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MDO requires a digital transformation, adaptive leaders, and Command and Control Systems to operate across all domains.

The Alliance's Transition to Multi-Domain Operations

An AIRCOM Perspective

By Squadron Leader Shaun Cannon, UK Air Force, HQ AIRCOM

Introduction

The concept of Multi-Domain Operations (MDO) has gained prominence in the context of NATO's military strategy. What started years ago as an operational answer to peer adversary competition, in particular, to counter the Russian Anti-Access/Area Denial (A2/AD) threat, has become one of the most challenging endeavours NATO has ever undertaken. The challenges posed by a peer adversary's A2/AD posture represent the manifestation of the changing and unpredictable

battlespace of the future. This multi-layered, multi-threat, highly dynamic, omnidirectional, and far-reaching multi-domain system-of-systems forced NATO to re-think its approach to effectively and efficiently implement the Military Instrument of Power (MIoP). Additionally, the increased competition in the cyber and space domains raises new complexities to be dealt with during operations.

Future operational concepts must ensure that NATO's core tasks can be executed across the full spectrum

NATO MULTI-DOMAIN OPERATIONS

ADAPTING BEYOND JOINT DOCTRINE

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NATO's MDO approach is not just a more enhanced version of Joint Operations.

from peacetime to conflict, and under all conditions. Therefore, NATO must have the capability to continuously understand the changing environment and consequently develop strategies to sustain an operational advantage.

On 19 May 2023, all NATO nations approved the Alliance Concept for MDO. This formally signalled NATO's transformation from a joint approach, focused on the military services, to a multi-domain approach. The NATO definition of MDO is 'the orchestration of military activities, across all domains and environments, synchronized with non-military activities, to enable the Alliance to deliver converging effects at the speed of relevance'.¹

This definition recognizes the complexity of the modern operating landscape and the increased presence of non-military entities at all stages of conflict, while retaining the centrality of force as a response to military problems. The Alliance's agreed vision is that its approach to MDO will enable NATO members to prepare, plan, orchestrate, and execute synchronized MloP activities across all domains and environments, at scale and speed, in collaboration

with other non-military Instruments of Power (IoP), partners, and stakeholders.² Realizing this vision will require tailored options delivered at the right time and place which build advantage in shaping, contesting, and fighting. This distributed yet coherent approach presents a multitude of dilemmas which can decisively influence the attitudes and behaviours of adversaries and relevant audiences by adapting faster than the adversary can respond.

The purpose of this article is to demonstrate that MDO requires a digital transformation, adaptive leaders, and Command and Control (C2) systems that can operate across all domains. Synchronized interactions are necessary with non-military IoP, and thinking must extend beyond the joint mindset.

Joint Operations and Multi-Domain Operations

Born from the need to work together seamlessly in the most demanding circumstances, 'jointness' remains an important part of military doctrine. It is the basis upon which the MDO-related thought is built.

But the complexities we face today show that joint doctrine alone is insufficient for the military challenges of our era. The operational domains of space and cyberspace have unique characteristics that cannot simply be incorporated into existing joint doctrine, as many critical capabilities within them are not owned by militaries. The proliferation of non-military actors that contribute to military success, including commercial entities, has intensified over the past several years. These actors must be considered during the planning and execution of military operations. Indeed, there are other considerations, such as changes in military culture that reflect broad social evolution. Social media is among the factors that need to be weighed in military operations of the 21st century. Simply put, joint doctrine alone, even if executed flawlessly, is insufficient for the context in which forces of the Alliance are expected to operate, both today and in the future.

Therefore, NATO's MDO approach is not just enhancing joint operations by simply adding new domains. It is not only about using as many domains as possible when planning for effects, and it is more than actions and effects in one domain supporting another (supported – supporting interrelationship concept).

NATO's MDO approach mainly relates to a change of mentality when planning and executing modern operations in order to orchestrate effects in all dimensions (physical, virtual, and cognitive), across all domains (maritime, land, air, space, and cyberspace), at all levels of command, and using all alliance IoP (military, information, political and economic). Currently, effect development is taking place at the service level. Services are looking primarily into effects in the domains they traditionally operate in. Effect development in MDO should take place from a domain perspective that is service agnostic. This small, but significant, paradigm shift increases the number of options and ensures that capabilities are employed more effectively than they are today. It is about combinations of capabilities and actions in and from multiple domains being able to converge as a collective threat or opportunity.

