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NATO CORPS HQ – LAND COMPONENT – INTEGRATION OF UNMANNED AERIAL VEHICLES (UAVs)

Constantin-Adrian CIOLPONEA
Ministry of National Defense, Bucharest, Romania
cicady87@yahoo.com

Ghiţă BÂRSAN
"Nicolae Bălcescu" Land Forces Academy, Sibiu, Romania
ghbarsan@gmail.com

ABSTRACT

Due to the impact on evolution of future conflicts, Unmanned Aircraft Systems/UAS are registered as influential technology, with unpredictable effects in the doctrinal sphere, namely the integration of Unmanned Aircraft Systems/UAS could alter the space-time-combat correlation, by reducing the time for engagement and increasing precision. The integration of Unmanned Aircraft Systems/UAS may require the synchronization of joint actions in all areas to allow rapid change of effort from one direction to another.

KEYWORDS: Imagery Intelligence, UAS integration, UAV

1. Introduction

In a highly volatile geopolitical environment, complexity is added by permanent shape shifting threat in combination with an aggressive technological race. Under the influence of the underlying factors changes in the physiognomy of modern warfare, military art continuously adapts its principles, methods, procedures and rules for the preparation and conduct of military actions so that they correspond to the organizational, structural and endowment transformations of the modern military system (Herciu & Lehaci, 2020).

The development of the UAS is part of the evolution of precision weapons systems, in a new paradigm of war, being a turning point in the evolution of military actions, as a whole "… the development of weapons systems that can hit the opponent with high precision ammunition: from positions located at long distances from the target, usually outside the enemy's weapons effective range, allows selective and precise approach to the most important objectives located in the depth of the enemy's disposition (or critical infrastructure)" (Herciu & Lehaci, 2020).

The wide integration of UAS could contribute decisively to the neutralization of the opponent's gravity centers and to the balance of combat potential. The integration of UAS should ensure the preservation of the combat initiative.

Directly strikes launched by UAVs or indirectly using guidance of high-precision vectors, contribute to battle-space shaping. When shaping the battle space, gaining and maintaining the initiative has a paramount

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importance. The manifestation of the initiative determines the limitation until the cancellation of the options of the enemy, at the same time as the maintenance of a sufficient number of options for the own forces (Herciu & Lehaci, 2020).

The integration of UAS might lead to the diversification of the action procedures, to the multiplication of the support and fire missions. At the same time, this integration can lead to the improvement and standardization of countermeasures against the opponent's UAS.

The integration of UAS in military operations is aligned with latest evolutionary trends of military science and it responds to an important critical condition for combat success, namely the ability to discover and identify the main objectives and focus on the decisive points (Lehaci, 2020).

Most military analysts consider the conceptual UAS integration in the C2 system at the joint level as the first step towards an efficient management of battle space. Therefore, the targeting process is designed to proper identify with accuracy decisive points (DP) and centers of gravity (CoGs) transformed in targets (High Value Target/HPT or High Pay-Off Target/HVT) (AAP-6 NATO Doctrine Terminology, 2018) for UAS or other striking vectors.

For successful combat, initially, there are necessary 2 basic conditions: the implementation of a secure, fast and reliable command and control system and the integration of the digital fire system, for all striking platforms on land, air and sea.

The level of integration of these 2 systems exponentially increases the rate of success for engagement of enemy targets. The criticality of forces modernization is a priority, and addresses several areas, such as: "readiness" built up, force digitization, connectivity and communications security, cyber defense, expeditionary force, deep strikes modernization, JSTAR (Joint Surveillance Targeting Acquisition Reconnaissance). Last mentioned objective implies necessary integration of modern UAS in operations and standardization of counter UAS measures.

In the cycle of MDPP (*Military Decision Making Process*), the selection and production of CCIR (*Commander Critical Information Requirements*) represents one of the most important steps. Formulating the right question, could lead to the optimal solution.

Primarily higher echelon but also the organic ISR assets from corps/division level bring to OPSCEN (Operational Center) the initial data about enemy disposition, structure and intentions. Modern Corps HQ integrate also automatic data processing systems designed to accelerate the staff analysis and data managing, threat assessment. In this respect the command and control FAS (functional area service) – is designed to ensure a real time update of the NCOP-(NATO comprehensive operational picture) and RGP – (Recognized Ground Picture), to rapidly exchange intelligence or command and control documents.

