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The Future of C2

Agility, Focus, and Convergence:
The Future of Command and Control
David S. Alberts



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Agility, Focus, and Convergence: The Future of Command and Control

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Abstract

The future of command and control is not *Command and Control*. In fact, the term *Command and Control* has become a significant impediment to progress. This paper presents and discusses key terms that form the core of a new conceptual foundation; one that can provide a point of departure for the systematic exploration of future “command and control.” Three concepts form this core: agility, focus, and convergence. In brief, agility is the critical capability that organizations need to meet the challenges of complexity and uncertainty; focus provides the context and defines the purposes of the endeavor; convergence is the goal-seeking process that guides actions and effects.

Overview

The future of command and control is not *Command and Control*.¹ In fact, the term *Command and Control* has become a significant impediment to progress. Efforts have been made to (re)define this term in ways that would make it more relevant to twenty-first century organizations and endeavors. Efforts to date, however, have not been able to overcome the deeply ingrained belief that the term *Command*

1. *Command and Control* in italics refers to traditional command and control – the evolved solution for traditional military organizations and missions. When italics are not used then I am referring to the functions we associate with command and control.

and Control is synonymous with a specific approach, namely the way traditional military organizations are organized and operate. The term thus has become unalterably frozen in time.

New approaches to accomplishing the functions that are associated with *Command and Control* are becoming an essential part of an Information Age transformation of military and civilian institutions; such a transformation is required to meet twenty-first century security challenges. Progress increasingly demands that we semantically separate ourselves from this restrictive legacy of language and connotation so that we can be unfettered in our exploration of approaches to command and control that are truly different (Alberts and Hayes 2006, 75). The need for new approaches does not imply that the traditional approach to command and control will never be appropriate; rather that there will be situations and circumstances when a different approach will be better suited.

Thus, understanding the relative fitness of different approaches to accomplishing these functions is necessary to ensure success. Similarly, the need for new approaches and a new language does not imply that there is no longer a need for what leaders, accountability, and responsibility provide. Quite the contrary, leadership remains an essential ingredient for a successful endeavor as does the existence of trust, which in large measure is a result of accountable and responsible behaviors. The issue at hand is whether or not to consider other approaches that can achieve these results.

Creating and gaining acceptance for a language that can be used to describe both traditional approaches as well as new, network-centric or edge approaches in a manner that facilitates understanding, comparative analysis, and assessment will not be quick or easy. However, it is a task that must be undertaken immediately for we urgently need to be able to engage a myriad of experts. We need to bring practitioners, theorists, and analysts together so that we can make progress in conceiving and developing the new approaches to accomplishing the functions of command and control that we need

to successfully prepare for and participate in complex endeavors across the spectrum of crisis to conflict.

Preparing for complex endeavors can be seen through the lens of participating entities or from the perspective of the endeavor as a whole. Inevitably, when asked to think about how to approach complex endeavors, individuals think about how their particular organization needs to change to relate to other involved entities in the context of a complex endeavor. If they think about the way the endeavor as a whole should be managed, the tendency is to impose their “solution” on others. To get the most out of the collection of entities involved in a complex endeavor, both of these inter-related challenges (micro and macro) need to be addressed.

This paper presents and discusses key terms that form the core of a new conceptual foundation; one that can provide a point of departure for the systematic exploration of future “command and control.” Three concepts form this core: *agility*, *focus*, and *convergence*. In brief, agility is the critical capability that organizations need to meet the challenges of complexity and uncertainty; focus provides the context and defines the purposes of the endeavor; convergence is the goal-seeking process that guides actions and effects.

This paper begins by making the case for abandoning the terms command and control in favor of focus and convergence. It then makes the case for putting agility at the center of our thinking about the capabilities of an entity, coalition, or more loosely connected collection of entities.

Why not the term *Command and Control*?

Command and Control is an approach that, while it was once very effective in achieving its ends, is no longer the only possible or even the best approach that is available. *Command and Control* is a solution to a problem that has changed. The situations for which *Command and Control* is best adapted have been transformed by the realities of

the Information Age. Thus, the assumptions upon which *Command and Control* were based are no longer valid. *Command and Control* is not well suited for coalition operations, particularly the kind of complex endeavors called for in the twenty-first century. Furthermore, while it may come as a surprise to some, *Command and Control* is not necessarily the best choice for some military operations.

Unsuited for Coalition Operations

Although the term *Command and Control* is most closely associated with military organizations, it is used in economics and business in much the same way. The institutional definition of the term and the meaning of its two components *command* and *control* have been under attack for sometime. Yet there has been a reluctance to abandon a term that has been so ingrained in military culture. Instead there have been attempts to try to change the way the term is understood. In a meeting of the Highlands forum several years ago, a well-respected military historian went so far in his critique of network-centric/power to the edge concepts that he stated that if militaries adopted these approaches they no longer would be military organizations. Centrally-planned economies, often referred to as command and control economies, have been felt by economists to be failures for some time. Much more recently command and control approaches to international supply chains were deemed to be dangerous (Shister 2006).

In an attempt to finesse the cultural resistance to redefining command and control, I have made the distinction between command and control of the endeavor (the coalition) and the command and control of each of the participating entities. I made this distinction in the hope that people could easily recognize that the inherent characteristics of a coalition, one comprised of a set of heterogeneous entities including both military and civil governmental organizations as well as international and private ones, were not amenable to unity of command or a traditional hierarchy organized around strategic, operational, and tactical levels. Such a coalition

was unlikely to possess the unity of purpose and discipline that are assumed to be present in military organizations.

