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**COMMAND IN A NETWORK-CENTRIC WAR**

By

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## **ABSTRACT**

This paper argues that a network-centric environment will not determine the essence of command in war. The essay begins with an explanation of the concept of information superiority followed by a description of the concept and essential characteristics of a Network-Centric Warfare environment. The impact of this environment on command is analyzed through its effect on the essence of command, defined in this paper as a mission-oriented human endeavor, performed within the limits of a commander's personal attributes, and guided by a framework of fundamental principles. The paper concludes that, in spite of advances in technology, command will always be limited by human attributes and capabilities, and will rely on a commander's creativity and intuition. Furthermore, the fundamental principles governing unity of effort, decentralization, trust, mutual understanding, and decision making remain unchanged in a network-centric environment.

## COMMAND IN A NETWORK-CENTRIC WAR

*“Far from determining the essence of command, then, communication and information processing technology merely constitutes one part of the general environment in which command operates.”*

Martin van Creveld  
*Command in War*, 1985.

The exponential growth of computer and communication technology in the latter half of the twentieth century has greatly impacted our society. Increasingly, both civilian and military sectors have grown reliant on these new technologies. This heavy reliance has led to the acknowledgement that friendly information systems must be protected from exploitation and attack in both peace and war, and the recognition that enemy systems are potential targets in times of conflict. In recent years, military doctrine addressing the new domain of information operations has been developed in earnest. Information superiority, the analogue of air superiority in *cyberspace*, has become one of the campaign objectives of the *cyberspace warrior*.

Advances in information technology have also enabled the development of increasingly capable and sophisticated command and control systems. In the United States, the concept of *Network-Centric Warfare* seeks to transform information superiority in cyberspace into an advantage on the physical battlefield. The concept has been fully endorsed by the United States Navy, and is acknowledged as a capability that must be achieved by the Canadian Navy.<sup>1</sup>

What is Network-Centric Warfare and how will it impact the operational commander? This paper argues that a network-centric environment will not determine the

essence of command in war. The essay begins with an explanation of the concept of information superiority followed by a description of the concept and essential characteristics of a Network-Centric Warfare environment. The impact of this environment on command is analyzed through its effect on the essence of command, defined in this paper as a mission-oriented human endeavor, performed within the limits of a commander's personal attributes, and guided by a framework of fundamental principles.

## **INFORMATION SUPERIORITY**

In the industrialized world, the second half of the twentieth century has seen an exponential growth in the reliance on information technology (IT) of both the civilian and military sectors. Sophisticated computer and communication systems have become central to all facets of traditional military operations such as command, transport, logistics, and intelligence.<sup>2</sup> Aided by the aggressive development of IT in the civilian sector, the rate of development and integration of IT systems into military affairs is not likely to diminish. The relatively low cost of IT systems makes it possible to extend the capabilities to users at all levels of the organization with the result that all functions, regardless of their significance, are served by and depend on IT. The result of this heavy dependence on IT by military and civilian organizations has led to the emergence of new vulnerabilities that can be exploited in conflict and, thus, to the concept of information warfare (IW).<sup>3</sup>

Dr. Tom Rona is credited with first using the term, information warfare, in the 1970s but it was in the 1990s that the US Department of Defense (DoD) first revealed the existence of command and control warfare concepts as a subset of the broader field of IW.<sup>4</sup> In response, leaders of the defense and information security industry have collaborated on the

study of the impact of IT and IW on military and civilian organizations with a view to making recommendations on how best to protect critical infrastructures. The US concern over the threat posed by the vulnerability of IT systems to IW led to the establishment of a plan for critical information infrastructure protection that was issued via a presidential executive order in 1996.<sup>5</sup>

Military doctrine has recently emerged to address the concept of IW and define how offensive and defensive military operations should be conducted in the new environment of cyberspace. In Canada, the *CF Information Operations* manual was published in April 1998, followed by the *Doctrine for Joint Information Operations* published in the US in October 1998. The doctrines are very similar and the definition of terms is consistent between the two publications. In US doctrine, *information operations* is defined as actions taken across the full spectrum, from peace to war, to affect adversary information and information systems while defending one's own information systems. *Information warfare* is information operations conducted during time of crisis or conflict. *Information superiority* is the outcome of successful information operations where the flow of information is enabled for friendly forces and denied to the enemy.<sup>6</sup>

In 1996, prior to the publication of the aforementioned doctrine manuals, the concept of information superiority was identified in the United States Chairman of the Joint Chiefs of Staff (CJCS) vision document, *Joint Vision 2010*, as a factor of "emerging importance".<sup>7</sup> Since then, the concept of information superiority has continued to evolve and grow in importance and figures prominently in the sequel document, *Joint Vision 2020*, that was published in June 2000. In this latest document, the CJCS describes his vision of the nature and capability of the US armed forces in twenty years, and the ongoing transformation that is

necessary to realize these new capabilities. The envisaged end state is a force “that is dominant across the full spectrum of military operations – persuasive in peace, decisive in war, preeminent in any form of conflict.”<sup>8</sup>