In other words, NATO's MDO approach is a shift in mindset from viewing operations through the

prism of component commands' capabilities to seeing the delivery of complementary effects across interconnected domains, with the aim of forcing adversaries to defend all domains continuously from all directions, thereby imposing multiple dilemmas on the adversary to expose vulnerabilities which can be exploited.

Principles of MDO

MDO is a logical evolution from joint to an approach that exploits domain capabilities irrespective of which military service or non-military provider has ownership of the resource. NATO's MDO Concept for the Alliance describes the agreed four guiding principles that are fundamental to NATO's successful conversion to an MDO-enabled Alliance: *unity*, *interconnectivity*, *creativity*, and *agility*. NATO's digital transformation effort underpins these principles. It fuses military assets and connects non-military actors so that they, through collaboration, coordination, and synchronization, can contribute to successful MDO.

- *Unity* is as important for MDO as it has been for joint or coalition warfighting, and for delivering a comprehensive approach while emphasizing the criticality of information sharing.
- *Interconnectivity* enables the exchange of data and information to build understanding, whether or not the tactical units are interoperable.
- *Creativity* is what staff and commanders will need in order to build blended multi-domain warfighting options and to appreciate what data may be available to support military activity.
- *Agility* focuses on improving speed, from tactical resupply to strategic understanding. It enables agility in decision-making across all levels and in defensive and/or offensive actions.

The following four enablers underpin the Alliance's transformation to MDO:

1. Data and Digital Transformation

MDO demands a data-centric approach that recognizes data as a strategic asset.



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Given the sophistication of modern capabilities, it is self-evident that digital transformation will be the key to unlocking the full potential of MDO. If the Alliance is to achieve its vision of MDO, then it will have to digitalize; there is no way to conduct MDO at the speed of relevance without it.

The Alliance needs to connect with one another via systems with sufficient capacity to enable persistent interaction. Digital transformation efforts, with regard to MDO, tend to gravitate towards technical specifications and the substantial investment in NATO's digital backbone. This is a welcome effort; however, for NATO to achieve the highest aspirations of MDO, it must widen the aperture regarding digital transformation beyond technology to include culture, processes, and people.

A common refrain in military circles is that joint culture took two generations to form within forces of the Alliance. Yet, advocates of MDO maintain that NATO forces lack the luxury of two generations to adapt to an MDO culture. NATO must be proactive and incentivize the cultural precepts that underpin an MDO mindset. It is crucial for a modernized NATO to have individuals who are skilled in handling data, as this

field has its own set of skills, practices, and norms. How forces of the Alliance reconcile military culture with that of data science within an MDO framework is a significant undertaking with potentially percussive benefits across the enterprise.

NATO will need to consider how artificial intelligence can help harness large data sets to enable elegant and exhaustive operational pictures that underpin effective MDO. Moreover, NATO's needs to refine and automate its processes and move human labour beyond the critical path of routine administration in order to achieve the requisite gains in speed and scale that MDO demands.

2. Exploiting the Technological Advantage

MDO must be optimized through the effective exploitation of technology that provides information and decision advantage. This includes the use of Emerging Disruptive Technologies (EDTs), particularly Artificial Intelligence (AI), and the transition to a data-centric organization via the NATO Digital Transformation Implementation Strategy (DTIS). These will unlock opportunities to advance interconnectivity and

interoperability across national forces and the other Instruments of Power.

EDTs bring opportunities for secure communications, situational awareness and decision-making and can support commanders in visualizing, testing, generating, and executing activities across all domains. Nations are exploiting EDTs at different rates, which creates a challenge for MDO interoperability. Furthermore, AI can potentially increase the speed and accuracy of data analysis, accelerating the commander's ability to react. As technology accelerates, AI provides opportunities to assist decision-making through the integration of highly automated functions. Whilst NATO must take advantage of technological advancement, responsible use of AI must be paramount before AI-assisted decision-making is integrated with NATO military forces.

