW is one of the key elements of the transformation of the U.S. armed forces. It offers substantial advantages in the employment of one's forces in combat. Yet there are also some serious disadvantages and limitations in the practical application of the entire concept. The NCW proponents' perspective is tactical, not operational or strategic. All the complexities and uncertainties in a war are reduced to nothing more than the collection, processing, and transmission of vast amounts of information and speed of command. In the past, command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) was properly considered a "system" in support of the military decision-making process. Yet NCW enthusiasts transformed C4ISR to become the very heart of warfare at all levels. Most NCW proponents pay lip service to or completely ignore the importance of the human element and psychological factors in warfare as taught by Carl von Clausewitz. NCW proponents are clearly neo-Newtonians in their understanding of the true nature of war. Moreover, their vision of future war is deeply flawed because they grossly overrate the importance and impact of the new technological advances.

## The Concept

NCW consists of sensor, shooter, and information grids. All three grids are interconnected so that actions flow from sensors through decision makers to the shooters.<sup>1</sup> The *sensor grid* is composed of air, sea, ground, space, and cyberspace-based sensors. It is intended to provide a joint force with

a high degree of awareness of friendly forces, enemy forces, and the environment across the joint battlespace. The *shooter (or engagement) grid* consists of the geographically dispersed air, ground, and sea-based shooters capable of delivering more responsive, accurate, and lethal fires.<sup>2</sup> The *information grid* consists of a network of networks encompassing numerous communications paths, computational nodes, operating systems, and information management applications allowing network-centric computing and communications across the joint battlespace. It provides the warfighter with assured high-speed access to the information required to dominate across all levels of conflict.

## Advantages

The key advantages that NCW offers are information dominance, shared battlespace awareness, speed of command, decision superiority, self-synchronization, and lockout of the enemy's options. *Information dominance* is the capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an enemy's ability to do the same. It is analogous to air superiority because it seeks domination of cyberspace.<sup>3</sup> Information dominance combined with advances in display technology will result in a dramatic increase in situational awareness and a better understanding of the battlespace. This, in turn, will allow commanders at all levels to prioritize and allocate weapons more effectively and efficiently, and thereby deliver highly precise fires.<sup>4</sup>

The NCW proponents claim that information technologies will provide continuous access and lead to superior knowledge of the situation across the spectrum of conflict, and at all times. This claim is not only unrealistic but also dangerous because it grossly exaggerates what technology can offer warfighters. The information requirements in a low-intensity conflict differ sig-

nificantly from those in a high-intensity conventional war. The volume and type of information required in fighting a less sophisticated opponent is far less demanding than in fighting a war with a more skillful and relatively stronger opponent. The type of information a commander uses to make a decision can vary greatly even within one's own forces. One commander might act without waiting to obtain information dominance because he is more willing to accept risks than another friendly commander. One's commander also might be forced to act sooner because of some unanticipated action by the enemy's commander. The sheer volume of information collected and processed and the speed of its transmission was never a sole or even a determining factor of success in combat. The experience conclusively shows that information dominance does not guarantee a sound decision, and the latter does not necessarily secure one's victory.

Another critical part of the NCW concept is *shared awareness*, achieved using improved sensors, powerful networks, improved display technology, and sophisticated modeling and simulation.<sup>5</sup> Information from all sensors will be available to all net participants.<sup>6</sup> At the tactical level, a common operating picture is achievable because the tactical situation, while highly dynamic, is also much less complex than at higher levels of war. At the operational level of war, tactical information must be processed and synthesized to provide an operational picture of the situation. Likewise, the strategic situation represents a synthesis of the elements of the operational situation. In general, the higher the level of command and level of war, the greater the importance of unquantifiable or intangible elements of the situation. They, in turn, cannot be obtained by using technical means of information collection. In contrast, tactical commanders are normally concerned with purely military aspects of the situation on the battlefield or in the battlespace.

NCW proponents assert that *speed of command* – the ability to observe, decide,

<sup>1</sup> Wayne P. Hughes, Jr., *Fleet Tactics and Coastal Combat* (Annapolis, MD: Naval Institute Press, 2<sup>nd</sup> edition, 2000), p. 285.

<sup>2</sup> Fred P. Stein, "Observations on the Emergence of Network Centric Warfare," <http://www.dodcrp.org/steincw.htm>, pp. 2–4, 6–7.

<sup>3</sup> Pierre Forgues, *Command In A Network-Centric War* (Toronto: Canadian Forces College, December 2000), p. 3.