For more than a decade, serious questions were raised regarding the continued viability of traditional notions of *Command and Control* for coalition operations. Mauer (1994) pointedly asked a number of questions about the application of traditional command and control to coalitions. Alberts and Hayes (1995) attempted to address many of these questions and directly addressed the language of command and control by suggesting that the term *command arrangements* was more appropriate for peace operations. This explicitly recognized the nature of the coalition required and the nature of peace operations.²

Mauer begins with the definition of the term *Command and Control* found in the Department of Defense Dictionary of Military and Associated Terms (Joint Publication 1-02, 2001). This definition³ of the term *Command and Control* is still in effect today:

Command and Control: The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. Also called C2.

2. Several terms were used at the time to describe peace operations. These included peace-keeping and peace enforcement. The difference was the degree to which the parties had agreed to outside forces and their roles as well as the permissiveness of the environment.

3. It is interesting to note that while this definition of C2 does, to a certain extent, fix responsibility and therefore accountability in the context of a chain of command, it does not explicitly include many of the concepts associated with leadership (inspire, motivate, marshal, prepare, mentor). To many therefore, this version of *Command and Control* has been considered a subset of, as the Germans refer to it, “Fuehrung,” an encompassing generic term that includes these other concepts.

Using this definition, Mauer systematically posed a series of questions in the context of a coalition operation (1994, 16-18). For example, with respect to the “exercise of authority” she asks: “Who defines the limits of authority?” and “Who is the authority?” (1994, 16).

Thus, the search for an approach to coalition command and control was on! However, the search for a solution has not to strayed too far from home. For Mauer explicitly posed these questions about *Command and Control* in the context of the following articulation of the challenges associated with command and control: “Sound command organization should provide for the unity of effort, centralized direction, decentralized execution, common doctrine, and inter-operability” (Mauer 1994, 18-19).

The solution sought was, in fact, a traditional approach to *Command and Control* with an agreement regarding the selection of someone in charge and the assignment of responsibilities. A major focus of attention was on whether or not U.S. forces would be under the command of a non-U.S. commander. Interestingly enough in the early part of the twentieth century, the concept of unity of command was controversial since it was threatening to traditional Service autonomy (Mauer 1994, 19). As Mauer correctly notes, allies may indeed have the same reaction to the imposition of unity of command on a coalition. Clearly, non-governmental and private volunteer organizations (NGOs and PVOs), whose work is critical to many endeavors, feel this way.

It is now becoming accepted that the subject of *Command and Control* needs to be rethought for coalition operations. But the search for solutions remains, for the most part, tethered to traditional concepts of command and of control.

The book *Command Arrangements for Peace Operations* (Alberts and Hayes 1995, 106-116) put forth a set of criteria for assessing the quality of command arrangements. These criteria are focused on successfully accomplishing the functions associated with command

and control, not on how to do it as the traditional use of the term is understood. This stands in sharp contrast to the C2 challenges that Mauer offers as a context for answering the questions she posed. Instead of “sound” command being defined as “unity of effort, centralized direction, decentralized execution, common doctrine, and inter-operability,” the quality of command was defined by measures relating to information quality and distribution and the quality of decisionmaking. The “how” in *Command Arrangements* was not limited to traditional approaches to command and control, for example potential approaches were not limited to those involving centralized direction and decentralized execution. Indeed, *Command Arrangements for Peace Operations* posits that consensus planning, as opposed to hierarchical decisionmaking, is more appropriate for these types of coalition operations (Alberts and Hayes 1995, 129).

Not the only option for Military Operations

Although the effort I have made to make a distinction between the command and control of coalitions (collections of entities) and the command and control of military organizations with established hierarchies has opened the door to thinking about new approaches to command and control, it is only a first step. This is because it sidesteps the urgent need for military and other organizations with well-established hierarchies to rethink command and control.

The need to think about new approaches is driven by: (1) the nature of operations and the environment in which they are undertaken; (2) the capabilities of adversaries; and (3) opportunities provided by advances in technology, particularly information technologies. The implications of the Information Age for national security have been discussed and debated for some time. The Information Age transformation currently in progress around the world is taking place not only in military organizations, but also in organizations that operate in many different kinds of competitive spaces. These in-progress transformations all recognize the need to re-visit the ways organizations are structured, managed, and operated.

Command and Control Approach Space

A particular approach to accomplishing the functions of command and control involves a choice in three inter-related dimensions: (1) the allocation of decision rights, (2) the dissemination of information, and (3) the pattern of interactions among participants. These form the axes of a three-dimension space that we have called the Command and Control Approach Space (Alberts and Hayes 2006, 75) which is depicted in Figure 1.

The term *Command and Control*, often referred to as classic or traditional command and control, occupies a relatively small set of possibilities in the lower left front corner of this space. Information Age concepts and technologies have created pressures that will inevitably move the practice of command and control away from the lower left front corner of this space in the direction of the opposite corner of this space occupied by edge approaches (Alberts and Hayes 2003, 201-210).

Moving the practice of command and control away from what, in Figure 1, is called “classic C2” in the direction of “edge organizations” ultimately involves adopting, when appropriate, self-synchronization. This was the most controversial aspect of the theory of Network Centric Warfare or Operations when it was initially articulated and remains contentious to this date in many military organizations. Often the argument is made that moving “power to the edge” is risky. While risk is exactly the issue, a strong case can be made that there is more risk inherent in continuing business as usual than there is in aggressively developing and testing new (edge-like) approaches to accomplishing the functions associated with command and control. In any case, the balance of risks (staying with “Classic C2” v. exploring new edge-like approaches) has and continues to shift. This risk-shift is a result of the increasing turbulence and uncertainty of the twenty-first century mission space.