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The war in Ukraine has demonstrated how another disruptive technology, Unmanned Aerial Systems (UAS), have given Ukrainian Forces an asymmetric advantage in what was initially expected to be a conventional conflict dominated by a larger aggressor. UASs have traditionally been used as an Intelligence Surveillance and Reconnaissance (ISR) tool to gather information on an adversary but have also been harnessed for applications such as communications and jamming. Open-source media has broadcast videos of Russian soldiers driven from their trenches at the threat of a mortar round being delivered on their position by an unmanned system, which is a significant disruptor in modern warfare.

EDTs can be big or small, and, like small UASs, don't have to be particularly high-tech or expensive. Further,

by definition, EDTs are a shifting landscape, not predictable beyond the near future.

3. Cross-Domain Command

MDO is reliant on collaborative, agile, and empowered C2. The Alliance's standing military structures (NATO Command Structure and NATO Force Structure) are unique amongst the instruments of power. Integrated military structures provide the Alliance an advantage in any contingency, regardless of its nature. Future success of the Alliance's MloP depends not only on preparation, capability, and agility of forces, but also the ability of commanders to operate in a complex operating environment simultaneously across physical and non-physical domains. This requires cross-domain understanding and agile and asymmetrical thinking supported by robust and continuously refreshed information and communications systems. Against this backdrop, traditional methods of command will have to evolve, continuing to embrace the flexibility and advantage of mission command.

NATO must review and, as necessary, adapt and advance current conceptual approaches towards a multi-domain perspective. Moreover, the traditional 'Art of Command' must transform into a modernized Cross-Domain Command that embraces a more agile and flexible approach.

Building upon ongoing efforts to adapt and modernize C2, the Alliance is adopting an incremental and evolutionary approach. Recognizing work already initiated by both NATO Strategic Commands and building on the approved MDO Concept, the Cross-Domain Command Concept will focus on medium to long-term conceptual development of NATO C2 into a future Cross-Domain Command.

4. Education, Training, Exercising, and Experimentation

Progression towards MDO will need investment in technologically-enabled training at the national and NATO levels. It will also require commanders and staff that can exploit capabilities across the domains, based

on technologically enabled understanding, to creatively generate relative advantage.

The development of multi-domain warfighters and cross-domain leaders through the linkage of professional military education, training, and operational requirements must be a priority for NATO. NATO's MDO Concept emphasizes the need for warfighters and leaders that are not only domain specialists but also are capable of exploiting strategic, operational, and tactical opportunities across all five domains while operating across multiple instruments of power.

Achieving this is a complex task. Alliance members will need to develop their professional military education (PME) and training programmes in a manner that meets the requirements of MDO. This will require the introduction and emphasis on new subjects and educational approaches that will develop creative and critical thinking, leverage the strategic, operational, and tactical advantages that multi-domain operations will provide, and will take into consideration adversary multi-domain capabilities. Additionally, digital education – from the flight line to the Four Star – will gain particular importance.

'To support the Alliance ambition of transforming towards an MDO-enabled Alliance with capabilities to deter and defeat adversaries across the five operational domains in an orchestrated and synchronized manner, the MloP must evolve.'

Across NATO, there will need to be an unprecedented alignment of PME and training end states. Greater interoperability at the operational level is best supported by greater interoperability at the nexus between education and training. However, the Alliance should support the simultaneous retention of national requirements and priorities in member states' professional military education and training programmes.

Whilst NATO has a role to play, the main effort remains a national responsibility.

Technology will play a vital role by taking NATO PME and training to a new level of authenticity that will lead to enhanced levels of readiness. Initiatives such as the next generation of Modelling & Simulation (M&S) tools will enable NATO and Allies to leverage the power of experimenting, modelling, simulation, and wargaming. Allies will also need to develop programmes which emphasize the persistent use of such tools in order to maintain a high level of readiness and enable the Alliance to fight and win in all future operating environments.

