

# **Network Enabled Capability: A Theory Desperately in Need of Doctrine**

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Western countries have maintained their position as the dominant militaries in the world since the 1990s largely due to their superior military technology. But recent years have seen this gap shrinking as the price of these technologies is rapidly decreasing and other countries are investing heavily in military modernisation programs. In an effort to maintain the military advantage, Western countries have been looking to not only improve the technology of their military equipment, but they are also heavily exploring new concepts of networks and systems that should allow them to greatly improve the efficiency with which they employ their equipment. The United States has been the leader of this line of development, calling the new theory Network Centric Warfare (NCW). The United Kingdom (UK) is developing this technology in parallel with the US, calling their theory Network Enabled Capability (NEC). NEC has the potential to completely revolutionise the conduct of warfare and many countries are relying on it as a means to keep their military advantage. The US Department of Defense Command and Control Research Program, in their report to the US Congress, wrote that NCW will be the single most important contributor to combat power in the future.<sup>1</sup>

Unfortunately, much of the enthusiasm and expectations of NEC have focused on the technology required to make NEC a reality. Almost no effort has been put into developing the doctrine or procedures that will be necessary to turn the technology of NEC into the huge advantages that have been suggested. Without new doctrine, the new technology will not provide a positive benefit over the status quo because it will be supported by old doctrine. It is only by combining new technology with doctrine written specifically to exploit the advantages offered by that new technology that

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NEC will be able to provide the full superiority of which it is capable. Specifically, there are three major areas of doctrine that must be developed in order for NEC to reach its full potential.

First, is the balance that must be achieved in NEC between the use of Mission Command and direct commander involvement in tactical decisions.

Next, doctrine must be developed that enables a decrease in the vertical command structure of units.

Finally, NEC demands development of a common language that will be used and understood by all services. It is only through the development of these three key doctrinal concepts, that NEC will be able provide a significant military advantage to the United Kingdom. It is important to note that there is significant speculation and debate about NEC and whether it is a huge advance or just a false prophet. This article acknowledges but does not engage in this debate. It presupposes NEC technology will reach fruition and focuses on the doctrinal gap that must be addressed to make that technology useful.

Before moving directly into the doctrinal shortcomings of current NEC development that must be addressed, it is important to overview the current state of NEC and the deficiencies in its development. NEC is based on the premise that the military needs to move away from its current platform-centric focus for conduct of operations to a network-centric focus where all players share their information with each other to achieve a heightened state of situational awareness.<sup>2</sup>

This increase of situational awareness and subsequent ability to react in a more timely manner than the opponent should give the military an exponential increase in ability without changing any of its platforms or weapons. The theory is fundamentally a commander focused concept that attempts to alleviate much of the fog and friction of warfare and give the commander more timely information than ever before.<sup>3</sup> The US has been aggressively pursuing the development of NCW and all of its associated technological requirements. Currently, the US has evolved the NCW concept into Network Centric Operations (NCO). The US Net Centric Environment Joint Operational Concept publication defines NCO as 'exploitation of the human and technical networking of elements of an appropriately trained joint force by fully integrating collective capabilities, awareness, knowledge, experience, and superior decision-making to achieve a high level of agility and effectiveness in dispersed, decentralized, dynamic and uncertain environments'.<sup>4</sup> There are four basic tenets that comprise the NCO concept: a networked force improves information sharing, information sharing raises situational awareness, situational awareness enables self-synchronisation,

collaboration and speed of command, and these, in turn, dramatically increase mission effectiveness.<sup>5</sup> In short, NCO is about developing a higher situational awareness faster than an adversary and being able to respond to this information in a timely manner.

The UK has been developing its own form of Network Centric Operations, called Network Enabled Capability (NEC), in parallel with the US, while introducing a healthy dose of scepticism into the project. The NEC program is less ambitious than the NCO program. The Ministry of Defence Network Enabled Capability paper defines the goal of NEC as decreasing the time it takes for information to travel from a sensor to a shooter, while making better informed decisions that lead to timely precision effects.<sup>6</sup> Specifically, NEC is based on three fundamental elements: the sensor that gathers information, the network that fuses and disseminates information, and strike assets that deliver effects.<sup>7</sup> When fully functional, NEC should integrate the sensor and shooter through a robust network that allows for the commander to achieve decision superiority and delivery of rapid and synchronised effects that overwhelm the adversary.<sup>8</sup> The crucial element of NEC is neither the sensor nor the shooter, but the network that allows the commander an unprecedented view of the battlespace and, through this heightened situational awareness, he can make better decisions in a more timely manner.

The US and UK programs are similar in most aspects, but there are several differences. The most important are the size and aspirations of the two projects. The US has put great faith and effort into their development of NCO and they expect it to infiltrate and overwhelm almost all aspects of military operations with the network at the centre of the capability.<sup>9</sup> The UK is taking a much more cautious approach. NEC acknowledges the resource limitations of the UK and the uncertainty of network technology by reducing the network to the position of just an enabler of the people and equipment that employ it in accordance with the doctrine of Effects Based Operations and Decision Superiority.<sup>10</sup> For example, the US envisions a future NCO environment where the network is able to automatically filter huge amounts of data and retask assets and missions based on a set of inputs from the commander and staff. This effectively takes the human out of the loop by accomplishing many tasks through an automated process. In contrast, the UK sees NEC just as an enabler of current operations that will not reduce manpower or man-hours required, but, will provide the commander and operator with more timely and accurate information with which to make decisions.