When supporting maneuver units the Corps command post, has to employ dedicated support units which were trained in advance in this type of environment. One of the most important combat functions for the Corps HQ is JISR. The objective of this important function answers to the first step of decision cycle: to find the enemy. Finding is followed by confirmation of the target and dissemination of Intel to subordinates and higher. The entire process feeds the targeting process which identifies the ways to destroy or neutralize the targets in the preferred priority. The targeting process could be planned or dynamic. If UAVs have dual capability, surveillance and striking could engage more rapidly targets in deep, based on opportunity.

NATO Corps HQ has a clear defined role and mission during different phases of land based operations. During conventional

conflict one of the most complex planning and execution phases constitutes – *"shaping operations"*, part of Corps Operational design. Shaping operations are to be synchronized with the higher echelon campaign, objective, and desired end-state, with adjacent forces on the ground, air or sea. The commander's concept of operations directs the manner in which the divisions cooperate to accomplish the mission and establish the sequence of actions necessary to achieve the end state, expressed in terms of decisive, shaping and sustaining (Army Field Manual, 2018).

Corps HQ (land) is one direct beneficiary of JSTAR system products, during competition, crisis and conflict. Without effective confirmed Intel on adversary, the speed of decision cycle, the magnitude of shaping operations and, more precise, the targeting process is greatly diminished. The Corps level has to manage simultaneously the deep, close and rear, in order to efficiently allocate reasonable resources. The corps synchronizes the employment of land power in conjunction with joint and land capabilities provided by the JFHQ/LCC. Corps operations shape the operational environment and set the conditions for tactical activities by the division and lower echelons. In combat operations, the corps task-organizes and maneuvers divisions to destroy enemy land forces, seize key terrain and critical infrastructure and dominate the land portion of the (JOA) joint operations area (Army Field Manual, 2018).

War-fighting Corps as a primary role is distinguished by the scope and scale of operations. Necessary right set of technical tools, services, staff skills and expertise, process and procedure are contributing to the operational success. When acting as a war-fighting formation the Corps HQ operates at the tactical level, providing the interface between operational level provided by the Land Component Command (LCC) and tactical level activities conducted by divisions. The tactical activities contribute to the effect to be generated, which in turn leads to the achievement of operational decisive conditions (Army Field Manual, 2018).

Corps level has always operated fulfilling minimum 7 distinct war-fighting functions associated with the sequence of operations. Commanding and controlling 3-5 maneuver divisions and subordinated Corps troops (MCR 20), employing ISR capability above divisional level and integrating the products into intelligence cycle and information campaign, fire support-prioritize and engage the adversary in deep with precision deep strike part of shaping operations, air support for vertical maneuver and fire support, force protection (*including air defense*) in AOR for Corps elements, logistic support. To achieve the depth of the operation, the commander must anticipate its course so that the enemy can be successfully engaged in depth of the battlefield (Lehaci, 2020).

War-fighting level cannot be achieved without organic ISR capabilities and expertise. In this sense UAVs are essential to attain operational success.

The operational success is also determined by the flexibility and manpower sufficiency in order for HQ to plan and deploy elements, such as: main command post, forward/alternate command post, tactical mobile command post, and rear command post. In this respect every entity serves a specific objective, and contributes actively to the final objective. UAVs have a direct impact on the speed of engagement of the targets.

The measurement of performance of each entity is determined by relevance of the subordinate units actions, operational objectives achieved, speed of engagement, determination and targeting of the enemy centers of gravity simultaneously with the protection of blue forces centers of gravity, in line with commander and higher intent.

Certainly the ISR support could be provided by the higher echelon, although without internal expertise in analyzing/ interpreting IMINT products, the speed of engagement is diminished. For the operational success other factors are also necessary. The basic ingredients for the performance of the Corps HQ could comprise: flawless connectivity and redundant network, exercised procedures in place, knowledge and expertise of every section of staff, team work, balanced distribution of workload within branches, a balanced and filtered flux of information, parallel and collaborative planning, technical support and efficient enablers.

Part of the operational art of the staff work in Corps HQ, is also the calibrated Battle Rhythm design to serve two functions: information and decision. The high tempo of incoming/outgoing information and products on horizontal and vertical chain requires also the time management keeping in mind a proper balance: 1/3 of the time allocated for the decision process and 2/3 for staff analysis and criteria construct. The balanced allocation of time leads to an efficient "loop sensor to shooter". An efficient "loop sensor to shooter" has two main critical characteristics: speed and precision. Behind the loop there are many decision steps, based on mission analysis, threat assessment, critical information requirements, target synchronization/prioritization matrix, battle space management, air-land integration and air deconfliction, war gaming, red team analysis, COA selection/comparison and simulation.