Wargaming and experimentation, both powerful analytic methods, can lend incredible insight into the complexities of MDO across NATO, not only in the analytic and planning communities, but also in the training and education communities. Experimentation and wargaming are uniquely suited to the exploration of new ideas, concepts, and capabilities, and will play a critical role in implementing MDO for NATO. When combined with EDTs, tools like next generation M&S, the ability to generate understanding in NATO's training and education enterprises will be almost limitless. However, a cultural change will be necessary to truly test and experiment during exercises.

MDO and Synchronization with Non-Military IoP

The same trends that are driving NATO to develop its MDO Concept are also increasing military operations' reliance on and interaction with non-military IoP. These trends include the proliferation of sensors, the rapid expansion of civilian space-based assets, the increasing importance of cyber to enable military operations, and the vulnerability of civilian infrastructure to kinetic and non-kinetic attack during wartime. Each trend necessitates more focused coordination of military and non-military IoP.

To succeed, military operations must be multi-domain and be built on a strong backbone of synchronization



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Technology that provides information and decision advantage can optimize implementation of the MDO concept.

with non-military IoP. Allied Command Transformation (ACT) has recognized this interdependence in its definition of MDO and achieving this will require immediate steps to further coordinate with non-military divisions of government and private-sector actors. It will also require a more concerted approach to incorporate these elements into NATO planning processes in the long term.

'After decades of low-intensity conflict, Russia's invasion of Ukraine has reintroduced large-scale, high-intensity combat to Europe.'

Ukraine's remarkable defence against Russia's brutal war of aggression demonstrates how MloP connects with and depend on non-military IoP. Ukraine's use of Starlink for C2 is well-documented, for instance, even as recent comments from the

SpaceX CEO demonstrate potential drawbacks to relying on the private sector for Low-Earth Orbit (LEO) enabled C2 infrastructure.

In addition to communications, Ukraine utilized commercial space capabilities to complement government-provided satellite imagery intelligence to great effect. Ukraine further leveraged the proliferation of private sensing available by incorporating publicly available information into its intelligence and targeting. In addition to turning to private-sector capabilities to improve combat effectiveness, Ukraine also had to address challenges posed by its reliance on private industry, critical infrastructure, and the private sector companies that operate and maintain said infrastructure.

The stress this war has put on the global industrial capacity and the air, land, and maritime lines of communication feeding into Ukraine have reminded military and non-military planners alike of the adage that logistics win wars. Hence, when Russia's initial invasion failed, it quickly ramped up a barrage of attacks on



NATO's adversaries have sought to limit NATO's access to the battlespace and to deny key operating areas.

Ukraine's transport, energy, and cyber infrastructure using both kinetic and non-kinetic means. Ukrainian ingenuity, coupled with support from military partners and private-sector actors, has enabled Ukraine to both sustain its war effort and continue to provide the basic functions of governance as a state. Ukraine has benefited from a protected rear support area for logistics in NATO nations, as well as the ability to draw on industrial capacity from the many nations donating to its armament. It is important to keep in mind that these advantages – protected industrial and logistics sustainment capacity – would not necessarily apply if NATO itself was in a large-scale conflict.

NATO will need to leverage private-sector capabilities across domains in order to enhance lethality. It also will need to deepen its industrial base capacity and protect critical infrastructure from kinetic and non-kinetic attack. All of this will require synchronizing the military instruments across the warfighting domains of air, land, maritime, cyber, and space with non-military IoP from governments and the private sector.

Though Ukraine has done an exceptional job of fostering this government-private sector cooperation during a wartime environment, it also spent the past eight years of its low-intensity conflict with Russia to harden its infrastructure and work with the private sector and across all levels of its government at all levels to prepare for and fend off Russian kinetic and non-kinetic attacks. If NATO faces a similar conflict, it will need to synchronize military and non-military IoP before the first physical shot is fired.

So What for AIRCOM?

Moving forward, AIRCOM must fully engage with the Alliance's transition to MDO and seize the opportunities that this offers to advance the Alliance, and AIRCOM, from the 'now' to the 'future'. The five priorities below will enable AIRCOM to be at the forefront of the Alliance's evolution towards MDO. Each priority not only contributes to achieving an MDO-enabled Alliance but also contributes to NATO air forces that are



‘integrated by design’ (IBD); collectively they form the AIRCOM Integrated By Design Campaign Plan (IBDCP).

