

## **Multi-Domain Operations:**

### **What's New, What's Not, and the Implications for Command and Control**

David S. Alberts  
Institute for Defense Analysis  
dalberts@ida.org  
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Carl von Clausewitz's (1780-1831) famously observed "Der Krieg ist eine bloße Fortsetzung der Politik mit anderen Mitteln." The appropriate translation is that war is a mere continuation of policy with other means; that is, war does not replace diplomatic, economic, and other means, but adds instruments of violence to the means employed. This may lead some to believe that since virtually all military operations have long been inherently multi-domain, nothing has changed and we do not need to do anything differently. While military operations have always involved multiple domains, this does mean that there are no significant differences between Multi Domain Operations (MDO) then and now. We will be well served if we can understand the character of 21<sup>st</sup> Century MDO and determine if, and how, the domains and the interactions between and among these domains have changed and the command and control implications of these changes. Should adaptations to our approaches to command and control be necessary, the tools exist, in the form of C2 Agility Theory and an accumulated body of evidence, to think through and make necessary adjustments to C2.

MDO can range in size, complexity, duration, and the domains of operation employed from relatively simple ones that involve a single entity operating in two domains to those that involve a heterogeneous set of entities, each of whom may be operating in multiple domains with very different characteristics. What is common across MDO is that operations in one domain need to be synchronized in time, space and effect with operations in one or more other domains to achieve the desired outcomes. Achieving this synchronization falls to C2.

Developing an understanding of the C2 requirements associated with an MDO begins with the identification of the domains involved. To do this properly requires a holistic perspective, since entities tend to limit their focus to the domains with which they are familiar and have an operational capability. Therefore, it is not surprising that each entity defines the set of operational domains differently. For the purposes of this discussion, operating domains are grouped into: a physical domain which includes but is not limited to the traditional military domains of land, sea, air, and to which space has recently been added; a Virtual Domain that includes but is not limited to cyberspace and information; and a Social Domain that includes but is not limited to the political, economic, and legal.

## MDO: circa 1970s

We can begin to understand if and how the nature of MDO has changed over time by looking back to the mid-1970s and the development of AirLand Battle (ARMY FM 100-5). AirLand Battle doctrine painted a picture of an extended, nonlinear, maneuver battle without distinct lines, rapid movements, intense volumes of fire, and with forward and rear areas blurred. AirLand Battle was built on four basic tenets: *initiative, depth, agility, and synchronization*.

Each of these tenets are related to the exercise of Command and Control. This is not surprising since the doctrine states that the ability to exercise effective C2 provides a decisive edge. The inclusion of *synchronization* as one of its core doctrinal elements recognizes the intimate relationship between the approach to C2 that is adopted and an ability to conduct a particular MDO. This linkage can be traced to General DuPuy's contention that effective command and control enhances combat power by its ability to synchronize. While AirLand Battle was focused on creating effects in the physical domain, it also recognized the importance of a Virtual Domain where adversaries could employ electronic countermeasures to disrupt effective C2 and understood that operating in a degraded communications and information environment placed a premium on subordinate *initiative*. Thus, it is not surprising that the AirLand Battle doctrine calls for a specific type of C2 Approach, *Auftragstaktik* (mission orders based upon commander's intent), an approach that is appropriate for the circumstances envisioned. The ability of a commander to conduct MDO will likewise depend upon the ability to manifest C2 *Agility*.

The remaining concept, *depth*, is about expanding the physical battlefield from a focus on front lines to an extended, fluid battlefield that requires a set of inter-related, interdependent activities. In the case of the AirLand Battle, air and ground maneuver forces; suppression of enemy air defenses; conventional, nuclear and chemical fires; unconventional warfare; active reconnaissance, surveillance, and target acquisition efforts; air defense; and electronic warfare all needed to be properly sequenced and managed in both front and rear areas, stressing both communications and logistics that support operations on an extended battlefield.

AirLand Battle involved two major physical sub-domains (Air and Land) operating on an extended, but still rather limited, geographic area. It recognized the growing significance of the Virtual Domain (consisting of EW and information) particularly as they contribute to situational awareness. While there was some recognition of a need for teamwork in joint and combined operations, AirLand battle doctrine assumed a unified chain of command and sought to achieve unity of effort with two organizations, each consisting of a number of specialized units.