The Ministry of Defence has laid out its programme for the development of NEC, which revolves around four principles that are considered

basic to all operations: sense, understand, develop intent, and synchronise effects.<sup>11</sup> From these principles, the Ministry developed a road map of priorities that must be accomplished in order to achieve NEC.<sup>12</sup> The first priority is to improve the connectivity of currently planned equipment. This improvement has already been started through programmes like the 'Bowman' radio system, but the UK will require a much more capable system to make NEC a reality. This capability increase will be met through the second priority, which is to further integrate organisations and systems. In this phase, more common systems will be promulgated through the military to allow them better communication.

The final priority will be to synchronise all aspects of military effect. Once all of the network hardware and software are firmly in place for NEC, the Ministry plans to shift its focus to the development of doctrine and procedures to synchronise its forces. But, this is where the UK could be severely hampering the effectiveness of NEC, because it has prioritised for most doctrine development to occur after all of the equipment required for NEC is in place.

Currently, NEC is just a theory, and it will remain so, until the technology and doctrine are fully developed to make it functional. But, there are many indications that NEC will be able to transcend or breakdown the current barriers that exist between the levels of war. Alberts, Garstka and Stein write that NEC has the potential to decouple the traditional constraints that exist between the tactical, operational and strategic levels of war.<sup>13</sup> This is due to NEC's propagation of knowledge and situational awareness of the entire theatre to all participants. The strategic level will soon have the ability to watch and influence every decision and action at the tactical level, the same as the so-called strategic corporal can influence the strategic conduct of a campaign.

This leads to the concept that the development of NEC must focus directly on how it can be used to achieve decisive effects simultaneously at the tactical, campaign and politico-military level of a war.<sup>14</sup> The US has already come to this conclusion in its development of NCW. The American publication *The Implementation of Network Centric Warfare* states that the key element of NCW implementation is not the technology, but getting the theory correct through a process of constant experimentation and testing.<sup>15</sup> This demands a serious effort to develop doctrine and procedures in conjunction with the technology of NEC so that the two can reinforce and feedback on each other, ensuring their successful integration when NEC is fully implemented.

The nature of NEC makes it especially dependent on the development of doctrine to achieve its full potential. The UK publication on NEC notes

that the primary challenge of NEC is not going to be the technology, but rather, the integration of the human dimension into the network.<sup>16</sup> It continues to say that the full benefits of NEC can only be realised when changes are made to organisational processes and individual behaviours.<sup>17</sup> NEC has a definite technological requirement but it is not based on the normal platforms used in military operations. The benefits of NEC can only be reached by improving the processes surrounding the employment of these platforms. This unique factor highlights that NEC is as much about a doctrinal change as it is about the technology that is developed. Donald Rumsfeld accentuates this point by comparing NEC to the example of German *Blitzkrieg* from World War II.<sup>18</sup> He explains that what was revolutionary about *Blitzkrieg* was not new capabilities or equipment, but rather, the unprecedented and revolutionary way in which the Germans mixed their capabilities. In other words, doctrine is just as important as having the new technology.

The reason that NEC will be so dependent on doctrine is because it promises to bring together a huge amount of information from every sensor in the battlespace. While this information superiority over an adversary can be translated into a decision advantage, it also has the potential to overload and paralyse the system. In order for NEC to work, copious amounts of information must be sifted, filtered and integrated to produce a product that allows decision superiority.<sup>19</sup> Most of that work depends on the human element,<sup>20</sup> using their experience and knowledge of the situation, as well as some type of established doctrine or procedure to accomplish the mission effectively. The total capability of NEC will require the simultaneous development of both technological and knowledge capability areas.<sup>21</sup> Technology alone cannot cope with all of the information that will be generated by NEC; therefore, doctrine must be developed that allows human interface with the system to turn that information into exploitable knowledge.

From these arguments, it is clear that NEC is going to require an entirely new way of thinking and working as it is brought online in the military. The US Department of Defense has laid out their plan for NCO implementation by specifying the rather all encompassing areas of change required as doctrine, organisation, training, material, leadership and education, personnel and facilities.<sup>22</sup> Rumsfeld expounded on this concept by noting that high technology alone cannot change a military. Rather, true change requires new ways of thinking, training and fighting.<sup>23</sup> The UK has adopted a similar, though more reserved, concept of implementation and notes that NEC advances will require a parallel development of people, through education and training, as well as new concepts, procedures and structures.<sup>24</sup> NEC is an emerging theory of war

that will require a complete military cultural change as it networks large and disparate groups of people. These changes in thinking and fighting can only be developed and disseminated throughout the military if they are created in the form of written doctrine that can be understood and practised by all.

There are many people, especially in the US, that consider NCW or NEC to be the next Revolution in Military Affairs (RMA). While it is beyond the scope of this article to debate whether it is an RMA or not, there is a very useful parallel that can be drawn. An RMA is not a development of technology alone, but rather, requires a combination of new technology along with new operational concepts and organisational adaptations.<sup>25</sup> Often, these doctrinal changes prove to be more important than the technology itself.<sup>26</sup> This appears to also be the case for the development of NEC because it is not a new weapon or armour. The source of its power is information itself. If this information cannot be exploited, then NEC will provide no increase in capability at all. NEC will only be empowered through the development of doctrine to utilise this newly generated information.

This naturally leads to the most important question about the development of NEC: At what point is it necessary and proper to start the development of doctrine to support the technological innovations of NEC? It is clear that doctrine and technology must be developed together if they are to produce enhanced capability. It is like the old paradox, 'Which came first, the chicken or the egg?' It is not possible that one was created without the other because they are intractably linking. The same is true with doctrine and technology for NEC; one is useless without the other. And so, they must be developed in tandem. Unfortunately, NEC has been characterised by vast expenditures on technology with almost no effort being put into the development of doctrine for its use. This is largely due to the fact that it is easy to fall prey to the promises offered by technology alone, forgetting about the tedious and demanding co-evolution of doctrine that is required.<sup>27</sup> Recent years have seen NEC-like systems such as Link 16, Blue Force Tracker, and 'Bowman' come online without any real plan for using them beyond complementing current doctrine. This practice is standard for two reasons.