The role of information technology as the catalyst of the transformation is stressed in the document. Lending credence to the notion that we are indeed in the midst of a Revolution in Military Affairs (RMA), the document expounds that the “continued development and proliferation of information technologies will substantially change the conduct of military operations.”<sup>9</sup> The vision asserts that the end goal of *full spectrum dominance*, which will be achieved through the application of “dominant maneuver, precision engagement, focused logistics, and full dimensional protection,” can only be reached by realizing the full potential of the information revolution.<sup>10</sup>

*Information superiority* is advanced by *Joint Vision 2020* as a key enabler of the future joint force. Information superiority is defined in this document as “the capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary’s ability to do the same.”<sup>11</sup> This capability will provide the joint force a competitive advantage that will allow the force to operate freely in a *global information grid*.<sup>12</sup> The development of this information grid will provide the *network-centric environment* required in achieving the goal of a fully synchronized information campaign.<sup>13</sup>

Information superiority is therefore analogous to air superiority. One seeks control of airspace while the other aims to dominate cyberspace. Both are a means to an end, and are valued for their desirable impact on the ability to accomplish military objectives. Without air superiority, all elements of a joint force are vulnerable to air attack. Similarly, without information superiority all elements of a joint force are subject to interference with the added

vulnerability that the theatre of operation in cyberspace is not constrained by geography. If the global information grid that is envisioned in *Joint Vision 2020* is penetrated, attacks in cyberspace will be able to reach civilian and military targets across the globe and at the speed of light.

## **NETWORK-CENTRIC WARFARE**

Network-Centric Warfare (NCW) represents the next step in the evolution of military thinking about IT and its impact on the conduct of operations. The IO doctrine thus far has been limited to a description on how to conduct offensive and defensive action in cyberspace to gain information superiority. The emerging concept of NCW will potentially lead to the development of doctrine that describes how the military should organize itself to capitalize on the advantage of information superiority to conduct operations in the physical space.

Vice Admiral Arthur K. Cebrowski (USN) describes the concept of NCW in the seminal article, *Network-Centric Warfare: Its Origin and Future*.<sup>14</sup> In this treatise, he asserts that “we are in the midst of an RMA unlike any seen since the Napoleonic Age when France transformed warfare with the concept of levee en masse.”<sup>15</sup> He argues that advances in information technology are causing military operations to shift from platform-centric warfare to network-centric warfare.<sup>16</sup>

The NCW concept has been fully embraced by the United States Navy. The Chief of Naval Operations (CNO) is quoted in the January 2000 edition of the navy public affairs journal as stating that “NCW will be the US Navy’s organizing principle in the next century.”<sup>17</sup> The literature is rich with exposés by various naval officers endorsing the merits of the novel concept where “mutually shared information and a common tactical picture will



permit coherent employment of the entire naval force as a single synergistic entity.”<sup>18</sup> While very few writings have been generated outside of naval circles, the applicability of the concept to all military operations is obvious and, as discussed previously, *Joint Vision 2020* indicates that a *network-centric environment* is required to achieve the goal of a fully synchronized information campaign.

In his article, Admiral Cebrowski describes the structural model required to enable NCW.<sup>19</sup> He explains that the model consists of information, sensor, and engagement grids. The information grid consists of the computer and communication technology that enables the passing of large amounts of data through interconnected and interoperable networks. The information grid provides the backbone that enables the architectures of the sensor and engagement grids. Sensor grids collect data from dispersed sensors and rapidly generate battle space awareness that is shared at all levels of operation. Engagement grids link together lethal and non-lethal weapon systems and capitalize on this situational awareness to optimize the employment of fires resulting in a focus on the *massing of effects* rather than the massing of forces.

Admiral Cebrowski points out that many key elements of these grids are already in place but that full integration is lagging behind.<sup>20</sup> Information technologies, unlike those of other technologies applicable to military operations, are driven by commercial developments rather than by classified military research and development.<sup>21</sup> This has resulted in the rapid evolution and acquisition of military networks that are not interoperable and therefore cannot be integrated. To lay the groundwork for NCW, the US DoD has set technical standards that will allow local and wide area networks to communicate with each other.<sup>22</sup> Admiral Owens, the Vice CJCS in 1995, estimated that a “system of systems” could be completed by year

2020, and earlier if priority of defense spending was shifted from other procurement projects.<sup>23</sup>

As mentioned previously, the USN has embraced the goal of NCW and is ahead of the other US services in pursuing its implementation.<sup>24</sup> The Navy has undertaken an ambitious project, called IT-21, to build the “information grid” needed to serve as the backbone for the NCW concept. A total of \$3.6 billion was allocated for this project for a five-year period beginning in 1998. IT-21 will provide an “intranet” capability to virtually all Navy units afloat and ashore.<sup>25</sup> Commanders will be able to view the common operational picture provided by the US DoD Global Command and Control System and will have ready access to mission critical information (such as weather and intelligence). They will be able to communicate with widely dispersed forces using secure email and video teleconferencing.