## 21<sup>st</sup> Century MDO

While the MDO we think about today are arguably a logical and perhaps predictable evolution of the mission challenges that AirLand Battle was designed to address, the sum and substance of the differences between MDO circa 1970s and 21<sup>st</sup> Century MDO are significant. The latest National Defense Strategy (NDS) speaks of a changing character of war driven, in part, by the reemergence of long-term strategic competition, the blurring of lines between civil and military goals, the use of cyberspace, information operations and advanced autonomous systems, and an expanded competitive space that includes ‘competition short of war.’ These changes create an imperative to operate in three inter-related domains: physical, virtual, and social. As the character of war has and will continue to change so too will the character of MDO and the balance that needs to be struck within and across these operational domains. One can expect that the magnitude of these changes to the character of war, acknowledged in the 2018 NDS, will pale in comparison with the changes expected over the next 50 years.

The threat posed by Hybrid Warfare serves as a contemporary example of a Complex Endeavor and highlights the significant differences between the primary security threat that gave rise to AirLand Battle (e.g. Warsaw Pact land invasion via the Fulda Gap) and the threat landscape the 2018 NDS envisions. Hybrid Warfare involves the synchronized, simultaneous employment of the full spectrum of instruments of power and influence and significantly blurs, if not eliminates, the distinction between war and peace. The MDO required to counter this and other 21<sup>st</sup> Century threats are significantly different from AirLand Battle. The number and diversity of the entities required to respond, the set of operational sub-domains in which they operate, the interdependencies between and among operations in these domains and the effects they create, all pose significant C2 challenges not fully anticipated nor appreciated in the more limited environment addressed by AirLand Battle.

Thus, 21<sup>st</sup> Century MDO differ from the MDO of yesteryear in four important ways: the domains of operations; the set of entities; the employment of technology; and the rules of the game.

***The importance of operations in both the Virtual and Social Domains and the effects associated with these domains have grown to the point where mission success is unlikely if operations in these non-physical domains are not properly managed and integrated with operations in the physical domain. In particular, it is critical that the cyberspace and information operations that take place in the Virtual Domain are integrated with operations in other domains.***

Operating in all three domains makes it far more difficult to understand cause and effect relationships, to predict the myriad of effects that are likely to arise from alternative courses of action, and to synchronize actions.

Furthermore these three domains differ in significant ways. For example, events in cyberspace can occur in fractions of a second, while events may unfold in the physical domain in minutes or hours, and in the Social Domain perhaps in days or weeks. Further, there are differences in the ability to sort out friend from foe.

The expanded set of domains involved translates into a need for an expanded set of entities, the number and diversity of which is such that:

- there are multiple interdependent “chains of command;”
- the objective functions of the participants conflict with one another or their components have significantly different weights; or
- the participants’ perceptions of the situation differ in important ways.

While technology has always shaped operations, historians may look back to our time as the point when technology began to change the very nature of our organizations and operations. If so, it will be because the proliferation of non-human entities has transformed our human-centric organizations into socio-technical ones. Enabled by near-ubiquitous connectivity, big data, on-demand data processing, machine learning and artificial intelligence, our operations will increasingly employ and delegate decision rights to robots, real and virtual entities (software agents), autonomous systems, and mixed human-agent teams.

## **Multi Domain C2**

The success of military missions largely depends upon commanders’ ability to adopt and execute appropriate approaches to command and control. In the case of 21<sup>st</sup> Century MDO, success also depends upon operations undertaken by a host of other entities. Multi-Domain C2 (MDC2) seeks to avoid conflicts and enable synergies within, between, and among entities conducting operations in multiple domains, and the effects that these operations create. MDC2 involves both the arrangements that govern the behaviors among the set of entities participating in a MDO as well as the individual C2 or, in the case of civilian entities, management approaches adopted by each of the entities in each of their operating domains.

The interdependencies among domain operations and the effects they create requires harmonization of entity C2 and management approaches. Harmonization refers finding an appropriate set of arrangements that govern the behaviors of the entities involved and their interactions such that operations are *collectively* as effective, efficient, and agile as is appropriate, given the situation. Harmonization seeks to provide a measure of coherence among operations conducted in a number of domains in an attempt to make them supportive of each other.