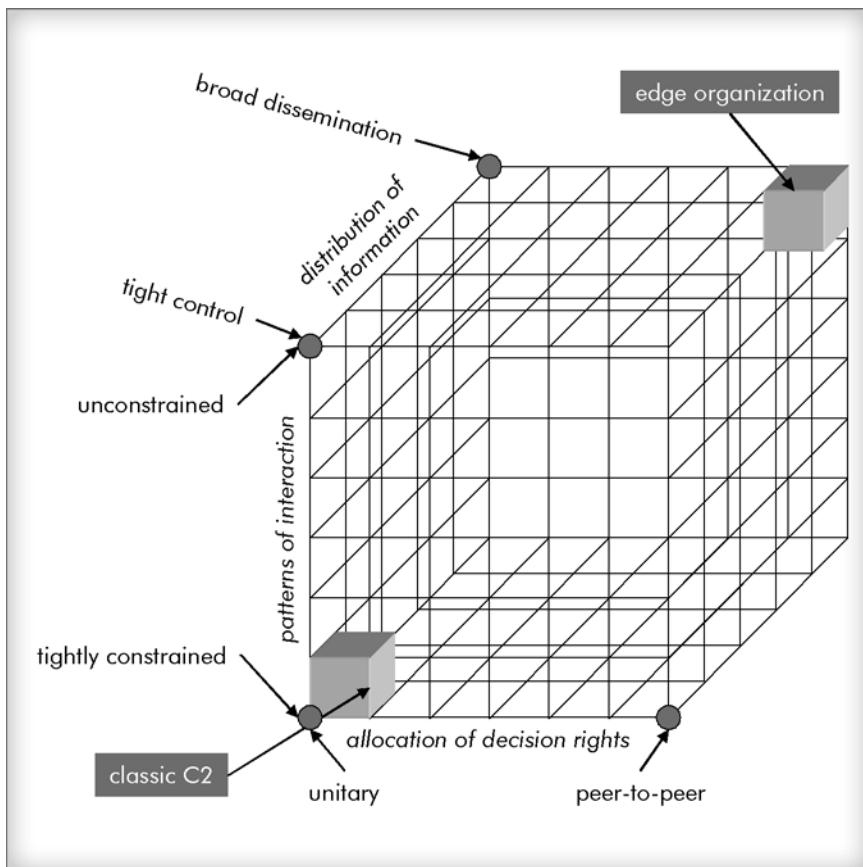


Figure 1. C2 Approach Space.

Hierarchy and the Flow of Information

Information is a strategic asset. How it is disseminated affects the ability of an organization to deal effectively with the challenges it faces. By the 1990s, advances in communications and information technologies and the accompanying changes in the economics of information made it feasible to disseminate information much more widely and with greater discrimination than ever before. The possibility of separating the flow of information from the chain of command concerned those at the highest levels of the military prior to the articulation of Network Centric Warfare (NCW). In 1995, the

then-Chairman of the Joint Chiefs of Staff was concerned that *C4I for the Warrior*, a concept that advocated vastly increased access to information at all echelons, might have adverse unintended consequences. The book *The Unintended Consequences of Information Age Technologies* (Alberts 1996) was written at the request of the Chairman to explore these concerns and make appropriate recommendations.

The major conclusion of this analysis was that coevolution of Mission Capability Packages (MCPs) was needed to avoid potential pitfalls and exploit opportunities. MCPs include a concept of operation, organization, an approach to command and control, and systems, as well as training and education (Alberts 1996, 50-52). Thus, as new capabilities were incorporated in the force, in this case information technologies that affected the way information could be disseminated, other aspects of the MCP must also change (coevolve) to avoid dysfunctional behaviors (Alberts 1996). Thus, it was asserted that *Command and Control* should not be viewed as a solved problem, but needed to be rethought as force capabilities and concepts of operation changed.

Command and Control and Self-synchronization

Self-synchronization is a way of distributing decision rights and is associated with a specific set of patterns of interactions among participants. The concept of self-synchronization is an integral part of Network Centric Warfare and Network Centric Operations (NCO). The idea of self-synchronization evolved out of a set of discussions with Admiral Arthur Cebrowski and later with John Garstka, both on the Joint Staff at the time. Having built a number of very complicated real-time systems, I was familiar with the software technique that involved the dynamic spawning of processes in response to variations in workload or demands for service. This technique involves the creation of copies of software modules that work in parallel. It would be the equivalent of the number of toll booths on a highway instantaneously growing or shrinking to meet the flow of traffic according to some criteria (e.g., expected wait time). The thought

was that units could be formed or re-constituted in real time in response to conditions on the battle field, thus making the best use of available resources. The command and control of this process, of course, could be either centralized or decentralized once intent was developed. However, it was obvious to me that, as was the case with real-time systems, that the conditions for the spawning of units would need to be specified in advance (intent) and the actions taken to implement this intent would need to be taken locally if the force was to be adequately responsive.

Taking this idea one step further, units, and indeed individuals, could alter their behaviors and adapt in response to a changing situation within a context of intent. After thinking about what conditions needed to exist in order to make this approach effective (e.g., the establishment of intent, the sharing of intent, the sharing of the information required to assess the situation, and the appropriate delegation of authorities), these ideas coalesced into what we called Network Centric Warfare. Self-synchronization was perhaps the most controversial aspect of this new theory of warfare. Self-synchronization, and the information flows and collaboration needed to make it an effective means to an end, challenged fundamental notions of *Command and Control*.