<sup>4</sup> Arthur K. Cebrowski, "Sea Change," *Surface Warfare*, 22–6 (Nov/Dec 1997), p. 5.

<sup>5</sup> Henry Kamradt and Douglas MacDonald, *The Implications of Network-Centric Warfare for United States and Multinational Military Operations* (Newport, RI: Decision Support Department Occasional Paper 98–1, 31 December 1998), p. 5.

<sup>6</sup> Hughes, Jr., *Fleet Tactics and Coastal Combat*, p. 285.

command, and act far more quickly than the opponent – is one of the most important advantages resulting from netting of one's forces and levels of command.<sup>7</sup> Through speed of command, the potential exists to offset a disadvantage in numbers, technology, or position.<sup>8</sup> Greater speed of command means greater automation of some warfare activities, and a "flatter" organizational structure because it would give commanders at all levels direct access to the information in making their decisions. Command and control will be largely based on negation.<sup>9</sup> Yet it is overlooked that the requirements for speed of command at the operational and strategic levels of command are significantly different from those at the tactical level. At the operational and strategic levels, the commander must anticipate events several weeks or even months ahead. In contrast, commanders at the tactical level need to anticipate events from a few hours up to 92 hours. At the tactical level, many decisions must be made, and very quickly. But at the operational and strategic levels, fewer decisions are made, and the time for making them is normally longer than at the tactical level. Yet the impact of operational and strategic decisions is significantly greater than that of tactical decisions.

Technically, processing and transmitting information faster does not necessarily result in a higher speed of command.<sup>10</sup> A commander's lack of mental agility or propensity to procrastinate can largely nullify gains achieved by speed of processing and transmitting information. Micromanagement from the top and overconcern for collateral damages can also significantly slow down speed of command.

One result of superior speed of command is *decision superiority* – the ability to operate well within an enemy's decision cycle to significantly reduce or lock out his options. With situational awareness provided by the netted picture, decisions can be made quickly and precisely.<sup>11</sup> Quick decision making combined with diverse high-precision weapons launched by geographically dispersed forces would enhance the probability of achieving a first-round hit on a target.<sup>12</sup> However, one's decision superiority is not necessarily the result of information dominance. To make faster and sounder decisions it is necessary to have properly educated and trained forces and sound command structure and doctrine.

The NCW enthusiasts assert that by obtaining information superiority and increased speed of command the commander would be able to preempt the enemy's options, create new options for friendly forces, and improve the effectiveness of the selected options.<sup>13</sup> One's forces, acting with speed and precision, can achieve massing of effects versus massing of forces, resulting in

rapid foreclosure of the enemy's course of action.<sup>14</sup> Combat will not consist of a series of steps, but will become more like a smooth curve and move to a high-speed continuum. The conventional observe, orient, decide, act (OODA) loop would disappear and the opponent would be denied an operational pause.<sup>15</sup> It should be obvious that, among other things, because of the vastly different factors of space, time, and force, the higher the level of war, the more difficult it is to foreclose the enemy's options. An agile and skillful adversary would normally have some option to choose from unless he is physically surrounded and threatened with immediate destruction. Additionally, at the strategic level, the ability to lock out enemy options may be limited by diplomatic or other constraints.<sup>16</sup>

By having shared awareness of the battlespace and a shared understanding of the commander's intent, one's forces will be able to *self-synchronize*, operate with a small "footprint," and be more effective when operating autonomously.<sup>17</sup> The concept of self-synchronization is achievable at the tactical level of war but not at the operational and higher levels of war. Not only combat forces but also operational functions, specifically intelligence, command and control warfare (C2W), fires, logistics, and protection, must be properly sequenced and synchronized to accomplish ultimate operational or strategic objectives.

### Disadvantages

Besides great promises, NCW potentially has some serious disadvantages. Perhaps the most serious are information overload and excessive centralization of command and control. *Information overload* can result when there is too much information for the commander and his staff to timely process and put into proper context. Another reason for overload is the inability of technical systems to timely and quickly transmit relevant information to users. Commanders can be overwhelmed by a vast flow of information, especially if they are not properly trained.<sup>18</sup> The greatest challenge that needs to be resolved is not to overwhelm the user with vast volumes of data. The critical problem is sorting out relevant from unimportant information.<sup>19</sup> The situation is even more serious if networks are used primarily to pass data instead of processing them into information. In that case, the sheer amount of information collected and transmitted to users by the diverse sources will most likely overwhelm the processing capability of lower levels of command.