Two other interoperable networks will provide the NCW sensor and engagement grid capability. The secure Link 16 Joint Tactical Information Distribution System (JTIDS) or the Multifunction Information Distribution System (MIDS) digital data radios now being deployed on ships and aircraft will fulfill the requirements of the sensor grid. The JTIDS and MIDS terminals will automatically report friendly positional data as well as known locations of enemy platforms for display over the network. The Cooperative Engagement Capability (CEC) will combine high-performance sensor and engagement grids. CEC-equipped ships and aircraft will operate as a single distributed air-defense system passing target data across the entire force in real time. The CEC will fuse the data from the various platforms to develop a target track with much greater accuracy than possible using any one sensor. Initial operational capability was achieved in 1996 in a test with the USS Eisenhower carrier battle

group. Current plans call for completing deployment of this capability aboard aircraft carriers, cruisers, destroyers, and Hawkeye aircraft by 2006.<sup>26</sup>

Having reviewed the NCW vision in technological terms, the salient characteristics of such a “system of systems” can now be identified with a view to determining the impact that a NCW environment may have on operational commanders. From Admiral Cebrowski’s perspective, the emergence of the new technology will enable an evolution from attrition warfare to a new style of warfare that is characterized by *speed of command* and *self-synchronization*.<sup>27</sup>

*Speed of command* is enabled and impacts the enemy as follows. First, information superiority on the information grid coupled with advances in display technology will result in a dramatic increase in situational awareness and a better understanding of the battle space. Second, the higher degree of battle space awareness, coupled with an effective engagement grid, will allow the commanders at all levels to employ forces with greater precision and to prioritize and allocate weapons more efficiently and effectively. Finally, the rapid and effective employment of forces will disrupt the enemy decision cycle and limit his ability to regain the initiative. Through speed of command, the potential exists to offset a disadvantage in numbers, technology, or position.<sup>28</sup>

*Self-synchronization* is made possible because of the ability to establish and maintain a high degree of situational awareness at all levels of operation. Operations no longer have to rely on top-down, command-directed synchronization. Each element of the force can ensure their unique operating rhythm is in tune with the commander’s intent and battle rhythm. This eliminates the need for a force-wide friendly decision cycle and, therefore, the enemy is denied the operational pause and is continuously kept off balance.<sup>29</sup>

In summary, the salient features of a fully developed and functioning NCW environment are:<sup>30</sup>

- ◆ High levels of shared battle space awareness
- ◆ Shared knowledge of the commander's intent
- ◆ Self-synchronization, speed of command and a rapid "lock-out" of the opponent's options.

## **METHODOLOGY**

Before proceeding with a study of the impact that a NCW environment will have on command, it is necessary to make some assumptions about the fielded technology to establish a basis for analysis and limit the scope of this paper. First, this paper assumes that the technological challenges that must be overcome to enable the NCW environment envisioned by Admiral Cebrowski have been overcome.<sup>31</sup> These challenges are not seen as insurmountable and it is not the purpose of this paper to challenge the feasibility of the technological vision.<sup>32</sup> Second, while information superiority can be achieved, it can also be denied or lost. Potential opponents will have the capability to interfere with the data on the information grid via technical or other means such as deception.<sup>33</sup> This assumption is validated by the fact that commercial rather than classified military programs develop most enabling technologies.<sup>34</sup> Third, it is assumed that the technological advancements to enable the information, sensor, and engagement grids have been matched with compatible developments in decision support technology. The NCW environment will result in an increased information flow that could easily overwhelm commanders. This potential has been recognized and research efforts are addressing this problem.<sup>35</sup>

Evaluating the impact of technological change on command is difficult because, as observed by Van Creveld, command is "so intimately bound up with numerous other factors

that shape war, the pronouncement of one or more ‘master principles’ that should govern its structure and the way it operates is impossible.”<sup>36</sup> While accepting the complexity of command as noted by Van Creveld, this paper attempts to gain insight of the impact of a NCW environment on command by first drawing from the work of Pigeau and McCann on the concepts of command and control.

McCann and Pigeau define command as “the creative expression of human will necessary to accomplish a mission.”<sup>37</sup> They convincingly argue that the human attributes essential for command consist of three principal dimensions: competency, authority, and responsibility. They recommend that all new command and control (C2) systems should be assessed for effects on these components. Accepting this model as a valid point of departure, this paper begins with an assessment of the effects of a NCW environment on the commander by analyzing its impact on these three human attributes.

Having examined the impact of NCW on a commander’s attributes, the paper will then turn to an analysis of the impact of NCW on his ability to exercise command. The *fundamentals of command* in CFP 300-1, *Operational Level Doctrine for the Canadian Army*, provide guidance to commanders in the exercise of command and will form the basis of the analysis.<sup>38</sup> This analytical approach is validated by two observations. First, the *fundamentals of command* are consistent with UK and US doctrine and transcend environmental boundaries. An identical set of key elements appears in the British Army doctrine, *Command*, and the set is consistent with the discussion on command in control in the US *Doctrine on Joint Operations*.<sup>39</sup> Second, the *fundamentals of command* are consistent with the views expressed by McCann and Pigeau, particularly as they emphasize the human dimension of C2 and the importance of the communication of intent.

The above analysis will lead to an evaluation of the impact of a NCW environment on the *essence of command*. This paper posits that the essence of command can be viewed as the synthesis of the above definition of command, the concept of command attributes, and the doctrine on the fundamentals of command. It is proposed that, in essence, *command is a mission-oriented human endeavor, performed within the limits of a commander's personal attributes, and guided by a framework of fundamental principles*. Thus, an evaluation of the impact on the commander's attributes and the fundamental principles of command will provide the basis for an assessment of the impact of a NCW environment on the essence of command.