Command and Control in Network-Centric Organizations

Network Centric Warfare, Network Centric Operations, or Network Enabled Capability (NEC), as it is called today by NATO and many nations, all recognize the need to coevolve (Alberts, Garstka and Stein 1999, 199-213) an approach to command and control, one that takes advantage of the changes in the information and cognitive domains enabled by advances in technology and the changing economics of information. The tenets of Network Centric Warfare (Alberts 2002, 7) begin with the creation of a robustly networked force. Contrary to what some thought at the time and perhaps continue to think, NCW is not about information technology. In the

discussion of NCW myths in the book *Network Centric Warfare* networking, rather than the network, was emphasized.

Actually, NCW is more about networking than networks. It is about the increased combat power that can be generated by a network centric force. As we will show, the power of NCW is derived from the effective linking or networking of knowledgeable entities that are geographically or hierarchically dispersed. The networking of knowledgeable entities enables them to share information and collaborate to develop shared awareness, and also to collaborate with one another to achieve a degree of self-synchronization (Alberts, Garstka and Stein 1999, 6-7).

Networking can involve the sharing of information, collaboration, or both. Collaboration can focus on the interpretation of information, it can focus on deciding the nature of an appropriate response (planning), it can involve the allocation of resources, or it can focus on actions (execution). Thus, Network Centric Operations require not only the deployment of the capability for elements of the force to be able to share information and collaborate, the Global Information Grid (GIG) as it is currently known, but also require changes to doctrine as well as processes to achieve widespread information sharing and collaboration across existing organizational lines and echelons. It also requires changes in the distribution of decision rights (authorities). Thus, Network Centric Operations involve an approach to command and control that occupies a different part of the C2 approach space than traditional approaches to command and control.

The power of NCO was not to come from simply creating a robustly networked force or from information sharing and collaboration, but was to be a result of achieving shared awareness and being able to act on this improved shared awareness by self-synchronization involving all levels. Thus, one needs to make all of the network-centric tenets a reality to realize their potential to deliver dramatically increased power.

In practice, NCO differs in degrees of maturity. A maturity model (Alberts et al. 2001, 241) with five levels of maturity was developed to make it clear that the theory could be implemented in stages and that achieving full network-centric capabilities was a journey, not something that should be expected to be achieved overnight. Nearly ten years later, no military organization has achieved full maturity although they may have units that have, at times, approached this. In fact, different levels of maturity may be appropriate for different circumstances (capabilities of the force and the characteristics of the situation) and involve different approaches to command and control.

This is not to say that *Command and Control* is never an appropriate approach to accomplishing the functions it was meant to accomplish. Rather, this traditional approach is only applicable in a relatively small part of the problem space. Instead of the traditional approach to command and control being a model that can be used as a point of departure for developing new approaches, traditional command and control has become a special case, applicable only to a particular set of circumstances.

If traditional command and control occupies only a small part of the approach space, then it makes sense to use language to discuss command and control, or more precisely approaches to accomplishing the functions associated with command and control, that relate to the whole space and not just a portion of this space. My decision to publicly argue for a change in the language, to abandon not only the term *Command and Control*, but also the words command and control, was a result of concluding that the ideas associated with these two words were antithetical to the approach required for mature network-centric or edge approaches.

Why not the words Command and Control?

Command is traditionally interpreted to involve a commander, that is, a place where the buck stops—the existence of a unified chain of

command and a supreme commander, a commander-in-chief. Although the theory of Network Centric Warfare does not explicitly state or even imply that there needs to be a single commander, many people assumed that it did. Many in the audience, overwhelming military, understandably drew the conclusion that NCW required a commander.

But this was not the only interpretation expressed at the time. The idea that “unity of command” was, at times, infeasible and that one should seek instead to achieve “unity of purpose” was introduced in *Command Arrangements for Peace Operations* (Alberts and Hayes 1995, 129). This idea derived from the recognition of (1) the absence of a single chain of command and (2) the variety of the players involved in peace operations. This idea was generalized beyond peace operations and appeared in the literature with the shift from “commander’s” intent in *Network Centric Warfare* (Alberts et al. 1999) to “command” intent in *Understanding Information Age Warfare* (Alberts et al. 2001, 142-3). This idea was re-enforced in *Information Age Transformation* (Alberts 2002), a book that pointedly never used the term *commander’s intent* to make it clear that the door was open to the creation of intent in different ways. In its most narrow construction, intent was to be considered the product of many “commanders.”

Understanding Command and Control expanded the notion of command intent:

There are numerous instances where there is no supreme or higher authority that can, in practice, determine intent. What is important is that the behaviors of the entities involved (individuals, organizations, and systems) act as if they are working toward some common purpose. Thus, intent may or may not be (1) explicitly communicated, (2) consciously or formally accepted, or (3) widely shared (Alberts and Hayes 2006, 37).

Pigeau and McCann (2000, 163-164) provided an excellent articulation of the nature of intent. They point out that only a small frac-

tion of perceived intent is the result of direct, explicit communications (to include orders, questions, and answers). Most of intent is, in their words, un-vocalized or implicit, consisting of expectations that they group into personal expectations, military expectations and cultural expectations. Thus, intent is a synthesis of both explicit communications and implicit understandings. The explicit communications can come from a variety of sources while the implicit understandings are a result of occupational and cultural influences. More recently they posited a relationship between intent, shared intent and organizational structure where the majority of intent in the context of centralized C2 was explicit while in the context of de-centralized C2 the majority of intent was implicit (Pigeau and McCann 2006, 104). They associate control with the former and emergent behavior with the later. This is consistent with the idea that control in the context of network centric approaches should be viewed as an emergent property.