First, the technology was developed with no real concept for its final application which means that it misses all the advantages of being tailor-made for a new practice. It will have to be 'adapted' for any future 'new doctrinal' use which is both expensive and inefficient.

Second, all of these systems provide potentially powerful advances, but rather than being realised at their introduction, it will take more years of

practice and doctrine development before real change is seen. It is folly to develop and field a new technology without conducting a parallel process of doctrine development for its use that complements the technology and provides feedback on its development. For NEC to be properly developed and ready for use when the technology is fielded, doctrine for its use must be simultaneously created, tested and evaluated.

There are three main areas of doctrinal development required for NEC. The first is the balance between Mission Command and direct commander involvement in tactical decisions. The British Army Doctrine Publication, Volume 2, defines Mission Command as a decentralised style of command, relying on initiative, the acceptance of responsibility and trust.<sup>28</sup> This philosophy was developed because it was considered the best way to cope with the Clausewitzian concepts of fog and friction on the battlefield.<sup>29</sup> Mission Command is based on four enduring tenets; 'timely decision making, a clear understanding of the superior commander's intentions, an ability on the part of the subordinates to meet the superior's remit and the commander's determination'.<sup>30</sup> What is truly novel about Mission Command is the contract of trust between the commander and subordinate.<sup>31</sup> The commander empowers the subordinate to act in ways the commander did not envisage based on extenuating circumstances as long as it falls with the commander's intent. To be truly effective, under Mission Command, superiors should keep control measures over subordinates to a minimum, to allow them the most freedom of action.<sup>32</sup> In the UK, commanders at all levels are authorized to conduct Mission Command, it is the style in which their forces excel and they believe it gives them a qualitative operational advantage.<sup>33</sup>

NEC naturally fits the concept of Mission Command because it raises situational awareness at all military levels, from the soldier to the general. NEC will provide more timely and better quality information to a broader spectrum of commanders than was previously possible.<sup>34</sup> This is especially true for the lateral sharing of knowledge, where lower level commanders will be able to know what their counterparts in other units are doing and seeing, and use this information to formulate their own actions.<sup>35</sup> The UK NEC publication states NEC is founded on the principle of Mission Command and will enable the commander to better articulate his intent and for subordinate commanders to execute that intent using the enhanced knowledge they have from shared situational awareness.<sup>36</sup> For example, since all units will know each other's location, should one come under heavy attack, other independent units nearby will be able to easily respond, even without the direct order of the commander, subjecting the enemy to an impromptu but coordinated attack from multiple directions.<sup>37</sup>

By providing commanders at all levels with more information, NEC should better equip subordinate commanders to exercise Mission Command.

Because the Mission Command philosophy relies on decentralised command, NEC doctrine must be established to protect and promote it. There is a general fear in the military community that NEC will promote more direct commander involvement in tactical operations and increase centralisation of command, resulting in a decrease in Mission Command. Storr rebuts this fear by noting NEC does allow more commander involvement, but the commander has a naturally limited capacity to only interfere with one or two subordinate commanders at a time, which will free up all the others to act on their own initiative.<sup>38</sup> Further, when conflict becomes more intense, a commander's ability to get involved in all aspects of the campaign decreases.<sup>39</sup> NEC will also mimic this effect because it will quickly overload a commander and staff with too much information for them to act on all of it effectively. This necessitates decentralised decision-making by the people who are closest to the actual conflict and best understand what information is important.<sup>40</sup> The key advantage NEC brings to Mission Command is that it enables the benefits of decentralisation – initiative, adaptability, and tempo – without sacrificing the coordination and unity of effort that a commander wants.<sup>41</sup> NEC should allow the commander to give his subordinates Mission Command with more confidence that they will be able to correctly execute his intent without direct involvement.

NEC will also improve the ability of the commander to observe and directly effect the tactical actions of his subordinate units. Most importantly, it will allow the commander to redirect the necessary subordinate units at decisive points of the campaign.<sup>42</sup> Currently, commanders have this ability but they are often forced to make decisions based on information that is outdated and incomplete. NEC should improve the quality and timeliness of the information senior commanders receive and allow them to be directive with their units to act at decisive points. This is important because achieving decisive points is often not about mass or force. Rather, it is about applying the correct, concentrated force at the right time and place.<sup>43</sup> A commander with better situational awareness should be able to better economise his forces by applying them at decisive points, knowing exactly what combat power is required to accomplish the task and not using more units than necessary. This, in turn, will free up units to accomplish other missions and result in the most efficient use of the force. This concept also aligns nicely with the requirements of Effects Based Operations (EBO). EBO is warfare based not on attrition, but rather, forcing the

opponent to yield by breaking his will to fight long before his means of fighting are exhausted.<sup>44</sup> The concept of 'breaking' rather than 'defeating' necessitates focus on the adversary's decision-making process and ability to act in a coherent manner.<sup>45</sup> NEC will allow commanders to have a much better awareness of the adversary's actions and decisions, allowing them to focus their campaign on the psychology of the enemy. They can use this information superiority to conduct precision violence against the opponent which will create effects beyond their means and dismantle the adversary's will to fight.<sup>46</sup> NEC holds the key to allowing the commander to correctly and efficiently conduct Effects Based Operations.