The government principle of decision cycle and effects delivery is based on following sequence: find, fix, maneuver, strike, exploit, and consolidate. Target engagement is only the final outcome, with cascading effects towards the achievement of operational objective. Targets engagement at the Corps HQ level is part of shaping operations. Successful targeting process will force the opponent to be in the wrong place at the wrong time. Having the possibility for real time target laser painting the engagement cycle could be dramatically reduced, from minutes to seconds. IMINT products may be stored and transmitted in a timely manner for air attack purposes, to jet-fighters, anti-tank guided missiles (ATGM) or guided precision ammunition (GPS) or laser (US National Research Council, 2000).

UAVs are playing an important role during the fixing phase of the target but also during the destroying phase directly or in support of other vectors. The organic integration of the UAS may be necessary at a tactical-operational level and may contribute decisively for maintaining the initiative, through the wide range of maneuvers and firepower support at commanders' disposition. During mission planning, the decision may be influenced by the existence of another pre-authorized algorithm, leading to automatic launch, based on the target profile recognition and possible IFF response.

Military drones have increased operational endurance, operate regardless of weather conditions, have a powerful range and altitude of operation, can carry/guide impact vectors, have artificial intelligence in operating software and computer systems required for friend-enemy recognition purposes (IFF) (AAP-6 NATO Doctrine Terminology, 2018), have high-performance research/observation/ surveillance equipment in multiple spectra: optical, UV, infrared and thermal.

One of the main tasks of Corps Main Command post (MCP) is to distribute the comprehensive operational image (COP/RGP) to all stakeholders of the corps battle space. For training and joint exercises, UAS integration brings new elements. No matter what combat scenarios, UAS could always challenge commanders' decision, through operational dilemmas. Reality reflects that quite often the balance of military potential is inclined by UAS

intervention, in the same way air superiority reflects an immediate strategic advantage. Desired effects have to be aligned against available resources and timeline. At the operational level operations assessment focuses on the desired effects and is aligned with the planning horizons to support both operations synchronization (midterm planning) and operations planning (long-term planning). This distinction is not a fundamental delineation between a mid-term and a long-term operations assessment but rather a difference in emphasis. An assessment of progress towards the end of the current phase or upcoming decisive conditions is required to support course of action development or adjustment and, possibly, branch planning; whereas an assessment of progress towards the achievement of objectives is required to support planning for sequels, termination and transition (AJP 3.1 Allied Joint Doctrine, 2019).

At tactical-operational level, first objective consists in the consolidation of a reliable informational situation (SITAWARE) (AAP-6 NATO Doctrine Terminology, 2018). Commanders have first priority, in timely disseminating the COP – Comprehensive Operational Picture. Maintaining an updated COP, the MCP ensures the flexibility of the C2 (command and control system) and subsequently synchronization of all kinetic platforms to include UAVs. In the armed struggle there are a series of tendencies characteristic for all its levels and which consist in: a new manifestation of the space-time-armed struggle correlation; synchronization and integration of actions; increasing the decisive character of the confrontation; spatial dissemination of actions; diversification of action procedures (Herciu & Lehaci, 2020).

For all operations the initial step would be to clearly define the area of operations, area of interest to clearly state the mission objective and intent. Analyzing the threat (enemy) has similar criteria as those used to perform a SWOT analysis on financial or economic market like SWOT analysis. The risk analysis, SWOT analysis, will consider the feasibility of targeting processes, the rate of probability, the combined effects.

The threat is analyzed identifying the strongest points and weaknesses which are to be exploited, opportunities revealed by maneuver design dynamic of operations or evolution in time, and risk associated with every planned action. Acknowledging establishing connectivity with neighbors subordinates and higher is paramount for actions/operations synchronization. Ideally the connectivity process and the C2 have to be exercised during exercises which will bring extra confidence to the Corps HQ.

Basis of reliable COP are IMINT products which are by-products of ISR activity. Organically the Corps has one ISR brigade responsible on IMINT, surveillance, reconnaissance in AOR. Simplified and correspondent COP image at Corps level, can be simultaneously displayed on tactical elements: combat fighter, cruise missile installation, high precision artillery ammunition battery (ex: HIMARS system, ATACMS, PRISM, Excalibur precision projectile cal. 155 mm, or NLOS SPIKE missile-produced by Rafael Industries).