Thus, a conscious attempt has been made to re-interpret the word “command” in the term “command intent” to remove the requirement for a particular organizational form. However, replacing commander’s intent with command intent, while an improvement, does not go far enough. This is because command implies control, for without the ability to ensure that a subordinate or agent will respond as directed (JP 1-02 2001, 127), command is a hollow concept.

The word “control” is inappropriate as well, because it sends the wrong message. It implies that complex situations can be controlled, with the implication that there is the possibility of an engineering type solution. Push the right levers; take this action or that; solve this problem. But this is a dangerous oversimplification. The best that one can do is to create a set of conditions that improves the probability that a desirable (rather than an undesirable) outcome will occur and to change the conditions when what is expected is not occurring. Control is in fact an emergent property, not an option to be selected. While one can enable self-synchronization in

the belief that appropriate behaviors will result, this does not equate to “control” of either the force or the situation.

Arguing that the functions we associate with command can occur without commanders is a tough sell in military establishments. The argument that an organization can be managed without managers is likewise a tough sell in industry. The argument that senior level commanders in the military or top management in industry do not have control creates cognitive dissonance. Nevertheless, this is undoubtedly the case. The widespread belief that we have control is merely an illusion, and a dangerous one at that. The literature on complex adaptive systems explains why the notion of control as a verb is misguided.

Power to the Edge introduced the concept of an edge organization with emergent rather than fixed leadership (Alberts and Hayes 2003, 181-186). In the Preface to *Understanding Command and Control*, I justified the decision to continue to use the words command and control despite misgivings:

A major discontinuity that will need to be addressed will be the definition of the words themselves. This is because the way that these words have been defined drastically limits the available solution space and points us in the wrong direction. This creates major problems for both authors and readers. It makes it very difficult to communicate effectively in a medium that is half duplex, where there is no ability for the authors and the readers to interact in real time; for readers to express their questions and concerns and for the authors to clarify and explain. Recognizing this, there was and continues to be a great deal of discussion about what to call this first book in the series and the functions it discusses. We chose to continue to use the term Command and Control despite its obvious problems because we wanted to find the appropriate audience, those who are interested in Command and Control, even if what they mean by these terms is very different from how we believe we should be thinking about the subject (Alberts and Hayes 2006, vii-viii).

Since writing this Preface, I have become convinced that continuing to use legacy language is not in the best interests of the community or the great institutions in which we serve. This is because the search for solutions has been, for the most part, confined to only the parts of the approach space that are in close proximity to traditional approaches. To meet the urgent need for better solutions, we need to explore the interesting parts of the approach space whether or not they are linear extensions of current approaches. Language is limiting our search for better approaches. Thus, changing the language has, for me, become a priority.

While there are many things we can do to improve existing programs of experimentation (devote more resources to it, undertake campaigns of experimentation vs. individual experiments, improve the training of the individuals involved, involve more organizations), doing these will only have a very limited impact unless we are willing and able to look well beyond traditional approaches. Changing the language we use will free us in our search for a solution for a better approach. If we develop a suitable language, it will point us in the right direction as well.

Focus & Convergence (F&C)

Having concluded that the time had come to change the language of command and control, the question at hand was what terminology could capture the essence of the subject and could be used to discuss both traditional approaches as well as new approaches. Equally important to capturing the essence of command and control (the “what” we were trying to accomplish), the new terminology should not imply a particular approach to implementation. If the words chosen had, in common usage, the connotations sought, then this would be a considerable advantage.

Focus & Convergence is the term that I have chosen to replace *Command and Control*. For me, it captures the essential aspects of command and control and can easily be understood by individuals

without a prior knowledge of or experience with command and control. Furthermore, these words do not carry any preconceived notions of how to achieve these objectives. *Focus* as a replacement for command speaks directly to what command is meant to accomplish while being agnostic with respect to the existence of someone in charge or particular lines of authority. Similarly, *convergence* speaks directly to what control (the verb) is meant to achieve without asserting that control as a verb is possible or desirable. The combined term, *Focus & Convergence*, speaks to the existence of a set of dynamic interactions between the two functions.

Focus

The functions of command and control are meant to bring individuals and organizations together, leveraging the available information and assets to create synergies that are otherwise not attainable to achieve something that individuals and organizations on their own could not achieve.

Given the challenges we face, I am interested in making sure that the term we adopt makes sense for endeavors that are comprised of a number of different kinds of organizations, each with their individual characteristics and values. Previous approaches to situations that require a mix of organizations (a heterogeneous self) have gravitated toward a “super-organization,” one that could be created with many of the characteristics of existing organizations. For example, in the discussions about the governance and processes associated with disaster-relief or stability operations, one often hears the suggestion (lament really) that this process or that should be adopted by everyone. This is merely wishful thinking that leads nowhere. Assuming away the things that make the problem messy (insisting on a chain of command or a unified intent) will only get in the way of understanding the problem and developing appropriate solutions. What is needed is language that does not assume someone in charge or a particular form of organization.

Focus has the following meanings (Merriam-Webster 2007):

- a state or condition permitting clear perception and understanding,
- a center of activity or attention,
- directed attention, and
- a point of convergence.