NCW enthusiasts assert that the engagement grid would give a higher headquarters access to the same weapon systems as subordinate commands and allow it to act immediately on its decisions. The time pre-

viously required to generate and transmit messages directing operational and tactical actions would be eliminated, greatly increasing the operational tempo of centralized commands. Yet the examples of the recent conflicts in Kosovo, Afghanistan, and Iraq showed that the greatly expanded communications capabilities and improved battlespace knowledge led to increasingly centralized, not decentralized, command and control (C2).<sup>20</sup> The commander who has the best picture is going to issue directive orders. Perfect knowledge implies total control. In practice, the higher the level of command, the higher the temptation to issue directive orders rather than rely on the commander's intent. One of the worst consequences of the new information technologies is the growing interference of operational commanders in the decisions and actions of their subordinate tactical commanders. However, it is simply an illusion, and a dangerous one, for an operational commander to think that instant communications allow him to conduct war by remote control thousands of miles away from the scene of the action. Highly centralized decision-making unnecessarily restricts freedom of action for subordinate tactical commanders. An increase in the information volume was historically best

<sup>7</sup> Arthur Cebrowski, "Network-centric Warfare: An Emerging Military Response to the Information Age," Presentation at the 1999 Command and Control Research and Technology Symposium, June 29, 1999, p. 3.

<sup>8</sup> Cebrowski, "Sea Change," p. 5.

<sup>9</sup> Cebrowski, "Network-centric Warfare: An Emerging Military Response to the Information Age," p. 3.

<sup>10</sup> Forgues, *Command In A Network-Centric War*, p. 10.

<sup>11</sup> William K. Lescher, "Network-Centric: Is It Worth the Risk?" *Proceedings* 7 (July 1999), p. 59.

<sup>12</sup> Committee on Network-Centric Naval Forces, Naval Studies Board, Commission on Physical Sciences, Mathematics and Applications, National Research Council, *Network-Centric Naval Forces. A Transition Strategy for Enhancing Operational Capabilities* (Washington, DC: National Academy Press, 2000), p. 53.

<sup>13</sup> [http://www.dodcrp.org/NCW/impily\\_milops.htm](http://www.dodcrp.org/NCW/impily_milops.htm) p. 2

<sup>14</sup> Arthur K. Cebrowski and John J. Garstka, "Network-Centric Warfare. Its Origins and Future," *Proceedings*, 1 (January 1998), p. 32.

<sup>15</sup> *Ibid.*, p. 33; Arthur Cebrowski, "Network-Centric Warfare: An Emerging Military Response to the Information Age," p. 3.

<sup>16</sup> Kamradt and MacDonald, *The Implications of Network-Centric Warfare for United States and Multinational Military Operations*, p. 27.

<sup>17</sup> David S. Alberts, John J. Garstka, and Frederick P. Stein, *Network Centric Warfare. Developing and Leveraging Information Superiority* (Washington, DC: DoD C4ISR Cooperative Research Program, 2<sup>nd</sup> ed, revised, August 1999), p. 91.

<sup>18</sup> "The Doctrine of Digital War," *Business Week*, April 7, 2003, p. 37.

<sup>19</sup> Forgues, *Command In A Network-Centric War*, p. 6.

<sup>20</sup> John D. Zimmermann, "Net-Centric Is about Choices," *Proceedings* 1 (January 2002), pp. 39–40.

resolved through centralized direction and decentralized execution. Another benefit of decentralized C2 is the speed of action by subordinate command echelons through initiative. Centralized C2 is necessary in cases where the higher commander or political authority simply cannot risk the consequences of errors on the part of subordinate tactical commanders, as for example in a crisis situation or in a post-conflict phase. It is also appropriate in the case where subordinate commanders are poorly educated and trained or the climate of trust and mutual understanding is lacking.

### Limitations

The network-centric environment has a number of technical and human limitations that have the potential to significantly and adversely affect employment of one's forces in combat. The entire NCW concept is based on the collection, processing, and dissemination of vast volumes of information. Hence, its success is predicated on having an extremely complex network of inter-operable subnets and systems working well. Reliance on network information could slow one's force tempo because incoming traffic can considerably slow down decision-making. Likewise, information overload may overwhelm processing capabilities, thereby slowing the tempo. The radio frequency (RF) bandwidth is another limiting factor today that can considerably slow down the rate of information transmission. This problem is easier to resolve than that of the limitations of the human brain. Bandwidth can be significantly increased by using powerful space-based lasers and terrestrial fiber-optics communications.

