



DISRUPTIVE AND EMERGING TECHNOLOGIES IMPACT ON THE MULTINATIONAL JOINT OPERATIONS COORDINATION IN MODERN WARFARE

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New technologies are rapidly emerging in various fields and many technological advances are considered innovative, but not each and every technology will change the ways of waging wars. However, there are technologies that have an exponential and sometimes decisive impact on modern warfare in terms of introducing new paradigms, creating new combat domains, adapting or changing operational doctrines and concepts etc. Therefore, it is important to understand the use of current disruptive and emerging technologies and their impact on modern warfare.

Military operations have long posed challenges to national security practitioners. In modern warfare, the emphasis is on joint and multi-domain military operations, which represent an evolution in military strategies, as the mentioned concepts entail integrating and coordinating forces in all areas of operations (air, land, maritime, cyberspace and space). These types of operations meet the requirements of a complex and multidimensional combat environment, where success depends on the ability to effectively integrate various capabilities and manoeuvre them in different domains simultaneously. Modern history demonstrates that military operations are conducted not only by states in declared conflict or competition, but also by "proxy" states or military organizations financed by them. Alliances are thus punctually formed in order to meet national interests.

In this context, the development of disruptive and emerging weapon systems has the potential to increase the complexity of the organization and conduct of military operations. An example in this regard is that of NATO, which faced significant challenges during the air operations in Kosovo in 1999 because the encrypted radio systems used by some member states could not communicate with those of other states. Lately, allies have had substantial debate over the best policies and practices to guide cyber operations. Nowadays, the weapon systems based on disruptive technologies will present new challenges



Advantages of Adopting Disruptive and Emerging Technologies in Multinational Joint Operations

The new technologies development pace is not the same worldwide, which means that some states will possess and effectively operate capabilities based on modern technologies, while others will not have access to such capabilities to the same extent. This uneven distribution of technology may result from variation in material and human resources or political resistance to adoption. Allies with developing economies will tend to allocate funding to modernizing conventional equipment rather than to developing new military capabilities based on emerging and disruptive technologies. In addition to variation in material resources, public support for the development of emerging military capabilities varies significantly from state to state, which may also influence the way states develop such technologies. Even though autonomous weapon systems enable the execution of a wide range of military missions, the notion of weapons – robots or weapons controlled by artificial intelligence – often creates negative images in public perception. Moreover, states without emerging technology-based capabilities may be less able to contribute to missions, which may compel better-equipped allies to assume a greater share of the effort, which can create friction.

The integration of disruptive technologies would stimulate military commanders to think and use them at the operational and tactical levels of war, and political leadership would likely exercise options at the strategic level. However, the disruptive potential of these technologies requires understanding how they could fundamentally affect the nature of military operations. Here are some specific ways in which emerging and disruptive technologies will impact the leadership and execution of these types of operations:

1. Interoperability and advanced integration

- **Joint digital platforms:** The development of integrated command and control platforms, based on artificial intelligence and big data, will enable the joint and partner nations to rapidly and efficiently share information. It will ensure

a common understanding of the situation and more effective coordination.

- **Combat engagement:** Emerging technologies such as robotics, satellites, drones etc., becoming mature, are causing the rules of engagement in war to change; for example, stand-off operations/non-contact warfare may become the norm in the future, drastically reducing the risk to the troops. UAVs define new rules of engagement, and concepts like drone swarm tactics will provide a new method for engaging the adversary. New domains of warfare will open up, such as space, cyberspace, virtual domain, including social media.
- **Secure communication:** Advanced communications technologies such as 5G and encrypted networks will significantly improve the ability of multinational forces to communicate seamlessly and without the risk of compromising data security, even in environments that are hostile or have limited infrastructure.

2. Rapid decision and real-time information

- **Artificial Intelligence and data analysis:** Artificial Intelligence (AI) will enable the rapid collection and processing of large volumes of data from various sources (drones, satellites, ground sensors), and commanders will be able to make informed decisions in real time, reducing the period needed to respond and adapt to changes in the battlefield.
- **Autonomous systems:** The use of drones and other autonomous systems will provide a constant flow of tactical information, and AI will be able to suggest strategic actions based on this information, thereby optimizing decision-making at all levels.

3. Efficient coordination and synchronization

- **Virtual simulations and training:** Virtual and augmented reality, along with advanced simulations, will allow multinational forces to train together in a joint virtual environment, even if they are in different locations. These simulations will be more realistic and allow tactics to be tested in a hostile environment.





- **Automated planning:** Emerging technologies will automate planning processes, creating multiple scenarios based on available data, optimizing available resources for better coordination among multinational forces.
- **Movement:** AI tools can improve mobility by automatically suggesting ideal routes, taking into account traffic congestion, road conditions, broken bridges and other elements. Intelligent ground, air and underwater vehicles can improve the range of surveillance and weapon systems.