## **IMPACT ANALYSIS**

McCann and Pigeau observe that command is a uniquely human characteristic that any individual in the organization, from private to general, can assume. They advance that varying levels of competency, authority, and responsibility set the general officer apart from the private in their abilities to command.<sup>40</sup>

Competency attributes span four general categories: physical, emotional, interpersonal and intellectual.<sup>41</sup> A commander's physical or emotional competency is not likely to be challenged in a NCW environment any more than it is in current settings.<sup>42</sup> However, new interpersonal and intellectual competencies may need to be developed.

The NCW environment will provide the commander and his staff with an increased ability to communicate via email and video teleconferencing (VTC) with all levels of his command. For most, this will not be a significant change as VTC is already being used as a means of communication between staffs and commanders with generally good results. There

is always a risk that VTC will be misused and employed as a micro-management tool. However, barring this misguided use, an expanded and appropriate use in a NCW environment is not likely to have any negative impact and may in fact enhance rather than diminish the communication function.

Intellectual competency is critical for absorbing large amounts of information, analyzing courses of action, and making decisions. Commanders must also be creative, flexible, and have a willingness to learn.<sup>43</sup> The NCW environment certainly has the potential to overwhelm commanders with too much information and, therefore, the ability to sort quickly through the unimportant will be a crucial skill. As previously discussed, the system will need to provide innovative decision support tools to assist commanders in this task. However, increased information will not necessarily result in improved leadership nor render commanders more effective. According to Lt Gen Claudia J. Kennedy, USA, “command is still largely a function of commander’s intuition ... individual’s perceive information in different ways.”<sup>44</sup> Essentially then, in spite of the vast amounts of data generated by a myriad of interconnected networks, in the final analysis, commanders will still need to rely on their creativity and intuition to make sound decisions in a NCW environment.

Authority, the second attribute advanced by McCann and Pigeau, refers to the domain of influence of the commander. It consists of legal authority, defined as that authority assigned by the government, and of personal authority, which consists of the authority granted by peers and subordinates.<sup>45</sup> McCann and Pigeau posit that “command authority is achieved almost exclusively through personal authority ... [and personal authority is] based on reputation, experience, and character.”<sup>46</sup>

A NCW environment has the potential to significantly impact a commander's personal authority. The increased level of shared battle space awareness and shared knowledge of the commander's intent will, assuming the commander is making correct decisions, bolster his reputation and increase his degree of personal authority over the entire force. Obviously, the reverse phenomena could also occur in situations where the commander is exhibiting questionable judgement. With respect to personal authority, a NCW environment will create a double-edged sword that commanders will need to wield carefully.

Responsibility, the final dimension of command, refers to "the degree to which an individual accepts the moral liability and obligation with Command."<sup>47</sup> McCann and Pigeau list two components of responsibility. *Extrinsic responsibility*, which is equivalent to accountability, deals with the formal obligations of command. *Intrinsic responsibility* relates to self-generated obligations and is a function of the resolve and motivation of the individual.<sup>48</sup> A NCW environment has the potential to induce higher degrees of intrinsic responsibility in commanders and subordinates alike; however, once again, an opposite effect is also possible. The higher degree of shared awareness can become a strong motivating force and increase the will to fight in all combatants. On the other hand, a shared awareness of culmination or imminent defeat may send shock waves through the force and negatively impact morale. In a NCW environment, perhaps to a greater extent than today given the heightened awareness of the situation, commanders will have to be vigilant and ensure effective leadership is exercised at all times.

McCann and Pigeau assert that the three dimensions of competency, authority, and responsibility are sufficient to account for Command capability and "together form an



abstract three-dimensional space within which the Command potential of all military personnel lie.”<sup>49</sup> They explain that “there exists a roughly linear relationship among the three dimensions, one that reflects an optimal balance for different levels of Command.”<sup>50</sup> Thus to be effective, a given commander’s abilities must match the levels of competency, authority, and responsibility associated with his position. Therefore, to function in the self-synchronization mode, NCW will need to ensure that commanders at all levels have the attributes necessary to accomplish the task. In effect, information technology alone is not sufficient to enable self-synchronization in a NCW environment. In the final analysis, it is the human element in the system, the commanders, that will make it work.

The fundamentals of command, as defined in CFP 300-1, are unity of effort, decentralization, trust and mutual understanding, and timely and effective decision making. Command promotes force cohesion to achieve unity of effort. Whenever possible, command must be decentralized and rely on the ability of sub-units to operate independently, while maintaining unity of effort. This favorable situation is made possible through the development of trust and mutual understanding. In such an environment, commanders can exercise timely and effective decision-making.<sup>51</sup> The impact of a NCW environment on each of the fundamentals of command will be addressed in turn.

*Although employing decentralization, the commander must remain able to coordinate the activities of his subordinates to achieve synchronization ... and to preserve unity of effort across his force.*<sup>52</sup>

Maintaining unity of effort is of course more difficult when command is decentralized. CFP 300-1 offers that the conflict between unity of effort and decentralization is resolved by ensuring that the commander’s intent is communicated and understood, the

main effort is clearly designated, a proper command climate is maintained, and the forces operate based on a common doctrine.<sup>53</sup> The role of the leader in establishing purpose, providing direction, and generating cohesion and motivation is stressed.<sup>54</sup> These guiding principles are fully consistent with the views expressed by McCann and Pigeau that command “is first and foremost a human endeavor” and that C2 is “the establishment of common intent to achieve coordinated action.”<sup>55</sup> These fundamental tenets operate independently of technology and will retain construct validity in a NCW environment.