There are three main doctrinal requirements to allow NEC to increase commander capabilities: filtering of information, Commander's Critical Information Requirements development, and command staff procedures. Unfortunately, most of the information provided to the commander by NEC is in unprocessed form and it will be difficult to find the vital information the commander needs for his campaign amidst all the other noise. NEC promises to provide the commander with information of a speed and quality never before realised.<sup>47</sup> However, this information will be completely useless, unless someone is able to process it into a form that can be understood and provides the required knowledge. Most experts agree that this filtering is the key concept in making NEC work.<sup>48</sup> While there is hope to automate some of this information filtering process, most of it will have to be done by an actual person, sifting the data and putting together elements from disparate sources to create valuable knowledge. NEC will rely on this human ability to differentiate what is important and urgent from what is not.<sup>49</sup>

The need to turn an overabundance of information into useful knowledge will force the commander to precisely define the Commander's Critical Information Requirements, to delineate what information is most important to execution of the campaign. The first step in achieving decision superiority is identifying what information you want to know.<sup>50</sup> Once this criterion is set, the commander's staff is able to assess all of the information, pick out the relevant parts and provide the commander with the correct information he needs to make the best decision.<sup>51</sup>

The Commander's Critical Information Requirements can also be used as the basis for designing information hierarchies and display systems tailored to the campaign which display the information the commander requires, filtering out extraneous inputs.<sup>52</sup> Further, the staff will be able to use NEC to directly access the key players in order to identify and fill any knowledge gaps and promote overall situational awareness.<sup>53</sup> Through the doctrinal development of Commander's Critical Information

Requirements specific to NEC, the commander will be able to help his staff and subordinates filter the vast information provided by NEC to produce the valuable knowledge required to obtain decision superiority.

While the commander sets the campaign and information requirements, it is easy to see that NEC will require a large staff working 24 hours per day in order to execute the commander's intent. Information itself is useless; it is only the human ability to do something with it that makes information powerful.<sup>54</sup> Unfortunately, it will be very difficult for the subordinate commanders, fully engaged in battle to observe, filter and understand all of the information that is available to them. In battle, the human ability to absorb information decreases significantly because of the attention focused on actual combat. In contrast, a commander's staff is perfectly situated to dispassionately observe all of the information that NEC is providing and use it to help subordinate commanders select the best courses of action. The staff is uniquely positioned to use the information NEC provides to develop a holistic view of the operating environment and develop a better 'feel' for the evolution of the campaign.<sup>55</sup> Once a commander develops a campaign plan, his staff will be able to monitor it with a level of detail never before available and use this information, with their holistic view, to adapt their decisions and planning to the dynamics of the operating environment.<sup>56</sup> Overall, NEC should give the commanders and staff, heretofore unknown abilities to directly influence the battle.

NEC is far from a complete panacea for the commander and will likely create issues that doctrine must address. The most likely problem will be for the commander to become paralysed by the overload of information that NEC provides. NEC critic, Richardson, points out that the amount of information generated can quickly create as many problems for the commander and staff as it solves.<sup>57</sup> Further, it will be easy for the commander to be drawn down into the tactical 'weeds' by NEC where he does not belong.<sup>58</sup> General Sir Michael Walker provides an example of this when he describes an incident in Bosnia in 1995 where the Supreme Allied Commander ordered two battalions of tanks to intercept a squadron of Serb tanks which he discovered on an unprocessed satellite photo, not realising the squadron was already under NATO control.<sup>59</sup> Another example is illustrated by the commander of the US 3rd Infantry Division during Operation 'Iraqi Freedom', when he boasted that he could see all of the brigades in his division over a 300 kilometre front and directly control their fights.<sup>60</sup> Both of these examples clearly illustrate how easy NEC makes it for commanders to leave their normal domain and delve into the workings of their subordinates.

The technology of NEC promises to bolster the abilities of Mission Command while allowing the commander to intervene at decisive points in a campaign. However, most of the potential benefits are just theories at this point and a significant amount of doctrine and procedures need to be developed to make them reality. The most important problem that doctrine must overcome is that Mission Command and direct commander involvement are generally viewed as mutually exclusive concepts. Doctrine will have to be developed to delineate when each concept is appropriate and when it is not. The answer will most likely lie in achieving a balance or complementarity between the two concepts. Storr describes five levels on which commanders can deal with their subordinates, which he calls the five 'Ins'; Interest, Involvement, Influence, Intervention or Interference.<sup>61</sup> Obviously, a commander working at either extreme is not acceptable, but there is a grey area between involvement and intervention where commanders need to operate. NEC will provide superior and subordinate commanders with the same level of information. This naturally leads to the dilemma of who 'has the stick' during operations.<sup>62</sup> The doctrine for NEC will have to take the path between centralised control and total decentralisation, by developing focused leadership and coherent strategic choices.<sup>63</sup> Commanders will have to understand that NEC does not give complete situational awareness and nothing can replace the feel the subordinate commander directly involved in the action is able to gain. Centralisation of command can only work under ideal conditions, which warfare is not, so NEC must not threaten delegation and Mission Command.<sup>64</sup> However, at the same time, there will be moments when the commander needs to interfere with Mission Command at decisive points. For this reason, doctrine will need to establish clear lines of responsibility and criteria, so that commander involvement is kept to a minimum, but necessary level.<sup>65</sup>