1. Counter-Anti-Access / Area Denial (C-A2/AD)

Russia and others have studied the West’s way in warfare for over 30 years, and Russia learned that air and space power is the foundation on which everything else is built. Accordingly, NATO’s adversaries have sought to limit NATO’s access to the battlespace and to deny key operating areas. The war in Ukraine highlights what happens when neither side can gain air superiority: a prolonged, artillery-heavy slugfest with tens of thousands of casualties. This is not how NATO or our nations want to fight. Instead, NATO needs to take down the Long-Range Surface-to-Air Missile (LRSAMs) systems and coastal defence cruise missiles that particularly limit air freedom of manoeuvre but also inhibit land and maritime operations.

A significant AIRCOM conceptual effort is focused here, to ensure that all of NATO’s air forces can bring their best operational capability to ensure access in all domains, but especially air, land and maritime.

AIRCOM is breaking new ground to tackle this problem and hosted a two-week event that brought together SMEs from NATO air forces and other domains to address key problem sets and provide focused, achievable, near-term enhancements – this being an inaugural Weapons and Tactics Conference (WEPTAC), the first of its kind in AIRCOM or NATO. MDO contributes to the C-A2/AD fight by employing capabilities from all components across all domains. Thorough peacetime planning enables a truly integrated approach with the benefit of deliberate mission command.

2. Integrated Air and Missile Defence (IAMD)

To the extent that NATO needs to dismantle our opponents’ C-A2/AD capability, the Alliance also needs to ensure that it is able to defend NATO territory, its people, critical infrastructure, and essential defence capabilities. After over 30 years of relative peace in Europe, NATO needs to bring IAMD back to the forefront. AIRCOM briefed at many events over the past year, including to the NATO Military Committee and at Supreme Headquarters Allied Powers Europe (SHAPE)-

led IAMD exercises, and engaged with all 32 NATO nations' Air Chiefs. AIRCOM will continue applying considerable attention to IAMD to defend every inch of NATO territory and airspace. Again, the WEPTAC is a key activity to help galvanise collective capability. MDO helps to identify peacetime capabilities from all components that can be integrated into an IAMD construct. No capability should be spared. Reluctance of component commanders to 'lose control' over own capabilities must be overcome with the promise of more effective integrated solutions. Concepts like Air Support Operations Centres should be assessed concerning the use of IAMD functions, rather than air-land integration alone.

3. Air Command and Control (AirC2)

There's no point in having great capabilities – fighters, SAMs, radars, and munitions – if a command is unable to ensure they are employed effectively. This requires an appropriately designed AirC2 systems

approach; hence C2 is another key priority. The war in Ukraine has also underlined the need for survivability, redundancy, and the ability to operate when communications are denied or degraded. AIRCOM is looking hard at what this means now and in the very near-term – from how we train commanders and staff, through testing distributed C2, to the equipment that allows us to prosecute air operations at scale within an increasingly complicated battlespace. AIRCOM has an excellent history to build upon, and some exciting technology to embrace. But most importantly, AIRCOM will get NATO AirC2 on track for a future Multi-Domain C2 (MDC2) construct. MDC2 is more than connecting networks, it requires doctrine, training, personnel, and leaders with an MDO mindset. It requires application of flexible C2 concepts, like mission command and command by negation, to stay flexible and adaptable. MDC2 requires the empowerment of commanders at the lowest practical level of the organization. It requires commanders having the understanding and the trust to delegate



NATO needs to regain agility and interoperability in how aircraft are supported and maintained.



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Liberal information sharing policies between Allies and Partners are crucial to create the level of shared understanding necessary to combine effects across all domains.

authority to the lower levels of the organization in a timely manner when the situation demands it.