Thus, *focus* captures a number of very important ideas related to bringing individuals and organizations together in the pursuit, if not the achievement, of something. *Focus* encompasses a number of the concepts we have used in our efforts to better understand command and control and different approaches to accomplishing the functions of command and control. These include intent, awareness, shared awareness, understanding, and shared understanding. *Focus* is found in both the cognitive and social domains. The term *focus* represents a synthesis of how the situation is perceived and understood, including perceptions about the nature of the endeavor (strategies and plans) that are appropriate for the situation.

Thinking about how a collective achieves focus and the degree to which focus has been achieved is *independent* of the approach or approaches that may be employed. Thus, there is no “right” approach to constrain our thinking and explorations. The term *focus* is not associated with a particular community or profession and thus is free from any baggage that this entails.

The degree to which an endeavor is focused can be measured by the degree of shared awareness among the participants in an endeavor, while the quality of focus achieved can be measured by the extent of shared understanding. Two metrics are needed to capture the two aspects of focus: establishing shared intent and understanding intent in context. One can imagine a group where all of the members correctly perceive intent but do not have a clear understanding of the situation; that is, they do not have actionable intent.

Convergence

The word *convergence* by itself does not imply moving in the right direction, only movement toward something, whether or not it is desirable. But when combined with focus to become, *Focus & Convergence*, it is about moving in the right direction, both as individual entities and as a coalition or collective.

Convergence has the following dictionary meanings (Merriam-Webster 2007):

- moving toward union or uniformity,
- coordinated movement to single point,
- the state or property of being convergent,
- independent development of similar characters, and
- the merging of distinct technologies, industries, or devices into a unified whole.

Convergence as a verb connotes a journey toward a definable (not necessarily desirable) outcome. The fact that successful convergence (being convergent) does not imply converging on a desired outcome (set of conditions) is useful, since understanding how a situation is unfolding, whether or not it is unfolding as one may wish, is important. A key aspect of the concept of “convergence with focus” (F&C) is that the emphasis is placed squarely on improving the value-view of current and future states rather than achieving some specific result.

The different meanings for the word convergence contained in its dictionary definition each express an important idea. I will discuss each of these related meanings for the word convergence, indicating how I think they should be interpreted in the context of the *raison d'être* of future command and control.

The idea of “coordinated movement” is important since it implies something more than a random walk that happens to converge. It implies some relationships and interactions between and among the

participants. The nature of these interactions is a key factor in locating a particular approach to *Focus & Convergence* (formerly *Command and Control*) in the approach space depicted in Figure 1. The nature of these patterns of interactions can differ considerably. In general, the more frequent and rich these interactions are, the greater the level of focus and convergence maturity⁴ that can be supported. For example, infrequent and limited interaction can support de-confliction but may not be sufficient to support coordinated efforts.

The idea of “independent development” is important since it acknowledges that independent entities can converge in the way they operate. Thus, independent entities, typically present in complex endeavors will, under certain conditions, act/respond in similar ways. Militaries use doctrine and training to create members of the force that will, given a particular situation, behave in similar ways. This meaning of convergence recognizes the potential for the convergence of peer-dominated coalitions.

That “merging into a unified whole” is also a sense of the word *convergence* means that this concept includes the possibility that the collective can, if it is convergent, behave as if it were a single entity. This is, of course, one of the ideals of command and control. This meaning of the word thus recognizes the possibility that “independent” actors can achieve operational coherence of the kind that heretofore has been associated with centrally managed operations.

Equally important is what the term *convergence* does not imply. Most significantly, convergence does not imply control, either the control of

4. The *Focus & Convergence* maturity levels referred to here are the same as the maturity levels associated with NATO C2 maturity. The NATO research group SAS-065 is currently working on a detailed articulation of NATO C2 Maturity levels based on Moffat and Alberts’ “Maturity Levels for NATO NEC Command,” published by the UK MoD as a DSTL paper TR21958 v 2.0, Dec 2006.

http://www.dodecrp.org/files/Maturity_Levels_for_NNEC_Command.doc

The term *Focus & Convergence* is intended to help people think differently about the subject. Thus, the concept of maturity can be expected to evolve as new views and approaches emerge.

one entity by another or control over outcomes. It simply reflects the effects that were thought to be a result of control.

A measure for F&C needs to consider both the direction and the rate of change. Direction is relative to a definable state. In the context of complex endeavors, a number of identifiable aspects of the situation may or may not be moving in the right direction. Furthermore these movements will not necessarily be independent of one another. If individual cognitive states (awareness and understanding) both experienced improvements in quality and converged, it would be reasonable to hypothesize that, as a result, plans, actions, and effects would converge, melding into a coherent whole with accompanying synergies.

While an increasing ability to achieve F&C is related to an ability to accomplish a given mission, being able to F&C is not sufficient to guarantee success. Rather, achieving F&C means that the entity made the most of its means and opportunity. In the language of *Power to the Edge*, achieving F&C maximizes the potential power of the entity. Clearly the more an entity, coalition, or collective have in terms of information, human capital, and material resources, the greater the potential of the entity and the more that can be gained from doing F&C well.

A critical aspect of a coalition or a more loosely coupled collection of entities is the diversity that it is able to bring to bear. The value of diversity is, of course, not a new idea. One of the founding principles of the field of Operations Research, the need for an inter-disciplinary team (Ackoff et al. 1962, 419-421) and not just the tool kit associated with OR, is one such recognition of the value of diversity. This idea is also embedded in the tenets of NCW that hypothesize that (1) information sharing and collaboration improve the quality of information and shared situation awareness and (2) improved shared awareness enables self-synchronization. Diverse knowledge, expertise, and experience are obviously required to fully exploit information sharing and collaboration. After all, if everyone knows the same set of facts, sees things the same way, and has the same

experiences and expertise, then there is nothing new that will result from sharing and collaboration (there are other benefits but gaining new insights is not one of them). It requires diversity to create the potential for value added.