These criteria must acknowledge that there are definitely times when the commander must intervene in his subordinate's actions. Obviously, NEC allows the possibility of interference by senior military or political figures in tactical operations.<sup>66</sup> This is commonly referred to as the 'long screwdriver'. Still, most commanders understand that their main role is to set the conditions for their subordinate commanders to succeed.<sup>67</sup> Using this concept, they should strive to give their subordinates the most freedom of action to work within the conditions they have created to meet the commander's intent. At the same time, it is the commander, not the subordinates, who is ultimately responsible for achieving the campaign end-state. There will be times when conditions change or an opportunity is available that the commander must ensure is taken by the subordinate commanders. Lloyd states that there will be occasions when direct control is warranted to

achieve a specific aim, but these must be the exception rather than the rule.<sup>68</sup> The real key for the commander is that NEC allows flexibility to exercise command and control as best fits the situation.<sup>69</sup> Commanders will now be able to plan the command and control procedures and architecture as part of a campaign because it can be specifically tailored. For example, a high intensity conflict will likely require much more decentralised control where the commander focuses on synchronising the effects of his units, while a lower intensity conflict can allow the commander to focus much more on specific actions and to recognise and control the 'strategic corporal' when he appears. Regardless, the command and control plan must maintain a flexibility that allows the commander to recognise and exploit any new critical vulnerability of the enemy that may appear during the execution of an operation.

Whatever doctrine is developed, probably the most important theme that can be reached is that the commander will require extensive practice to make NEC-powered command effective. NEC will require a new type of commander who is able to assimilate copious amounts of information and decide when is the most appropriate time to act.<sup>70</sup> Storr uses the analogy that NEC will change military command from a game of stud poker, where you know some but not all of the cards, into more of a chess match, where you (potentially) see all the pieces, so the command emphasis is on where the pieces are moved.<sup>71</sup> This change increases the need for commander training, so he can recognise situations and decide quickly on the correct response (just as a chess Grand Master does in competition). Training will also be important to wean commanders away from the desire to interfere unnecessarily with their subordinates. The more they practice command, the more they will learn to trust the decisions and actions of the subordinate commanders.

Finally, as with all training, it will not be complete until it has been thoroughly debriefed with all relevant lessons identified.<sup>72</sup> These can then be promulgated to the rest of the force to improve their training and feedback on the doctrine that has been developed. Through the development of doctrine and training, it will be possible to strike a proper balance between Mission Command and direct commander involvement in a network enabled environment.

The need to balance Mission Command and direct commander involvement is not the only doctrine that needs developing to empower NEC. Probably the most revolutionary concept to be introduced with NEC is that of decreasing vertical command structures. The main idea behind this concept is that NEC increases the number of subunits that one commander and staff can control, so it will be possible to decrease intermediate levels of

command. The purpose of a command hierarchy is to enable a commander to control all of his assets and coordinate their capabilities.<sup>73</sup> While this hierarchy is required to overcome the stress of controlling such a wide array of assets, the price that is paid is the creation of friction inside the organisation.<sup>74</sup> If it were possible for one commander to control all of his assets without the need for subordinate command structures, the organisation would have less inherent friction. NEC challenges the traditional hierarchies of the military including the concept of tactical, operational and strategic levels.<sup>75</sup> Instead, NEC pushes toward a much more flexible and decentralised structure. Further, NEC will enable distributive and collaborative planning where the commander can liaise directly with all of his subordinate units and collectively plan operations.<sup>76</sup> This ability to communicate directly with all subordinate units should alleviate the need for intermediate tiers that control smaller groups of assets.

Most likely, this will drive the military to a wartime hierarchy and a peacetime hierarchy. The Royal Air Force (RAF) is already employing this type of command structure. During peacetime, the RAF uses its normal flight, squadron, station command structure for training and administration. It usually even deploys in these formations. But, during actual operations, the squadrons offer their assets to the Joint Force Air Component Commander (JFACC) who directly tasks the aircraft for missions and controls and coordinates them without going through the intermediate echelons of the flights, squadrons, or wings. NEC is empowering the JFACC, through the Air Operations Centre, to directly control all of the assets under his command. The intermediate echelons still conduct important enabling roles like maintenance and administration, but they are not necessary for actual combat operations. This is, currently, just the first step in the network enabled decrease in vertical command structure.

In order for this theory of flattened organisational hierarchy to become a reality, doctrine will have to be developed for its implementation. Litton explains that current vertical structure is based on the reality that higher levels of command have a 'bigger picture' of the operating environment than lower levels.<sup>77</sup> NEC will remove the difference in situational awareness between echelons and allow the lowest units to have the same 'big picture' as their commander. Theoretically, NEC will even allow any tactical headquarters to take control at the operational level, because they will have the same information.<sup>78</sup> If all levels have the same situational awareness, then the advantage of a flattened structure is that it allows faster response times because there are fewer command and control layers.<sup>79</sup> The commercial sector has already been flattening its command hierarchies in response to NEC-style shared situational awareness with huge benefit.<sup>80</sup>

Cebrowski cites commercial examples where the most effective employment of commercial NEC has occurred when organisations developed new, flatter structures at the same time.<sup>81</sup> Doctrine must be developed to flatten current military-command structures with the introduction of NEC.

Along with a flattened hierarchy, NEC will also drive the military to a highly flexible and adaptive command structure. Sun Tzu believed that the best military would have a command structure so flexible that it bordered on anarchy.<sup>82</sup> The shared situational awareness provided by NEC will make this concept much more attainable. Rear Admiral Charles Style of NATO and the Royal Navy commented that the main concept of NEC requires joint forces to operate seamlessly.<sup>83</sup> He makes this statement because the advantages of NEC do not centre on the communication that NEC provides, but rather, the increase of military effectiveness and efficiency that it will enable.<sup>84</sup> Specifically, NEC should allow a commander to tailor combat forces specifically to a task required in the campaign rather than sending in an entire unit to complete just one job as the current command structure requires. This efficient use of forces should release extra combat forces to be combined to accomplish more tasks. NEC enables this ability to establish appropriate organisational relationships specifically tailored to the current task.<sup>85</sup>