4. Information Sharing

MDO is based on shared situational understanding. Situational understanding is based on shared situational awareness. Sharing of information is crucial to create the level of understanding necessary to develop the combinations of effects across all domains to which MDO aspires. Information-sharing holds the most promise on return with the lowest cost assuming problematic policy barriers can be overcome. NATO must ensure that restrictive rules and processes guarding what information can be shared within the Alliance do not unnecessarily hold us back. Each nation needs to assess and – where appropriate – overcome outdated and overly restrictive policies. Two examples: the US now shares 3,000 points of interest a month with NATO allies...previously it was only 30 a month; and more information on the F-35 has been shared at the WEPTAC than was ever achievable before. Both of these improvements cost nearly nothing – they were simply policy restrictions that were removed through engagement, risk assessments, and thoughtful discussion. But if the Alliance wants to think of data centrality in MDO, it needs to get the information exchange across NATO correct.

5. Agile Combat Employment (ACE)

NATO needs to regain agility and interoperability in how aircraft are supported and maintained. These are skills and knowledge NATO worked hard to develop and practice during the Cold War, but which were not maintained in recent decades. Ongoing work to progress ACE and supporting elements such as Aircraft Cross Servicing (ACS) is geared to correct this shortfall, increasing the survivability and operational effectiveness of our aircraft and systems while posing problems for adversaries. Once again, the war in Ukraine highlights the need to avoid being predictable and thus easily targeted. It also demands speed and responsiveness to deploy and redeploy as required. Nations have different versions of ACE, but there are some common themes and requirements AIRCOM will develop together, such as ACS and the necessary level of secure fixed and mobile digital communication and information systems.

Conclusion

MDO is a critical component of NATO's military strategy. The integration and synchronization of capabilities across different domains are necessary to overcome the complex and interconnected challenges of contemporary warfare. Key components of MDO include

interoperability and synchronization among different domains, the use of modern technologies, and effective planning and execution. The driving factors behind MDO include the evolution of technology, the changing character of warfare, and the need for a coordinated response to global threats utilizing all IoP.

MDO extends joint concepts and emphasizes the importance of domains rather than the military force operating in them. A strategically-aligned Alliance equipped with MDO capabilities will have the ability to seize opportunities throughout all stages of conflict, including shaping, contesting, and fighting. This advantage extends from tactical engagements to strategic operations, and can be leveraged in collaboration with partners. New structures for command and control help amplify this focus on domains and provides increased options for warfighting commanders.

The ongoing conflict in Ukraine has been a case study in the evolving character of warfare and the challenges that arise. It shows the criticality of operating in the cyberspace and space domains, the utility of technology like drones and autonomous systems, the importance of

adaptive leaders who can deliver effects across multiple domains at speed and scale, and the potential risks of relying on non-military IoP.

Implementing the Alliance Concept for MDO and NATO's transformation into a multi-domain enabled Alliance is a true Bi-Strategic Command endeavour. MDO will shape the future of deterrence and defence in the North Atlantic area of operations. Working together to achieve the MDO vision, AIRCOM remains a relevant actor in this changing environment and, through the IBDCP, fully contributes to the Alliance's evolution towards MDO.

The time for getting our concepts, doctrine, tactics, techniques, and procedures right to fight and win a peer adversary fight is now. Let's not waste time. Let's accept the challenge and push hard to get NATO Air Forces ready. Fight's on! ●

1. NATO Allied Command Transformation. 'Multi-Domain Operations: Enabling NATO to Out-Pace and Out-Think its Adversaries,' 29 July 2022. <https://www.act.nato.int/article/multi-domain-operations-enabling-nato-to-out-pace-and-out-think-its-adversaries/> (accessed 4 March 2024).
2. NATO Allied Command Transformation. 'Multi-Domains Operations Conference – What We Are Learning,' 8 April 2022. <https://www.act.nato.int/article/multi-domains-operations-conference-what-we-are-learning/> (accessed 4 March 2024).

ABOUT THE AUTHOR

Squadron Leader Shaun Cannon

UK Air Force, HQ AIRCOM



Squadron Leader Cannon is stationed at HQ AIRCOM, Ramstein, Germany working in the A5 Policy Branch. He is an Air Traffic Controller and has worked in various locations in the United Kingdom both in Terminal and Area Radar. Additionally, he served in various national and

international staff positions, these appointments included a previous tour at HQ AIRCOM in the Standards and Lessons Learned Division and as a Liaison Officer with the French Air Force. He has several operational assignments including Iraq and Bosnia-Herzegovina.