When UAVs are involved in striking missions, there are possible essential changes in time-space-combat correlation, due to incremental distance and hitting probability enhancement which proportionally depends on scientific breakthrough, like: jamming protection, navigation and propulsion, on-board computing, network connectivity. The aim is minimizing the area affected by strikes, reducing collateral casualties; correlated with the tendency to dramatically reduce the time elapsed between the discovery of the target and until its destruction (neutralization) (Herciu & Lehaci, 2020).

For opportunity strikes the decision cycle would be very fast and has to be standardized in the targeting cycle.

2. ISR – a Corps HQ Warfighting Function

The corps synchronizes the employment of land power in conjunction with joint and land capabilities provided by the JFHQ/LCC. Corps operations shape the operational environment and set the conditions for tactical activities by the division and lower echelons. In combat operations, the corps task-organizes and maneuvers divisions to destroy enemy land forces, seize key terrain and critical infrastructure and dominate the land portion of the (JOA) joint operations area (Army Field Manual, 2018). Consequently, critical for shaping operations becomes the delivering speed of deep strikes, synchronized in cascade effects towards desired operational objective. The commander's concept of operations directs the manner in which the divisions cooperate to accomplish the mission and establish the sequence of actions necessary to achieve the end state, expressed in terms of decisive, shaping and sustaining (Army Field Manual, 2018).

The C2 system is facilitating the production, synchronization and the dissemination of important command documents: OPLAN/OPORD/WORNO/ INTSUM/Branch plans/Contingency plans and so on. Moreover, displaying in OPSCEN the maritime and air recognized picture allows Corps planned operations to be synchronized and integrated on the entire operational spectrum (deep, close, rear). In this way an integrated operational picture is essential for achieving shaping objectives at Corps level and if necessary to integrate mission command concepts for subordinated units.

The integration of the UAV is dependent on the processing speed and the efficiency of the targeting process, at the tactical, operative, strategic level. The result of the targeting process is quantified in the number of destroyed objectives and reveals the efficiency of the UAVs action in the area of operations. The targeting process is the means of selecting targets to fulfill a commander's intent and prioritizing them systematically so that the most important are prosecuted first. It includes both a lethal and a non-lethal approach to pursue targets based on their importance and is dependent on the commander's intent (Jux, 2018).

This need for an exponential increase in data processing speed implicitly leads to an intrinsic need for interconnection to a command system, in which all information is displayed, analyzed and subject to decision simultaneously in all critical centers of the system – in other words, we are witnessing network integration with its inherent advantages and disadvantages.

ISR platforms are crucial in detecting or confirming the adversary intentions and actions, but are not the only sources. IMINT, SIGINT, GEOINT, OSINT, HUMINT are overlapped and compiled in order to have a more clear picture of the enemy disposition, composition and intention. Finding is followed by fixing and striking. Fire support success depends largely on the Corps HQ ability to rapid synchronize and integrate all fires support with other elements of combat power especially from higher, across all 5 domains. Fires have to include ground, air and maritime long range precision systems beyond divisions range. There are many different ways to organize your approach to the targeting process. US Joint Publication 3-60 (Joint Targeting), for example, outlines a targeting cycle that supports the Joint Force Commander's (JFC) joint operational planning and execution with a comprehensive, iterative, and logical methodology for using ways and means to create desired effects (Joint Tageting, 2018).

Commanders may encounter the following dilemmas: to dedicate UAS

systems only for data and information collection (IMINT), (APP-6NATO Doctrine Terminology, 2018) or to take into consideration early engagement of opponent, through deep precision strikes, where also Special Forces and UAS could play a major role. The development of the UAS is part of the evolution of precision weapons systems, in a new paradigm of war, being a turning point in the evolution of military actions. The development of weapons systems that can hit the opponent with high precision ammunition: from positions located at long distances from the target, usually outside the enemy's weapons effective range, allows selective and precise approach to the most important objectives located in the depth of the enemy's disposition (or critical infrastructure) (Lehaci, 2020).