## **C2 Implications**

***The most significant implication of this analysis is that individual entities may need to adopt a C2 Approach that they would not choose to employ if they were acting alone.*** That is, for the

MDO to be as successful as possible, entities will need to choose an approach to C2 that makes sense for the MDO; not just for one domain. In other words, the most appropriate C2 or management approach for a given entity's operation cannot be determined without considering the nature of the MDO, the characteristics and dynamics of the operational domains, and the capabilities of participating entities. Effective MDC2 requires a holistic design, rather than a result from a set of independent design efforts.

As the number and diversity of entities and the sub-domains of operation in MDO increase, so too does the MDC2 challenge. The solution, in the form of a set of entity C2/management approaches and an approach to harmonization, depends upon the interdependencies and the degree of coupling among domain operations.

C2 Agility Theory provides useful insights that will enable us to design an appropriate approach for a given MDO. The theory considers a wide range of C2 approaches, each of which is appropriate for different situations, and does not assume a unified chain of command. However, the ability to implement what theoretically would be the most appropriate C2 approach will be a function of the C2 capabilities of the entities involved. Entities that possess more C2 Agility, are able to adopt a variety of C2 approaches. These approaches include those that feature self-synchronization that will be better positioned to contribute to and function well in 21st Century MDO.

## **C2 of Socio-technical Organizations**

Socio-technical organizations feature the allocation of significant tasks and decision rights to non-human entities. ***The unique nature and dynamics of operations in the Virtual Domain require us to delegate tasks, decision rights, and some degree of autonomy to bots and bits. We must understand the C2 implications of these delegations.*** The 'cognitive' abilities, expertise, and experience that these newest team members bring to the fight have yet to be adequately understood. Questions about their reliability, risk tolerance, and trustworthiness need to be answered and factored into our C2 calculus, just as they are today for human team members.

What sort of assignments are they better equipped to handle? For example, non-human entities are less likely to experience information overload, or psychological and cognitive barriers to 'overturning' past decisions to make a decision that is more appropriate for the situation at hand. At the same time, precisely because of the in-humanly fast tempo of intelligent things, humans will find it difficult to understand and trust the recommendations or actions of their non-human team members. 21<sup>st</sup> Century MDO require collection and analysis of information on a scale heretofore unimaginable. This is another area where intelligent things will shine. They can acquire and process huge amounts of data, analyze this data in an unbiased manner and 'make sense' of it quickly. Errors and omissions will be less likely, and conflicting data will be noticed. On the other hand, intelligent things have their limitations. They rely largely on pre-existing models and algorithms (although a degree of learning will be

expected), and are less likely to show creativity, to detect unconventional opportunity in data collection, or data relevance, or a clever deception hidden in the data.

## Summary and Conclusion

Multi Domain Operations are not new. Our command and control concepts, approaches, and processes have evolved to meet the challenge of avoiding conflicts between and among units operating in multiple physical subdomains. Arguably, military organizations are the best of breed in organizing for and managing large, complicated operations. This is because they have, in the past, successfully adapted their C2 concepts and approaches in response to a changing threat environment and advances in technology. ***21<sup>st</sup> Century MDO require the ability to conduct simultaneous and integrated operations in the Physical, Virtual and Social Domains.*** The growing importance of the Virtual and Social Domains has far reaching impacts. First, it has led to a greatly expanded and more diverse set of entities, whose actions need to be, to a greater or lesser degree, synchronized in both the environments in which they operate and the effects that they create. This makes significant aspects of the operation unfamiliar to each of the participants and thus makes it more challenging to develop shared awareness. It also makes understanding the full consequences of actions far more difficult, thus increasing uncertainty and opportunity for internal conflict.

Despite the differences that exist between land, maritime, air, space, cyberspace and special operations forces, the 'we' of yesteryear was an organization with a single operational chain of command, a shared sense of purpose, and a unifying culture. Today's MDO require an 'us,' that is, a collection of heterogeneous 'we's. The task of orchestrating this collective falls to C2 – both on an entity and on a collective level. C2 Approaches that worked well for 'we' in the past may not be appropriate for 'us' today. Fortunately, we have the theory, the evidence, and the analytic tools to inform us as we seek to develop appropriate approaches to MDC2. That development should begin with urgency.