To establish purpose, leaders require awareness. As advanced by Keegan, “the essentials of action by the commander are knowing and seeing.”<sup>56</sup> In this sense, a NCW environment certainly has the potential of facilitating the leadership function by increasing awareness. However, NCW runs the risk of overloading the commander if not properly designed. The technological challenge was expressed at a 1997 AFCEA conference. In the words of MGen Charles W. Thomas, USA, who chaired a panel on information systems at the conference, “building the right software filters, the right profiles, so that we can provide the right information without overloading each commander, is one of our great challenges.”<sup>57</sup> As outlined previously, this paper assumes that this technical hurdle has been successfully breached.

In a NCW environment, where the self-synchronization of forces is enabled and valued, commanders will be able to adopt a *command by negation* approach to maintain unity of effort. With the assumption that the technology will provide the means to effectively filter the large amounts of data and present a valid picture of the battlefield, commanders will be able to focus on the monitoring rather than the control of operations. While the means to

achieve unity of effort may change, this important and fundamental aspect of command will remain in a NCW environment.

*To generate the required tempo of operations and to cope with the uncertainty, disorder, and fluidity of combat, command must be decentralized to the maximum extent possible.*<sup>58</sup>

NCW will facilitate the decentralization of command. “No longer dependent on information being passed along, units can act on changing situations as they happen to exploit weaknesses and counter enemy strategies to accomplish the overall mission.”<sup>59</sup> However, decentralization cannot be applied indiscriminately. Decentralization relies on implicit communications, up and down and across the system.<sup>60</sup> In a NCW environment, the push for speed of command and self-synchronization will drive all participants to rely too heavily on the common operating picture, and to treat this situational display as a “shared reality that is neither shared nor real” due to the inherent inaccuracies of any information system.<sup>61</sup> Centralization may be more appropriate if the higher commander has better information, if subordinate commanders are not sufficiently trained, or if a climate of trust and mutual understanding has not been achieved.<sup>62</sup>

NCW may bring out the best and the worse in leaders. Some have argued that while NCW will allow for the flattening of organizational structures, the grave nature of military operations may push some commanders to seek too much control.<sup>63</sup> The best commanders will learn to use the increased situational awareness to their advantage. The complete linkage of the information network to all command hierarchies will allow commanders to adapt command and control roles and responsibilities based on the changing war fighting

scenario.<sup>64</sup> Commanders that use NCW effectively will “banish over-supervision and expect – demand – initiative from subordinates based on improved situational understanding.”<sup>65</sup>

CFP 300-1 explains that commanders must “allow subordinates to exercise freedom of action but [must be ready] to exert control when necessary by asserting their authority.”<sup>66</sup> This will continue to be sound guidance for commanders who seek to apply the principle of decentralization in a NCW environment.

*A superior needs to have the trust of, but also have trust in his subordinates. The basis of this two-way trust is mutual understanding.*<sup>67</sup>

CFP 300-1 identifies trust as one of the “cornerstones” of command. The maintenance of trust is vital to the maintenance of morale. Soldiers must trust not only their immediate superiors, but must believe in the abilities and judgement of commanders throughout the chain of command. Soldiers need to understand “the reason why” and maintain a sense of involvement in the decisions made by their superiors.<sup>68</sup>

NCW runs the risk of working against the establishment of mutual understanding by having the unwanted effect of distancing the commander from his troops. In the opinion of LtGen Kennedy (USA), “the most important and challenging thing the nation might face in JV 2010 is providing a means for the commander to see them, to be with them and to look them in the eyes when they say ‘I am ready’.”<sup>69</sup>

Pigeau and McCann echo the sentiments expressed by General Kennedy.<sup>70</sup> They relate the importance of shared intent between commanders and their subordinates. The components of shared intent are explicit and implicit intent. Explicit intent is passed overtly through orders but is not sufficient for ensuring operational success. Implicit intent is passed

through the exercise of leadership and the continual personal interaction with subordinates. By communicating implicit intent, “a Command climate is established where trust, confidence, motivation, creativity, initiative, pride, discipline and esprit de corps are developed.”<sup>71</sup>

A NCW environment will greatly facilitate the sharing of explicit intent and may, if the technological challenges are surmounted, service the need of maintaining close contact and shared implicit intent between the commander and the commanded. In any event, the fundamental need of shared intent and the element of trust it engenders will remain a cornerstone of command in a NCW.

