

RELEVANT APPROACHES FOR ADAPTING OPERATIONAL LOGISTICAL SUPPORT TO THE CHALLENGES OF HIGH-INTENSITY WARFARE AT THE REGIONAL LEVEL

Gheorghe MINCULETE

“Nicolae Bălcescu” Land Forces Academy, Sibiu, Romania
minculetegh@yahoo.com

Abstract: *The article examines the transformation of operational logistical support required for combat forces engaged in high-intensity regional warfare, highlighting the transition from centralized models to dispersed, resilient, and adaptive structures. The research employs a qualitative approach based on document analysis and a synthesized assessment of the logistical support provided to Ukrainian combat forces in the Pokrovsk operational area (Ukraine). The analysis aims to identify the main vulnerabilities and adaptation mechanisms generated by the dynamics of the contemporary battlefield, drawing lessons for the future. The findings indicate that logistical support is evolving from a support function into a structural element of the multi-domain operational architecture, being profoundly influenced by increased battlefield transparency, the proliferation of precision strike capabilities, and the need to ensure continuity of logistical flows under conditions of high risk and uncertainty. In this context, flexibility, dispersion, and redundancy emerge as essential principles for maintaining operational sustainment capacity at both tactical and joint levels.*

Keywords: operational logistics, operational logistical support, high-intensity armed conflict, logistical resilience, multi-domain operations

1. Introduction

The reconfiguration of the international security environment, currently characterized by the return of high-intensity armed conflicts, has significantly altered the role of logistical support within defensive and offensive military operations. As resource consumption and operational tempo have increased considerably, logistical chains can no longer be treated merely as support elements; instead, they have become factors that directly influence the combat capability of forces engaged in complex operational environments [1].

In this context, logistical support can no longer be practically separated from maneuver, as the continuity of specific flows directly conditions the freedom of action of forces engaged at the tactical and joint

levels. Moreover, the interdependence between logistical sustainment and operational outcomes becomes bidirectional, indicating that not only does maneuver depend on logistics, but also that the architecture through which logistical effort overlaps with that of combat forces is shaped by planning, dynamic execution, and the resilience of defensive or offensive combat actions.

At the same time, the use of advanced intelligence, surveillance, and reconnaissance capabilities, as well as precision weaponry, has significantly reduced the space considered safe behind the front line. As a result, logistical nodes, integrated into operational support networks, are no longer protected by

distance, but instead become vulnerable to detection and targeting [2].

These developments compel commanders and logisticians at the tactical and joint levels to rethink the methods and procedures for planning, organizing, and executing their logistical support in order to achieve operational objectives and the desired end state. Traditional models, based on concentration and stability, are gradually being replaced by more dispersed and flexible logistical structures, capable of operating in an unpredictable operational environment [1, 3].

In this paper, I analyze how logistical support structures adapt to the requirements of high-intensity armed conflicts, with a focus on developments observed in the war in Ukraine. Methodologically, the research is qualitative, based on the analysis of open sources and on a relevant methodology presented succinctly, to ensure interpretative consistency and the empirical relevance of the conclusions.

2. Essential Logistical Characteristics of High-Intensity Warfare

High-intensity warfare is characterized by a high consumption of resources, a high frequency of engagements, and the rapid degradation of operational infrastructure. Unlike low-intensity armed conflict, operational cycles are significantly shorter, and the pressure on logistical systems is constant and cumulative. Under these conditions, logistical support can no longer be rigidly planned, but must be continuously adapted to the evolving operational dynamics within tactical and joint functional areas of operations [1, 6].

An essential factor is the extensive use of surveillance and reconnaissance systems, which makes the battlespace far more transparent than in previous armed conflicts. This situation significantly reduces the existence of truly secure logistical areas and extends exposure even into the depths of the tactical or joint device [3].

At the same time, the increased capability of long-range precision strike systems changes the way operational depth is perceived. Logistical routes can no longer be considered relatively protected areas, but instead become spaces of constant risk. For this reason, within logistical systems integrated into tactical and joint operational environments, there emerges a need for resource dispersion, increased redundancy, and the intensive use of ground and aerial transport drones [4, 5].

At the same time, high-intensity armed conflicts present other particularities that must be taken into account. Thus, an important element is the reduction of the time between target identification and the execution of a neutralizing strike. This acceleration of the operational cycle compels operational logistics to respond more rapidly and flexibly, in an environment where resource demand may vary abruptly within the same phase of action. Under these conditions, rigid logistical execution structures become difficult to protect and are replaced by more flexible and adaptable ones [6].