The integration of UAVs in support of MNC-SE JSTAR capabilities, in accordance with the land Corps mission, doctrine and organization will take into consideration the following: UAVs performances, current and future missions, possible configuration, components of the UAS systems, support and maintenance requirements and training. Dynamic (opportunity) targeting can break the decision cycle of the opponent and has to consider the risk involved for the ISR platform, importance of objective, coordination with other blue forces in area, collateral damage assessment, focusing on the synthesis of critical parameters necessary for success in combat. Some of the analyzed parameters are: range, altitude, maneuverability, defensive active measures, propulsion, payload, and navigation system, processing power and AI on board, destructive potential, endurance, network connectivity, feasibility. Currently, the effective range of the on board UAS weapons, often exceeds the maximum range of conventional organic weapons (especially for land forces). This obvious advantage could also be classified and demonstrated, through combat potential analysis. From doctrinal perspective, the integration of UAVs in military operations should be in full accordance with principles armed conflict, as follows: freedom of action, unity of command, surprise, decisive application of force on critical points (Roşca, 2020).

No operation is similar to one another. For each tactical, operational level we have some notional distances between elements and coordination lines. It is clear that for the Corps level these distances are longer than other tactical levels. In this perspective the area of interest for the Corps level stretches beyond 300 km and deep strike capabilities at Corps level should be able to cover at minimum this range. Obviously for targets situated beyond this 300 km range, Corps HQ will have to push the request for deep strike to the higher echelon, which has better options in hand. Long range artillery, Air assets, ISR assets, SOF elements, ballistic and cruise missiles have to be taken in consideration during targeting process, for all the platforms and forces, UAVs support are a must.

On this line, the influence of the deep space of the battle will be handled by the higher echelon (CFLCC, JFLCC, MCLCC, LCC) having strategic assets such as: joint ISR, deep strike capabilities from air, land or sea, special operations, Cyber assets, electromagnetic or space capabilities. When acting as a war-fighting formation the Corps HQ operates at the tactical level, providing the interface between operational level provided by the Land Component command (LCC) and tactical level activities conducted by divisions. The tactical activities contribute to the effect to be generated, which in turn leads to the achievement of operational decisive conditions (Army Field Manual, 2018).

The government principle of decision cycle and effects delivery is based on following sequence: find; fix; maneuver; strike; exploit; consolidate. This sequence is similar to another analysis method: strategic foresight analysis sequence.

The desired effects are orchestrating in cascading sequence on entire spectrum of battle space: in deep, close and rear. To achieve the depth of the operation, the commander must anticipate its course so that the enemy can be successfully engaged depth of the battlefield (Herciu & Lehaci, 2020). The operational success is also determined by the flexibility and manpower sufficiency in order for HQ to plan and deploy elements, such as: main command post, forward/alternate command post, tactical mobile command post, and rear command post. In this respect every entity serves a specific objective, and contributes actively to the final objective.

The measurement of performance of each entity is determined by relevance of the subordinate units actions, operational objectives achieved, speed of engagement, determination and targeting of the enemy centers of gravity simultaneously with the protection of blue forces centers of gravity, in line with commander and higher intent. The basic ingredients for the performance of the Corps HQ could comprise: flawless connectivity and redundant network, exercised procedures in place, knowledge and expertise of every section of staff, team work, balanced distribution of workload within branches, a balanced and filtered flux of information, parallel and collaborative planning, technical support and efficient enablers.

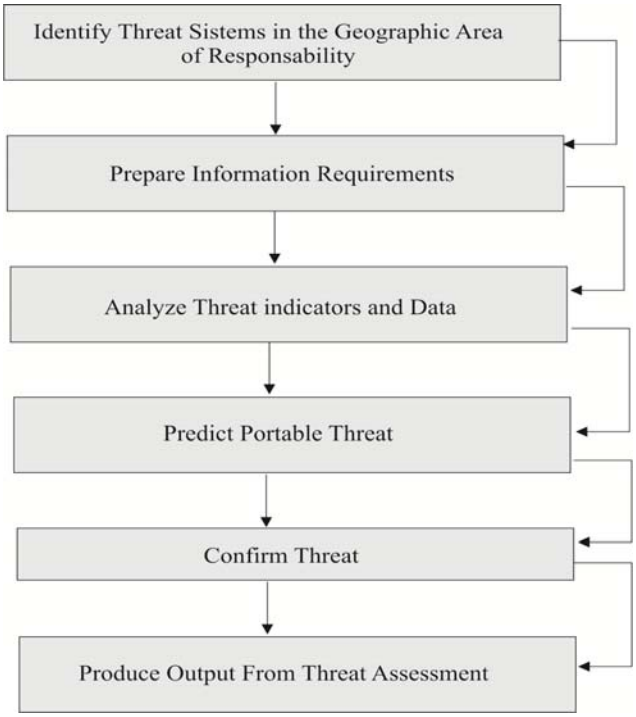


Figure no. 1: *Threat assessment process*
(Sources: AJP 3.1 Allied Joint Doctrine)