4. Multinational capabilities improvement

- **Logistics and supply:** Logistics management systems based on blockchain and AI will provide transparency and efficiency in managing shared resources. Multinational forces will be able to better coordinate the supply and use of resources, avoiding duplication of effort and reducing waste.
- **Distributed manufacturing technologies:** 3D printing and other additive manufacturing technologies will enable the on-site production of the necessary equipment, reducing reliance on traditional supply chains and better adapting to the specific needs of each participating force.
- **Protection:** Equipment and personnel protection will certainly get a boost. Nanofiber-based military uniforms could change colour and texture to better camouflage, thus reducing the visual signature, and inventions like smart robots, drones, UCAVs etc. will reduce the involvement of troops/pilots in risky situations and therefore casualties on the battlefield.

5. Decision and risk management

- **Collaborative decision-making platforms:** Digital platforms that enable communication between the armed forces of the Alliance or coalition states will make it easier to manage multinational joint operations, facilitating the exchange of sensitive information and the synchronization between different levels of command.
- **Risk and conflict management:** AI and predictive analytics will help anticipate and manage potential conflicts between

participating nations, be they related to differences in doctrine, communication or strategic interests.

6. Cyber and information operations

- **Joint cyber defence:** Emerging technologies will enable the development of joint cyber defence frameworks so that multinational forces can concertedly defend their critical infrastructure and communications against cyber attacks.
- **Information operations:** Multinational collaboration in information operations will be enhanced by emerging technologies, which will enable better coordination in the fight against disinformation and propaganda, especially in areas of complex operations and those of strategic interest.

7. Security and modern warfare ethics

- **Ethical considerations:** As emerging technologies become more integrated into military operations, ethical challenges will arise related to the use of AI in lethal decisions, the compliance with international laws, and the protection of human life. Multinational forces will need to develop common legislation to govern the use of these technologies.

Challenges related to Decision Making in Ensuring Interoperability

Even if allies and coalition partners overcome domestic obstacles to developing military capabilities based on disruptive and emerging technologies, the use of these systems can still complicate the decision-making process and pose major interoperability challenges for multinational coalitions. These challenges can complicate multinational joint operations and jeopardize the cohesion between security partners. Decision making among allies is often characterized as a complex coordination game. Although allies share a set of goals and objectives, each state sustains its own national interests. The negotiations required to harmonize these divergent political interests may result in longer time for making decisions at strategic level. The rapid rate at which information is produced and operations are conducted today can strain alliance decision-making processes. NATO's current





decision-making structure, for example, challenges the 32-member North Atlantic Council to debate and vote on matters related to the use of force. As emerging technologies accelerate the speed of war, decision-making timelines must be compressed, and alliance leaders may find themselves making decisions without the luxury of extended debate. At the operational and tactical levels, the increased deployment of military systems based on disruptive and emerging technologies has the potential to complicate interoperability among alliance forces.

As new weapon systems are introduced in the battlefield, they must be able to communicate and integrate both with each other and with older generations of weapons, and it can be a complicated task for political and technical reasons. Politically, states may be hesitant to share military and intelligence data, even with close allies. They may fear that providing unfettered access to data risks revealing sensitive sources and methods, which could cause mistrust, strain political relations or compromise ongoing military operations. Even if allies are willing to share data, significant technical hurdles remain. A lot of military and intelligence data are stored in classified national networks that are not typically designed to allow easy information sharing, and this aspect will become more pronounced as data requirements increase in an age of warfare based on emerging technologies.

Conclusions

States acquire and develop new military technologies to gain a battlefield advantage, increase operational efficiency and reduce operational risk. Although these technologies can help shift the balance of power, the armed forces often have difficulty integrating new equipment and procedures into their existing force structure because of a combination of technical and institutional barriers. The challenge of integrating new technologies into military operations is amplified in the case of multinational alliances and coalitions. While the members of these entities share security interests, each pursues its own national interests and has its own set of priorities and procedures for action. As a result, each state may have different views on how and when to use these new technologies, complicating the planning as well as the execution of military operations. However, in the case of functional

alliances and coalitions, decision-makers can always identify solutions so that such divergences can be overcome, and disruptive and emerging technologies can profoundly transform the management of multinational joint operations, making them more efficient, faster and better coordinated.

Such a solution is the conduct of joint training activities, through joint multinational exercises, not only at the command level but also with troops. The Joint Forces Command, as the only structure in the Romanian Armed Forces capable of planning and managing joint operations, is responsible for coordinating such activities on the national territory.