*An effective planning and decision-making capability requires a balance between information and time ... The key is to make timely and effective decisions, appropriate to the level of command.*<sup>72</sup>

According to CFP 300-1, decision-making is a “time-competitive process to try to get inside the opponent’s decision-action cycle.”<sup>73</sup> The “faster commander” thus retains the initiative and keeps his opponent off balance by rendering his actions ineffective and inappropriate. However, the doctrine points out that timely decision-making does not only mean that decisions must be made quickly, but equally important is the need to “make good decisions at the right time.”<sup>74</sup>

The “speed of command” characteristic of a NCW environment could lead to some undesirable effects. “We may find ourselves acting so rapidly within our enemy’s decision loop that we largely are prompting and responding to our own signals ... like Pavlov’s dog ringing his own bell and wondering why he’s salivating so much.”<sup>75</sup> While networked organizations can process information faster, this does not necessarily mean that speed of

command is increased. Rather “this should translate into increased time for analysis and contemplation of appropriate response.”<sup>76</sup> NCW should not seek to change the Observe-Orient-Decide-Act (OODA) loop to a DADA loop.<sup>77</sup>

Professor Mackubin T. Owens<sup>78</sup> points out that “possessing a mass of data does not mean that the decision maker understands their significance or what to do with them.”<sup>79</sup> Only when data has been synthesized and converted into knowledge does the decision-maker achieve true situational awareness. Neither is more data necessarily better. As Zimm points out, more data would have “clogged an already crowded process” and would not necessarily have altered the *Vincennes* commanding officer decision to identify as hostile and order the shutdown of an Iranian commercial airliner.<sup>80</sup> What was needed was “exactly the right information, provided in a 2 minute and 22 second window.”<sup>81</sup>

CFP 300-1 points out that commanders must be conscious of the gravity of decisions that could result in the loss of life.<sup>82</sup> One element of decision-making may be aided by NCW in that perfect information will alleviate the burden of choosing; however, no amount of IT will ever allow complete insight into the minds of the opposing commander; or the intentions of a potential foe. As Admiral William Owens, Vice CJCS in 1996, explains:

“ The system-of-systems does not offer omniscience or omnipotence. It has demonstrated the ability to reduce the fog and friction of war and promises to do even more so in the future. What counts in war is the relative influence on the opposing side of what some have called the fog and friction of conflict. The side that can reduce the effect of that fog and friction significantly, relative to its opponent, will win.”<sup>83</sup>

Therefore risk taking, and the need to make decisions in the absence of perfect information, will continue to be a burden of command in a NCW environment. Technology, no matter how sophisticated, will never change this simple and unavoidable truth.

## SYNTHESIS

As previously argued, this paper posits that, in essence, command is a mission-oriented human endeavor, performed within the limits of a commander's personal attributes, and guided by a framework of fundamental principles. A NCW environment will not change the fact that command is a mission-oriented human endeavor performed within the limits of a commander's personal attributes.<sup>84</sup> However, two features of NCW have the potential of significantly impacting the attributes of competency and authority. First, the processing and assimilation of large amounts of data can overstress the intellectual competency of commanders. This paper assumes that system designers will be successful in their goal of filtering the data and providing commanders with adequate decision support tools. Arguably, a failure to design NCW systems in this manner will seriously constrain any potential advantage of a NCW environment as any increase in awareness will be limited by the human ability to process data. Second, the effectiveness of commanders can be diminished through a loss in personal authority in situations where a commander's questionable judgement is quickly disseminated across the information grid for all to see. However, while the new technology may alter the environment to the point that personal attributes are impacted, the central fact remains that command potential and effectiveness is limited by the personal attributes of the commander. In this respect at least, the essence of command is unchanged.

The analysis has also shown that commanders will continue to be guided by existing fundamentals of command in a NCW environment. While the means to achieve unity of effort may change, and the ability to decentralize command functions will be enhanced, the importance of these elements in the effective exercise of command is undiminished in a NCW environment. Similarly, and as argued in the previous paragraph, the establishment of

trust and mutual understanding may be altered in means but not in import. Finally, decision making will continue to be the province of commanders and continue to rely largely on commander's experience and intuition.

Therefore, a NCW environment will not determine the essence of command in war. The technology will bring a new set of variables to the command equation that must be solved by commanders. In the words of Martin van Creveld, "far from determining the essence of command, then, communication and information processing technology merely constitutes one part of the general environment in which command operates."<sup>85</sup> The technological component of war can never fully account for the dynamic interaction of human beings and "war will remain predominantly an art, infused with human will, creativity, and judgement."<sup>86</sup>

## **CONCLUSION**

The emergence of the concept of Network-Centric Warfare represents a significant milestone in the evolution of military thinking on how to integrate information technology into military operations. The first impact of information technology on military doctrine has been the formulation of organizing principles dealing with the conduct of operations in cyberspace and the idea of information superiority. The concept of Network-Centric Warfare seeks to further exploit information technology and significantly enhance the functions of command and control in the battlefield.

However, this paper has argued that a network-centric environment will not determine the essence of command in war. Command is in essence a mission-oriented



human endeavor, performed within the limits of a commander's personal attributes, and guided by a framework of fundamental principles. In spite of advances in technology, command will always be limited by human attributes and capabilities, and will rely on a commander's creativity and intuition. The fundamental principles governing unity of effort, decentralization, trust, mutual understanding, and decision making remain unchanged in a network-centric environment.

## Notes

<sup>1</sup> David Morse, "STANAVFORLANT Under Canadian Command." Canadian Military Journal, 1-2 (2000): 62.

<sup>2</sup> Canada, National Defence, CF Information Operations, B-GG-005-004/AF-032, 15 April 1998, 13 November 2000 <[http://bbs.cfc.dnd.ca/Admin/jointdocs/cdnpubs/af\\_032\\_info\\_ops/titl-toc.html](http://bbs.cfc.dnd.ca/Admin/jointdocs/cdnpubs/af_032_info_ops/titl-toc.html)>.