In a provocative book, Scott E. Page (2007) entitles his Prologue “How diversity trumps ability: fun at Caltech.” The central theme of the book is that diversity produces benefits and that both ability and diversity deserve equal billing. The diversity Page is taking about involves differences in perspectives, interpretations, heuristics, and predictive models. There are also differences in value propositions that he argues can have a negative effect. This is in essence the argument for a critical level of shared intent. He sees diversity as an opportunity. On that, F&C has the potential to leverage.

Agility

Agility must become the sine qua non of military organizations, not just an afterthought that is lost with the first budget cut. The importance of agility has, of course, been understood for some time, but it has been viewed as too difficult or costly to achieve. Agility, to some, could only be obtained at the expense of effectiveness. This view is misinformed and dangerous. In the 21st century, a lack of agility is a fatal flaw.

Agility, as explained in *Power to the Edge* (Alberts and Hayes 2003, 127-128), is the synergistic combination of robustness, resilience, responsiveness, flexibility, innovation, and adaptation. Each of these attributes of agility contributes to the ability of an entity (a person, an organization, a coalition, an approach to command and control, a system, or a process) to be effective in the face of a dynamic situation, unexpected circumstances, or sustaining damage. Effectiveness without agility is fragility.

There is, however, a more direct and potentially much better way to assess agility. This approach involves developing an understanding

of what makes something more or less agile and directly measuring these variables. This is a very powerful approach if one adequately understands the links between the enablers and agility and if the set of enablers used⁵ is for all intents and purposes collectively exhaustive. Obviously, this approach is also challenging. However, if these two approaches are used interactively, I believe that a more useful result will be obtained for any given level of effort. The combined approach involves constructing a conceptual model of C2 agility and testing out linkage hypotheses by using a scenario-based approach. Once the conceptual model of agility reaches a critical level of maturity, then it would theoretically be possible to eliminate the use of scenarios altogether. The complexity of the situations we face and the intelligence of our adversaries contribute to our inability to predict. The unexpected is now the expected. The purpose of command and control is to make the most of situations. This requires that the functions associated with command and control are not only accomplished but are accomplished in an agile manner. Thus, for the purposes of assessing alternative approaches to command and control, the measure of merit that should be used is agility. Agility is a scenario-independent measure. To date, however, the approach most often taken to measuring agility is to expand the set of scenarios considered (NATO 2002, 13). This approach is problematic for two reasons. First, there are no reasonable assurances that the scenarios that are considered are the only ones that will occur. Second, if one tries to hedge one's bets by greatly increasing the number of scenarios under consideration then, as the number of scenarios grows the ability to properly analyze them diminishes. A better approach would be to characterize scenarios by isolating what makes one scenario different from another and perform a sensitivity analysis on these variables. In practice, this is a rather difficult task to do well. In addition, it requires a great deal of computational power and a good means of visualizing results.

5. Clearly different circumstances require different amounts of agility. The appropriate amount of agility one needs is called “requisite agility” and will be discussed later in this paper.

Becoming More Agile

While there has been increased awareness of the importance of agility, this increased awareness has yet to be translated into changed priorities, processes, and measures of merit. Investments in the enablers of agility still face a hostile reception from budget analysts who have not learned how to place a value on agility. New capabilities are still evaluated by looking at, at best, a very small number of approved scenarios rather than on their agility-related attributes. Exercises still are focused on a given scenario and process and are resistant to suggestions that they need to look at what happens when systems fail or adversaries do unexpected things. Program managers continue to isolate their programs from realities that might create problems (delays or increases in costs) during design and development and, as a result, give us fragile rather than agile capabilities. Experimenters focus on the success of a concept or capability, rather than doing their best to make it fail so that we can better understand its weaknesses and limitations, thereby increasing the risk of failure when it really counts. These attitudes and actions are not because our people lack experience or competencies, but rather they are a result of institutional values and rewards that create the wrong mindsets and incentives.

There are, however, significant signs of progress. For example, the scenarios and considerations one is to use in creating the force are moving in the right direction. In the 1990s, it was popular wisdom to oppose undertaking operations other than war and to express the view that we should train and equip only for fighting wars. It was argued that, as a result, our forces would be able to handle these other types of operations because they were “lesser included cases.” As a result, we built and trained a force that was less agile than it could have been. Today these views are largely discredited. In 2005, the Secretary of Defense signed DoD Directive 3000.05, “Military Support for Stability, Security, Transition, and Reconstruction (SSTR) Operations.” This directive repudiated the logic of the “lesser included case” approach to operations other than war and

greatly expanded the scenarios that need to be considered in force development.

Stability operations are a core U.S. military mission that the Department of Defense shall be prepared to conduct and support. They shall be given priority comparable to combat operations and be explicitly addressed and integrated across all DoD activities including doctrine, organizations, training, education, exercises, materiel, leadership, personnel, facilities, and planning. (DoD 2005, 2)

It would be difficult to over-estimate the magnitude of the change that this represents for a military organization. A significant part of the change required relates to changes in the way militaries think about command and control. Thus, an essential aspect of achieving agility is the adoption of a new language to replace the language of command and control and the development of new approaches.