In a major operation in Romania, commanders may encounter the following dilemmas: to dedicate UAS systems only for data and information collection (IMINT), (APP-6NATO Doctrine Terminology, 2018) or to take into consideration early engagement of opponent (*shaping operations*), through deep precision strikes, where also air striking vectors, special forces and UAVs could play a major role. The integration of UAVs could imply structural changes of Corps organization and manning, different mentality of specialists training process

(drones operators, server managers and Intel fusion annalists). Finally the outcome of efficient integration should lead to acceleration of targeting and decision cycle by design, simplified Battle Rhythm; integrated real time NCOP, sound decisions for shaping operations.

Additionally, commanders should have a permanent directive, in order to reduce the footprint of equipment and personnel, in entire spectrum: optical, IR, thermal, UV, electromagnetic. When the adversary is running the targeting process, he also needs a clear comprehensive operational picture. No concealment/camouflage measures in place, no thermal reduced print for ground troops, no communication discipline and minimum emissions print, could only help the opponent in completing the necessary targeting phase. After this phase, time is compressed; the precision strikes are to be expected, in matter of minutes.

Having *air superiority, or not*, force protection against UAS, is about to become a mandatory procedure. Force low profile includes but not limited to: low radio traffic, very weak thermal, IR and acoustic signature, visual camouflage.

3. Conclusions

Practical UAS integration solutions, tested and validated will be included in research as an implied objective. The set of recommendations will be analyzed in the perspective of the direct effect of UAS integration on: force structure, decision-making process, standardization, training, and specialization of personnel and the creation of the combined effect in military operations belonging to the opponent, both in defensive operations and in offensive operations (in particular being the case study on the integration of UAS in special operations).

Another topic for reflection will be: the range of side effects of the integration in the force structure of UAS namely: rapid alteration of human and artificial ratio factor, new specialization of personnel, C2 impact. An important direction with potential impact will be the use of UAS to resupply troops, especially with ammunition and special equipment.

Maneuverability, travel speed, low altitude flight combined with planned flight-pattern protected to electro-magnetic jamming, can make the difference in the battle.

By highlighting the importance of integrated actions of UAS platforms/ systems, this thesis aims to target strategic decision makers at the political, politico-military and military levels. Last but not least, the intellectual approach addresses the academic environment and national scientific community. It can be appreciated that the multidimensional importance of the integrated actions of UAVs capabilities of the Romanian Army, especially on the national territory, during the crisis and war, is a topical issue and major interest in the new security environment. Therefore, the continuation of the fundamental oriented research and the deepening of the applied studies will allow the consolidation of the documentary base in the field of military sciences and will complete the specialized university didactic material, for the purpose of quality academic training, of the personnel from the Romanian intelligence structures and not only.

The complexity of using UAS, is given by the high mobility of these systems, low radar footprint, high-performance low flight, multi-role missions, surprise, synchronizing network action – drone swarm attack, simultaneously applicability in all environments, land, air, sea. Due to the impact on evolution of future conflicts, UAS are registered as influential technology, with unpredictable effects in the doctrinal sphere, as follows: the integration of UAS could alter the space-time-combat correlation, by reducing the time for engagement and increased precision. The integration of UAS may require the synchronization of joint actions in all areas to allow rapid change of effort

from one direction to another, could contribute decisively to the neutralization of the opponent's gravity centers and to the balance of combat potential;

The integration of UAS should ensure the preservation of the combat initiative and might lead to the diversification of the ground tactics and the multiplication of the support and fire support missions. Subsequently, this integration can lead to the improvement and standardization of countermeasures against the opponent's UAS. These considerations, may lead to the conclusion that the UAS, can become a vector for an accelerated change in the physiognomy of war. The final statement underlines the correlation from the constant changing challenges and emerging disruptive technologies. Thus, NATO has to adapt and to be flexible, not only facing the emerging technologies (like the proliferation of drones in conflict), but also by adapting new war-fighting concepts, adapting flexible and modern force structure. Training and getting ready for the future requires a new breed of force, adaptable, with "out of the box" mentality but also having access to latest generation of weapon system.

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