This leads to the doctrinal concept that the military should organise itself into small units that are able to join together to accomplish a specific task. Effects Based Operations highlight the fact that massing forces is normally not the best means to effectively employ military forces.<sup>86</sup> While peacetime training and administration do require the military to group units functionally, the subunits of these groups do not necessarily have to be tasked together to accomplish a mission.<sup>87</sup> This is clearly illustrated by the fact that the military often deploys just part of a squadron or brigade to an operation because that is all that is required to complete the mission. This concept can be further employed for each specific task that must be accomplished inside the campaign. NEC will allow groups of any composition to be assembled as needed to suit the task at hand. Further, NEC will encourage the creation of new capabilities, never before employed, based on the integration of disparate units.<sup>88</sup>

Further advantages of this concept will be realised when task-organised units are able to disperse after their task is complete and immediately be ready for re-tasking. The task-organised groups will only remain together for as long as it is necessary to complete the task.<sup>89</sup> Once the task is complete, the unit will disband and each subunit can be used in a different task-organised group. NEC will also reduce the friction that naturally occurs as a

group transitions from one task to another because of the shared situational awareness that will be available to the units joining the task.<sup>90</sup> By receiving awareness at the beginning of a task, units should be able to more quickly achieve full capacity in their task and operate more efficiently over a shorter amount of time. US Vice President Dick Cheney claims that US/UK forces have already started to benefit from this NEC-created efficiency as demonstrated by Operation 'Iraqi Freedom' in 2003 when less than half of the ground forces and two-thirds of the aircraft were able to achieve a much more difficult objective than during the 1991 Gulf War.<sup>91</sup>

Once a military has mastered the ability to employ small subunits together on specific tasks through NEC, they will be able to begin operations based on the principle of swarming. Swarming is the convergence of geographically dispersed, decentralised units for a common task, and then their dispersal for future action.<sup>92</sup> When conducted properly, swarming operations allow groups to project the effects of mass from dispersed locations.<sup>93</sup> This will often be accomplished by projecting fires or effects from geographically diverse locations without requiring big manoeuvres from the units to project the effects. These dispersed forces, operating with non-linear density, will be able to generate combat power at the required time and place to achieve precise effects and gain temporal advantage.<sup>94</sup>

NEC promises some amazing capabilities in its employment, but the key requirement it must fulfil is the seamless creation of united teams from disparate units. In order to do this, NEC must provide a high level of shared situational awareness that can be easily read and understood by all of the units involved.<sup>95</sup> Once shared situational awareness is achieved with all of the units involved, they should be able to use common explicit rules and procedures to perform like a small, close group that can work together effortlessly.<sup>96</sup> It is important to note again that NEC derives benefits by increasing the efficient use of current military technology through better integration of units, not by increasing the effects that can be delivered by any single unit.<sup>97</sup> This makes it vital for units to be able to work together immediately like a highly experience team, not experiencing the normal growing pains of a unit newly coming together.

There will likely be resistance to the concept of decreasing command structures in the military. The main reason for this resistance will be the lack of willingness to forfeit direct control of assets that support a unit's military operation. Current military doctrine emphasises the placement of all the assets a commander needs to accomplish a mission under his direct control. This is typified in the UK concept of an Empowered Brigade which has organic artillery, engineers, logistics and communications, to

name just a few units, in order to accomplish its missions without support from any other units. NEC doctrine will run diametrically opposed to this concept because its strength comes from the flexibility of efficiently applying proper units to task, rather than accomplishing all tasks with rigid, inflexible, preset groups. Unfortunately, this concept requires a considerable amount of trust between commanders that each will fulfil their contract to produce a desired effect that contributes to a whole. Commanders will be required to give up their direct control of organic assets and replace it with trust that NEC will allow them to access capabilities provided by other units, in a timely manner.<sup>98</sup> Without forcing commanders to forfeit direct control over organic assets, NEC will not be able to achieve the flexibility and responsiveness that is required to make a flattened hierarchy workable.

Also, NEC can easily overburden a flattened hierarchy if the higher level staffs are not properly manned because of the amount of information and control that must be worked at that level.<sup>99</sup> Doctrine writers will have to revisit the required size of higher headquarters staffs as they remove the need for subordinate headquarters. Finally, doctrine will have to look at the redundancy and survivability of a network system that potentially only has one headquarters directing all activity. If the network or headquarters should be damaged or destroyed, it could render all other units useless.<sup>100</sup> NEC doctrine will have to overcome this resistance in order to achieve a flattened hierarchical structure.

Probably the most important doctrine that must be developed is common Tactics, Techniques and Procedures (TTP) for use by all military units. NEC postulates the ability of different forces to come together and work as a team without difficulty. While shared situational awareness will enable this capability, it is not the only requirement for it to work. Military functional units do not often train in a joint environment and do not understand the TTP of other units. Until subunit commanders understand how other units operate and what actions they will likely take, it will not be possible to easily integrate their own actions into the whole. The military will have to develop common TTPs for units so they can understand what actions to expect of others, and then, the military will have to ensure that all forces are training in their use. It is only after these TTPs are developed and commonly understood that disparate units will be able to randomly come together in a task and operate as a real team without having integration problems. Using NEC to decrease the vertical hierarchy in the military offers some significant increases in capability, but there are still many doctrinal hurdles that must be tackled before these capabilities can become reality.