<sup>3</sup> Canada, National Defence, Information Warfare and Information Operations, Directorate of Strategic Analysis Research Note No. 98/09 (Ottawa: DND, 1998) 1.

<sup>4</sup> Edward Waltz, "The US Transition to Information Warfare," Journal of Electronic Defense, December 1998: 35-42, ABI/INFORM, ProQuest Direct, Information Resource Centre, Canadian Forces College, Toronto, 10 October 2000 <<http://proquest.umi.com>>.

<sup>5</sup> Waltz, n. pag.

<sup>6</sup> United States, Joint Chiefs of Staff, Joint Publication 3-13: Joint Doctrine for Information Operations, October 1998: I-1, 13 November 2000 <<http://www.dtic.mil/doctrine/jel/operations.htm>>.

<sup>7</sup> United States, Joint Chiefs of Staff, Joint Vision 2010, 1996 (?): n. pag., 10 October 2000 <<http://www.dtic.mil/jv2020/history.htm>>.

<sup>8</sup> United States, Joint Chiefs of Staff, Joint Vision 2020, June 2000: 1, 10 October 2000 <<http://www.dtic.mil/jv2020/jvpub2.htm>>.

<sup>9</sup> Joint Vision 2020, 3.

<sup>10</sup> Joint Vision 2020, 1.

<sup>11</sup> Joint Vision 2020, 8.

<sup>12</sup> Joint Vision 2020, 8.

<sup>13</sup> Joint Vision 2020, 9.

<sup>14</sup> Arthur K. Cebrowski, "Network-Centric Warfare: Its Origin and Future," United States Naval Institute Proceedings, 124-1 (January 1998): 28-35.

<sup>15</sup> Cebrowski, Network 29.

<sup>16</sup> Cebrowski, Network 29.

<sup>17</sup> C. Dour and V. Beck, "A Network-Centric Frame of Mind," Public Affairs Communicator, January 2000: n. pag., 14 November 2000  
<<http://www.mediacen.navy.mil/pubs/pac/jan00/pg11.htm>>.

<sup>18</sup> Edward C. Whitman, "Submarines in Network Centric Warfare," Sea Power, July 1999: 33-36, ABI/INFORM, ProQuest Direct, Information Resource Centre, Canadian Forces College, Toronto, 10 October 2000 <<http://proquest.umi.com>>.

<sup>19</sup> Cebrowski, Network 33.

<sup>20</sup> Cebrowski, Network 33.

<sup>21</sup> Waltz, n. pag.

<sup>22</sup> Bob Brewin, "DOD Lays Groundwork for Network-Centric Warfare," Federal Computer Week Editorial Supplement, 10 November 1997: n. pag., 10 October 2000  
<<http://208.201.97.5/pubs/fcw/1997/1110/wp/wp-netcentric-11-1-1997.html>>.

<sup>23</sup> William A. Owens, "The Emerging System of Systems," United States Naval Institute Proceedings, 121-5 (May 1995): 39.

<sup>24</sup> Leslie West, "Exploiting the Information Revolution," Sea Power, Mar 1998: 38-40, ABI/INFORM, ProQuest Direct, Information Resource Centre, Canadian Forces College, Toronto, 10 October 2000 <<http://proquest.umi.com>>.

<sup>25</sup> An "intranet" is an organization-wide version of the Internet.

<sup>26</sup> West, n. pag.

<sup>27</sup> Cebrowski, Network 32.

<sup>28</sup> Arthur K. Cebrowski, "Sea Change," Surface Warfare, 22-6, (Nov./Dec.1997): 5.

<sup>29</sup> Cebrowski, Network 33.

<sup>30</sup> Dour and Beck, n. pag.

<sup>31</sup> Core technologies supporting NCW include various information and Intelligence, surveillance and reconnaissance (ISR) technologies. See Waltz.

<sup>32</sup> Alan D. Campen, "Joint Vision Initiates Big Challenges to Acquisition, Integration, Culture," Signal, October 1997: 71-73, ABI/INFORM, ProQuest Direct, Information Resource Centre, Canadian Forces College, Toronto, 10 October 2000  
<<http://proquest.umi.com>>.

<sup>33</sup> Barry D. Watts, "Clausewitzian Friction and Future War," McNair Paper Number 52, Chapter 11, October 1996: n.pag., 27 October 2000  
<<http://www.ndu.edu/inss/macnair/mcnair52/m52cont.html>>.

<sup>34</sup> Waltz, n. pag.

<sup>35</sup> One such effort is a program called *Command 21* that is studying the decision-making process with a view to designing new decision-support systems. See Cebrowski, "Sea Change".

<sup>36</sup> Martin Van Creveld, Command in War (Cambridge: Harvard UP, 1985) 261.

<sup>37</sup> C. McCann C. and R. Pigeau, "Clarifying the Concepts of Control and of Command." Proceedings of the 1999 Command and Control Research and Technology Symposium, (Washington, DC: CCRP, Dept. of Defense) 5.

<sup>38</sup> Canada, National Defence, Conduct of Land Operations – Operational Level Doctrine for the Canadian Army (CFP 300-1) (Ottawa: DND, 15 Sep 1996) 3-4.