Summary and Way Ahead

The future of military organizations will depend upon their ability to become agile and this in turn will depend upon finding new ways to approach the challenges of command and control. Abandoning the term *Command and Control* and replacing it with *Focus & Convergence* will help us to more fully explore the promise of new approaches to accomplishing the functions associated with command and control. This will encourage us to look for solutions in the right places (parts of the approach space), guide us in assessing the merits of the alternatives under consideration, and re-direct our attention away from the “how” we know and are comfortable with to the “what” needs to be accomplished and then to the possible ways of achieving the desired result.

Abandoning the term “command and control” does not imply that commanders are no longer needed. As indicated earlier in this paper, leadership is an essential ingredient for success. A challenge

we face is to better understand the role of leadership in creating the conditions necessary for success and remain agnostic as to the merits of alternative approaches. A related issue involves accountability and responsibility, which I have associated with the creation and maintenance of trust.

Military organizations are designed to operate in high stress environments. As a result, a military rank structure has evolved. This rank structure is “a default and competent nexus of leadership... around which emergent behavior can arise and carry the day.”⁶ Thus, there is nothing inconsistent with either changing the language or with adopting self-synchronization or power to the edge principles where appropriate and current military rank structures provided that designated leaders add these new approaches to their conceptual kit.

Accountability and responsibility have behavioral, political, and legal dimensions. From a behavioral perspective, the reasons why individuals act as if they are accountable or responsible do not matter. However, politically and legally we have grown to accept a set of standards related to accountability and responsibility that are not easily applied to distributed accountability and responsibility. This is a subject that certainty needs to be addressed in considerable detail. Suffice it to say, our legal systems have been rather slow to catch up with the realities of the Information Age, particularly in the areas of information assurance, privacy, intellectual property, as well as third party responsibility and accountability. Given that (1) some of the most significant threats to our security and well-being involve attacks on our information/system control infrastructure, and (2) an increasingly significant factor in gross national products are emerging business models that involve products and services delivered in cyberspace and industry restructuring that create different relationships between and among manufacturers, suppliers and customers,

6. From comments on a draft of this paper received by the author from Ross Pigeau. These comments also formed the basis for the discussion of responsibility and accountability in this section.

revamping our legal systems is already receiving increasing attention. As these issues are sorted out, I suspect that we will have new and useful perspectives related to more distributed accountability and responsibility.

Assessing potential approaches in terms of their contribution to agility will help to ensure that whatever is ultimately adopted will be applicable in these challenging times. As these concepts are better and more widely understood, they will contribute to changing the culture as it pertains to the ways militaries should organize and operate in general and how those in leadership positions should approach the challenges they face.

The way ahead involves two parallel tracks. First, there needs to be a major effort devoted to understanding the concept of agility. Understanding how agility applies to entities (individuals, teams, organizations, and collections of entities) as well as how it applies to *Focus & Convergence* and the processes and systems that support *Focus & Convergence*. Second, there needs to be an effort to explore the full set of possibilities contained in the approach space without the pre-conceived notions associated with command and control.

Although thinking about *Focus & Convergence* will be difficult to the extent that it is difficult to change institutional culture, in some ways re-orienting ourselves to value agility over optimization will be the more difficult of the two challenges.

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References

- Ackoff, Russell L., Shiv K. Gupta, and J. Sayer Minas. 1962. *Scientific method: Optimizing applied research decisions*. New York: John Wiley and Sons.
- Alberts, David S. 1996. *The unintended consequences of the information age*. Washington: National Defense University.
- Alberts, David S. 2002. *Information age transformation: Getting to a 21st century military*. Washington: CCRP.
- Alberts, David S., and Richard E. Hayes. 1995. *Command arrangements for peace operations*. Washington: National Defense University.
- Alberts, David S., and Richard E. Hayes. 2003. *Power to the edge: Command...control...in the information age*. Washington: CCRP.
- Alberts, David S., and Richard E. Hayes. 2006. *Understanding command and control*. Washington: CCRP.
- Alberts, David S., John J. Garstka, and Frederick P. Stein. 1999. *Network centric warfare: Developing and leveraging information superiority*. Washington: CCRP.
- Alberts, David S., John J. Garstka, Richard E. Hayes, and David T. Signori. 2001. *Understanding information age warfare*. Washington: CCRP.
- DoD Directive 3000.05. 2005. Military support for stability, security, transition, and reconstruction (SSTR) operations.
<http://www.dtic.mil/whs/directives/corres/pdf/300005p.pdf>
(accessed March 30, 2007)
- Highlands Forum. <http://www.highlandsgroup.net/static/clients.html>
(accessed March 30, 2007)
- Joint Publication 1-02. 2001. Department of Defense dictionary of military and associated terms.
http://www.dtic.mil/doctrine/jel/new_pubs/jp1_02.pdf
(accessed March 30, 2007)

Mauer, Martha E. 1994. *Coalition command and control*. Washington: National Defense University.

Merriam-Webster Online Dictionary. <http://www.m-w.com/>
(accessed March 30, 2007)

NATO SAS-026. 2002. *Code of best practice for C2 assessment*. Washington: CCRP.

Page, Scott E. 2007. *The difference: How the power of diversity creates better groups, firms, schools and societies*. Princeton: Princeton University Press.

Pigeau, Ross, and Carol McCann. 2000. Re-defining Command and Control. In *The human in command: Exploring the modern military experience*, ed. Ross Pigeau and Carol McCann. New York: Kluwer Academic/ Plenum Publishers.

Pigeau, Ross, and Carol McCann. 2006. Establishing command intent: the key to coordinated military action. In *The operational art: Canadian perspectives: Leadership and command*, ed. Allen D. English. Kingston: Canadian Defence Academy Press.

Shister, Neil. 2006. Blending command and chaos into supply chain management. In *World trade*.