The final doctrinal requirement that must be produced for NEC to become a workable concept is an introduction of a common language throughout the entire military. In order to fully appreciate this requirement, it is best to look at another, quite revolutionary concept, which network centric theory suggests. This concept is called self-synchronisation. Self-synchronisation is a US concept, which envisions subunit commanders, armed with the commander's intent and highly developed shared situational awareness, operating in concert without any traditional orders or commander's direct control.<sup>101</sup> In other words, it is Mission Command taken to the extreme point where the commander gives initial direction and then sits back while the subunits do all the work and coordinate among themselves. The subunit commanders are responsible for maintaining situational awareness of the entire operation, and their position in it, and then using that awareness to conduct their own actions in a way that is synergistic with the entire effort and synchronises the effects produced.<sup>102</sup>

Self-synchronisation is another theory that promises a large leap in combat capability but there are requirements that must be met for it to work. The first is the need for the commander to effectively transmit his intent so the subordinates can work inside of it. This is especially true with Effects Based Operations where the goal is to break the enemy's will to resist. It requires actions to be tightly coordinated to put the right effects against the right vulnerabilities at the right times.<sup>103</sup> Self-synchronisation allows units to best respond to unfolding events, but they must fully understand the commander's intent, and their part in it, if they are to correctly modify their actions to produce the desired effect.<sup>104</sup>

Further, the subunit commanders will need to understand the entire operational plan and the role of other units, so that they can react, not only to the changing environment and enemy, but also in concert with the actions of other friendly units.<sup>105</sup> Under self-synchronisation, subunit commanders will have a heavy burden to understand all aspects of the commander's intent and be able to react appropriately to the changing environment, friendly situation and enemy actions.

The next requirement is for the subunits to supply information to develop the shared situational awareness that self-synchronisation depends upon. The network centric environment will invest each user with rights and responsibilities.<sup>106</sup> While everyone will be using the Common Operating Picture to develop their situational awareness, this picture cannot be developed unless each actor in the operation feeds it with information about their current situation. Largely, the system will be fed information through passive means, such as global positioning satellite sensors on every

vehicle that constantly reports their position, or the linking of radars that display their collective information on the Common Operating Picture. Still, there is a lot of information that is not easily networked, such as a scout observing an enemy movement with his eyes, which will require an active means of posting on the network without delay.<sup>107</sup> Technology and doctrine will have to be developed to allow users to easily feed all of this active and passive information onto the network without placing an undue burden on them.

The final requirement, which derives directly from the concept of users supplying information, is the need for shared situational awareness to be available at all levels. Current warfare relies heavily on identification and control measures to integrate military forces. While effective, Identification Friend or Foe equipment and Fire Support Control Lines are very inefficient tools that hamper friendly forces and slow down their decision cycles. The shared situational awareness of NEC offers a solution to this inefficiency by allowing instant identification of friend from foe and their locations.<sup>108</sup>

Based on this shared situational awareness of the entire battlespace, restrictive measures such as the Airspace Control Order and restrictive Close Air Support procedures are no longer required.<sup>109</sup> Most of these procedures were developed to prevent fratricide between friendly forces, but NEC should provide shared situational awareness of all friendly positions to all users and completely eliminate the possibility of misidentification of forces. US General Tommy R. Franks, the Joint Forces Commander during Operation 'Iraqi Freedom' claims that this effect was already partially demonstrated during the operation, when forces used Blue Force Tracker to significantly reduce the incidents of friendly fire between units.<sup>110</sup> Military units should then be able to turn this freedom from restrictive control measures into increased response time and rapid, synchronised operations.<sup>111</sup>

Shared situational awareness is really the linchpin of NEC and the basis from which all improvements are achievable. Shared situational awareness is based on the concept that multiple nodes or sources in a network will provide the best possible information. The concept derives from Metcalfe's law, which observes that a linear increase in the number of nodes connected to a network yields an exponential increase in their potential value.<sup>112</sup> Shared situational awareness relies on this concept of combining multiple sources of information to produce an 'end-to-end transparency' that provides all users with the same picture.<sup>113</sup> Forces will then be able to use this Common Operating Picture that provides them with shared situational awareness to develop a synergy of effort that was never before possible.<sup>114</sup>

Once the requirements for understanding commander's intent, users supplying information, and development of shared situational awareness are met, self-synchronisation promises to offer a host of benefits. Randall believes that self-synchronisation will be the best benefit of NEC and allow huge advances over the current command and control systems.<sup>115</sup> This is due to the fact that self-synchronisation builds upon the timeless military principles of security and surprise and allows units to employ them to their maximum benefit.<sup>116</sup> These are the same principles that the German war machine was able to employ with great effect in its doctrine of *Blitzkrieg* during World War II; using overwhelming synchronised force to defeat the enemy.<sup>117</sup> Self-synchronisation will rely on a similar concept, where a smaller, but highly integrated force, will be able to produce such massed effect that it can overwhelm a larger but un-networked force.<sup>118</sup> The US Marine Corps has been validating this theory to good effect in the Sea Dragon programme which does away with command hierarchy and allows individual units to coordinate an intense, high-speed style of combat.<sup>119</sup>

As with the other NEC concepts, self-synchronisation has some huge hurdles to overcome in the way of doctrine and technology. In fact, current UK thinking rejects self-synchronisation as a step too far in current network-centric capabilities.<sup>120</sup> This is a very fair judgement in light of several realities about creating self-synchronisation. The first reality is that self-synchronisation does not do much to account for an incomplete Common Operating Picture. This can come in several forms. The most likely one is a lack of ability to adequately track all enemy actions. Current NEC theory does not account for the enemy's ability to avoid friendly sensors and conduct actions beyond the knowledge of the network.<sup>121</sup> Further, Effects Based Operations, the cornerstone of NEC, requires detailed knowledge about the enemy that is often 'unknowable' or not detectable by current NEC capabilities.<sup>122</sup> It incorrectly assumes that it is possible to view the enemy's values and determination and directly attack them. This obstacle has been well illuminated by current operations in Iraq that seem to expose the many shortcomings of NEC in Military Operations Other Than War.<sup>123</sup> Despite the best available sensors, networks and equipment, US and UK forces have largely not been able to stop the asymmetric attacks of insurgent forces. NEC simply cannot provide information about what it cannot see. While NEC promises to improve the situational awareness of military forces, it is impossible to generate complete certainty on the battlefield because there will always be some form of fog and friction.<sup>124</sup>