<sup>39</sup> United Kingdom, Chief of the General Staff, Army Doctrine Publication Volume 2 – Command, April 1995: n. pag., IRC Electronic Library, 15 November 2000; United States, Joint Chiefs of Staff, Joint Publication 3-0: Doctrine for Joint Operations, February 1995: II-16, 13 November 2000 <<http://www.dtic.mil/doctrine/jel/operations.htm>>.

<sup>40</sup> McCann and Pigeau, Clarifying 7.

<sup>41</sup> McCann and Pigeau, Clarifying 7.

<sup>42</sup> Physical competency considers physical strength, sensory motor skills, health, agility, and endurance.

<sup>43</sup> McCann and Pigeau, Clarifying 7.

<sup>44</sup> Campen, Joint Vision n.pag.

<sup>45</sup> McCann and Pigeau, Clarifying 8.

<sup>46</sup> McCann and Pigeau, Clarifying 8.

<sup>47</sup> McCann and Pigeau, Clarifying 8.

<sup>48</sup> McCann and Pigeau, Clarifying 9.

<sup>49</sup> McCann and Pigeau, Clarifying 9.

<sup>50</sup> McCann and Pigeau, Clarifying 9.

<sup>51</sup> CFP 300-1, 3-4.

<sup>52</sup> CFP 300-1, 3-4.

<sup>53</sup> CFP 300-1, 3-5.

<sup>54</sup> CFP 300-1, 3-3.

<sup>55</sup> McCann and Pigeau, Clarifying pp. 2-5.

- <sup>56</sup> John Keegan, The Mask of Command, (New York: Viking Penguin Inc., 1987) 325.
- <sup>57</sup> Campen, Joint Vision n.pag..
- <sup>58</sup> CFP 300-1, 3-5.
- <sup>59</sup> Jay L. Johnson, “Network Centric Warfare – Real Time Awareness,” All Hands, Jan.1998: n. pag., 10 Oct. 2000,  
<<http://www.mediacen.navy.mil/pubs/allhands/jan98/janpg52.html>>.
- <sup>60</sup> CFP 300-1, 3-5.
- <sup>61</sup> Thomas P.M. Barnett, “The Seven Deadly Sins of Network-Centric Warfare,” United States Naval Institute Proceedings, January 1999: n. pag., ABI/INFORM, ProQuest Direct, Information Resource Centre, Canadian Forces College, Toronto, 10 October 2000  
<<http://proquest.umi.com>>.
- <sup>62</sup> CFP 300-1, 3-6.
- <sup>63</sup> Barnett, Deadly Sins n. pag.
- <sup>64</sup> Raymond J. Christian, “What is Network Based Anti-Submarine Warfare?” Paper posted on Internet site operated by James N. Eagle, Department of Operations Research, US Naval Postgraduate School, n.d.: n. pag., 10 October 2000,  
<<http://spica.or.nps.navy.mil/netusw/WHITEPAP.DOC.htm>>
- <sup>65</sup> Steven J. Mains, “Adopting Doctrine to Knowledge,” Military Review, 7-2, March-April 1997: 95.
- <sup>66</sup> CFP 300-1, 3-3.
- <sup>67</sup> CFP 300-1, 3-7.
- <sup>68</sup> CFP 300-1, 3-7.
- <sup>69</sup> Campen, Joint Vision n. pag.

<sup>70</sup> R. Pigeau and C. McCann, “Re-defining Command and Control.” In C. McCann & R. Pigeau (Eds.), The Human in Command (New York: Kluwer Academic/Plenum) n. pag.

<sup>71</sup> Pigeau and McCann, Re-defining n. pag.

<sup>72</sup> CFP 300-1, 3-3.

<sup>73</sup> CFP 300-1, 3-8.

<sup>74</sup> CFP 300-1, 3-8.

<sup>75</sup> Barnett, Deadly Sins n. pag.

<sup>76</sup> Barnett, Deadly Sins n. pag.

<sup>77</sup> Barnett, Deadly Sins n. pag.

<sup>78</sup> In 1998, Mackubin Thomas Owens was professor of strategy and force planning at the US Naval War College.

<sup>79</sup> M.T. Owens, “Technology, the RMA, and Future War,” Strategic Review, 26-2, Spring 1998: 69.

<sup>80</sup> Alan D. Zimm, “Human-Centric Warfare,” United States Naval Institute Proceedings, 125-5, May 1999: 31.

<sup>81</sup> Zimm, Human-Centric 31.

<sup>82</sup> CFP 300-1, 3-8.

<sup>83</sup> William A. Owens, “The Emerging System of Systems,” National Defense University Strategic Forum, Number 63, February 1996: n. pag., 10 October 2000  
<<http://www.ndu.edu/inss/strforum/forum63.html>>

<sup>84</sup> The idea that artificial intelligence may eventually transform the art of command from a human-centric to a machine-centric activity is beyond the scope of this paper.

<sup>85</sup> Martin Van Creveld, Command in War (Cambridge: Harvard UP, 1985) 275.

<sup>86</sup> F.G. Hoffman, “An Alternative to the ‘System of Systems’,” Marine Corps Gazette, 84-1, January 2000: 22.



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