An increase in situational awareness is limited by the human ability to process data. A human brain can often be overwhelmed by the amount of information available.<sup>21</sup> As technological advances proceed at an extremely rapid pace, a vast amount of information will be generated within an ever-decreasing time window. So far, the human decision-making cycle has not kept up with advances in technology.<sup>22</sup> The human factor can, in fact, become the weakest link in the decision-making process. This problem can possibly be resolved if appropriate and timely actions are taken to adopt advanced techniques in processing and displaying information to be assimilated

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lated by the commander and his staff. Otherwise, technology will increasingly become a problem, not a solution. As a result, the new information technologies can actually increase, not reduce, the fog of war and friction.<sup>23</sup>

### NCW and Coalition Warfare

NCW is widening an interoperability gap among U.S. forces and those of allies and potential coalition partners. It raises concerns among U.S. allies and potential coalition partners as to their ability to stay even with the United States and contribute to future operations.<sup>24</sup> Basic to the conduct of coalition warfare is the ability to develop and maintain a shared perception of the situation, and to develop coherent plans. This, in turn, requires a level of information exchange, systems that can understand one another. The greatest concern is that the United States will have technology that is too sophisticated to operate with other less advanced militaries.

The nature of NCW may ultimately result in more unilateral U.S. actions. The risk of so-called clueless coalitions is very real and cannot be adequately appreciated. The amount of information shared must be carefully controlled in coalitions. A partner or friend of today might be an enemy tomorrow. It is likely that some information will be shared in future coalitions, particularly at the strategic levels, but this information will be carefully controlled

and time will be required to sanitize it. Given the possibility of long-term harm to the United States, it is unlikely that U.S. commanders will take the risk and authorize coalition partner access to the networks.<sup>25</sup>

### Conclusion

NCW offers many advantages that if properly implemented would lead to significantly increased effectiveness of one's forces in combat. There is much to be gained by having continuous access to the vast amount of diverse information collected by the large number of platforms and sensors. Geographically dispersed forces will be able to use their weapons more precisely and with higher lethality than was the case in the past. Information technologies will allow the accomplishment of military objectives by using smaller but more capable forces. Various staff sections do not necessarily need to be collocated but can be geographically dispersed, thereby increasing their survivability. Plans made can be changed faster than in the past because of much better situational awareness. NCW will be a solution for situations, such as crisis and post-conflict phases that require highly centralized command and control. It is also applicable in cases where subordinate commanders and staffs are poorly educated or trained.

The network-centric environment also has the potential to create some serious

<sup>21</sup>Forgues, *Command In A Network-Centric War*, p. 10.

<sup>22</sup>Meilinger, "U.S. Technology Can Outpace Decision-Making," p. 19.

<sup>23</sup>Gilles Bérubé, *Technology and Decision Making* (Toronto: Canadian Defence College, NSSC4/CESN 4, 2002), p. 5.

<sup>24</sup>Robert Chekan, *The Future of Warfare: Clueless Coalitions?* (Toronto: Canadian Defence College, AMSC 4/CESM 4, October 2001), p. 8.

<sup>25</sup>Ibid., p. 13.

problems in the combat employment of one's forces. Information overload is a real-life problem. The capabilities of the new information technologies are going to increase exponentially in the years ahead. At the same time, the human ability to process and comprehend information is not going to substantially improve. This growing gap between technology and the human brain could be reduced only if a better way is found to filter and present vast amount of information, especially at the higher levels of command. Another danger in the net-

centric environment is excessive centralization of command and control. Interference of the operational commander in the decisions and actions of subordinate tactical commanders must be resisted; otherwise, the effectiveness of one's forces in combat will be significantly reduced. Technology never did, and never will, replace operational art as an intermediate area of study and practice between tactics and strategy. Nor will the new technologies change the essence of command. The human element – the commander and his staff – will remain,

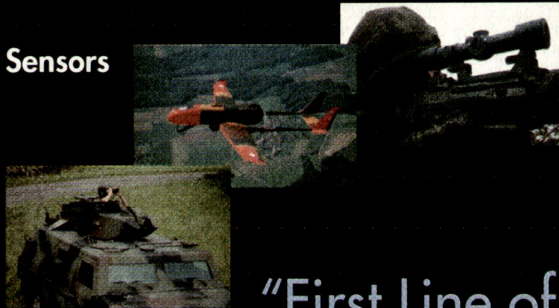
as it was in the past, the key to success in combat. ■



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## Network Centric Warfare

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