The other major hurdle for self-synchronisation to overcome is the need to develop a Common Operating Picture that is useable and understood by all military forces. The development of the Common Operating

Picture itself will take considerable effort. Currently, the Air and Maritime components are able to develop Common Recognised Pictures in their mediums that provide almost complete awareness on all military activities. This is due to the fact that both of these mediums rely almost exclusively on electronic sensors to detect other vehicles. Almost completely gone are the days when pilots scan the skies with their eyes to detect enemy planes and sailors scan the horizon with binoculars to detect a submarine mast. Because these mediums rely on electronic sensors, it is easy to feed this information into an electronically created Common Recognised Picture through completely passive means, without any active work done by the operator. The situation is very different for the land component which relies on the human senses, as much as electronic sensors to detect enemies, civilians and friendly units. Not only is actively input information much less reliable and precise, but it is much more difficult to integrate with information derived from electronic sensors. More importantly, active data entry requires the supplier to turn away from other duties to input the information. This can be an untenable burden for a scout trying to remain undetected or an infantry unit in a fire-fight. This explains why air and maritime components tend to be much bigger proponents of NEC while the land component fears its many shortcomings.<sup>125</sup>

Once all of this information is input into the system, some form of doctrine will need to be developed to enable the display of information in a common format. This is often referred to as the Common Recognised Operating Picture (CROP). The problem with the CROP is that military components often speak very different languages and use symbols to represent different things. This difficulty was highlighted between the US Air Force and Navy in the 1980s when a difference in aviation communication terms forced them to hold a joint conference where they established a common combat aviation vocabulary. But the problem persists today between the components and is typified by the completely disparate responses the three components would give if you asked them to 'secure the building'. The disparity of military terms cannot be allowed in a NEC environment. The CROP will require development of a common language, both words and symbols, which will enable all users to understand it in the same way.

Along with the difficulty of developing a CROP for the entire theatre, is the fact that, even with a CROP, each unit will likely interpret the information they are given in a slightly different way. Kolenda notes that if the same situational picture is presented to different people, each of them will perceive, absorb and interpret what they see in a different manner.<sup>126</sup> This means that each viewer of the CROP will automatically receive a different

situational awareness from what is presented. Compounding this problem is the fact that most viewers will be under a great deal of stress and this will exacerbate the differences in awareness.<sup>127</sup> Differences in shared situational awareness will reintroduce the fact that friendly fire and actions contrary to commander's intent are still possible and this will negate the ability of NEC to enable self-synchronisation without restrictive controls and commander direct involvement. Once these factors are re-introduced, most of the benefits of self-synchronisation will be gone.

Probably the biggest hurdle to self-synchronisation is its application in coalition operations where units will have different equipment, procedures and capabilities, not to mention different languages. Current US thinking about NCO acknowledges the fact there is going to be major challenges in properly sharing situational awareness between coalition partners.<sup>128</sup> This problem came to the fore during Operation 'Iraqi Freedom', when the US had to supply UK vehicles with Blue Force Tracker units, not only so they could have the shared situational awareness required to conduct operations, but also to inform the network of all UK unit locations.<sup>129</sup> Most Western militaries expect to conduct future operations in a coalition environment. This fact requires NEC to develop doctrine that not only makes the concept workable within a single military force, but between the militaries of different countries.

The US has been particularly bad about deluding itself with the possibility of self-synchronisation. The Office of Force Transformation is the US agency currently leading the development of NCO. It recently released a pamphlet entitled 'The Implementation of Network-Centric Warfare'. The pamphlet describes seven case studies in NCO that demonstrate all of the benefits that can be achieved.<sup>130</sup> These include studies of Operation 'Iraqi Freedom', Close Air Support, and a Stryker Brigade. The studies all compared networked forces to non-networked forces and showed the huge increase in ability networked forces displayed. The problem with all of the examples is that they were conducted by units that already spoke the same military language and already had well established Tactics, Techniques and Procedures on which to base their operations and integration. None of them brought together units which had not worked together before and tried to integrate them into a seamless whole. Until the proponents of NEC, recognise this appalling lack of doctrine and move toward the development of a common language and procedures for the entire military, self-synchronisation will never be a reality.

Network Centric Warfare and Network Enabled Capability are the new buzzwords in Western militaries as they try to increase their combat power by turning network centric theory into reality. Most research in this area has

been focused on the development of technology to support NEC to the detriment of doctrine development. However, NEC cannot become a real, workable concept until proper doctrine is developed to enable the use of NEC technology. Further, the developers of NEC must understand that they cannot afford to ignore the development of doctrine and leave it to be created after the technology is available because this will significantly delay achievement of the huge benefits possible.

There are three main areas where doctrinal development must focus in order to make NEC a reality, when the technology is full deployed. The first is creation of a balance between Mission Command and the direct commander involvement that NEC empowers. Next is the concept of decreasing vertical command structures to enable smaller, more agile subgroups to work together as a synergistic whole. Finally, doctrine must address the requirement for the entire military to have a common operating language for them to properly share situational awareness and execute self-synchronisation. If doctrine is able to overcome these three major hurdles, then NEC will be able to provide the revolutionary leap in capabilities that it suggests. And Western militaries will be able to gain back the huge advantage and ability to dominate that they have come to expect when conducting operations.

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