In addition, operational phases tend to overlap, which generates continuous pressure on logistical systems supporting tactical and joint levels. This leads to logistical sustainment no longer being designed and implemented within clearly defined time windows, but rather according to simultaneous and unpredictable needs, distributed across multiple lines of effort [7]. Last but not least, continuous operational changes mean that the logistics of combat forces can no longer be separated in any way from tactical and joint concepts. In this framework, its protection and functioning must be integrated from the planning phase of tactical and joint actions, as its vulnerability directly influences combat capability during the projected operational phases [4, 8].

In conclusion, in high-intensity warfare, the logistics of combat forces becomes a dynamic and exposed system, whose

efficiency depends on mobility, dispersion, and the ability to rapidly adapt to changes in a complex and unpredictable battlefield.

3. Reconfiguration of Operational Logistical Support

In the context of high-intensity warfare, operational logistical support is undergoing a profound transformation, shifting from hierarchical and centralized structures toward more dispersed and flexible models. In the context of high-intensity warfare, the process of providing operational logistical support is undergoing a profound transformation; it no longer requires hierarchical and centralized execution structures of this type, but rather resilient, dispersed, and flexible entities (organizations) [5]. This change is not only organizational in nature but is primarily driven by the evolution of the battlefield environment, where continuous surveillance and the increased range of strike systems have significantly reduced the protection of areas (locations) hosting logistical execution structures deployed in the rear of tactical and joint combat forces, previously considered secure [1, 15, 17]. The experience of the high-intensity armed conflict in Ukraine shows that reliance on large logistical hubs, optimized for efficiency and volume, generates major vulnerabilities under conditions of persistent monitoring. Repeated strikes against depots and distribution points have continuously disrupted supply flows, forcing rapid reorganization of support mechanisms [3], [10]. In practice, resilience has depended not only on efficiency but especially on dispersion and on the ability to rebuild and protect logistical networks supporting combat formations [11].

Under these conditions, traditional linear logistical chains are becoming increasingly vulnerable. They are being replaced by more network-like logistical structures and formations, in which flows are fragmented and adapted according to the evolution of tactical and joint situations in the field [11],

[12, 13]. This leads to a transformation in the role of logistical nodes, from fixed to reconfigurable according to requirements, allowing a more flexible use of allocated resources and enabling Just-in-Time delivery in line with operational demands [14].

An important aspect is redundancy, which is no longer treated as an additional cost but as a condition for the continuous and resilient functioning of tactical and joint logistical systems [10]. This involves the multiplication of routes and storage points, helping maintain continuity in the supply and resupply of equipment and materials even under conditions of losses or disruptions caused by adversary actions. This approach is evident in recent armed conflicts, where logistical fragmentation has become an operational necessity [12].

At the same time, the mobility of logistical structures has become essential. Fixed support points are more exposed; therefore, frequent relocation (changes in concealed deployment locations in the field) and the reduction of logistical footprint contribute to increased functional survivability of logistical organizations, which must simultaneously protect themselves while sustaining operational forces (within whose structure they are integrated) [5]. Operational logistics thus becomes not only a support process but also one of continuous adaptation to the dynamics and requirements of combat forces engaged at tactical and joint levels [6].

The integration of information from surveillance systems into logistical planning has reduced reaction time but increased dependence on communication infrastructure and digital systems. In this sense, the logistics of combat forces becomes closely linked to the resilience of information networks and their ability to function under continuous pressure from adversary forces [13].

Given the importance, urgency, need for adaptation, and resilience of engagement, logistical support is directly integrated into tactical and joint operational planning,

reflecting a paradigm shift: logistics is no longer separated from maneuver, but is part of the same operational construct, particularly under conditions of a high operational tempo [7, 14].

Logisticians must have early awareness of the configuration and dynamics of maneuver in order to allocate, distribute, and ensure the provision of resources in a timely manner (*Just-in-Time*) to combat forces at the tactical and joint levels [2].

Another important trend is the reduction in the size of logistical nodes. Large centers (structures and formations) are being replaced by smaller and more mobile entities, with increasing use of ground and aerial transport drones, allowing better adaptation to risk conditions. In parallel, civilian infrastructure is more frequently used to support logistical flows, increasing distribution capacity but also introducing additional vulnerabilities [6, 14].

Overall, logistics in high-intensity warfare becomes a flexible, distributed, and adaptive system in which survival depends less on optimization and more on the ability to rapidly reorganize according to battlefield evolution (especially future battlefields) [15].

4. Methodology

The objectives of future warfare are no longer primarily focused on the immediate occupation of territory at any cost, but rather on ensuring, first and foremost, the control and survivability of one's own logistical networks. These networks are subject to continuous reconnaissance, surveillance, and attack by the adversary through ISR systems, drones, artillery, and other strike capabilities.

Moreover, operational logistical survivability at the tactical and joint levels depends less on the volume of available resources and more on the capacity for rapid adaptation. In this regard, Ukrainian combat units and large formations have been compelled to reduce the size of convoys, transition to dispersed transport methods,

including the use of robotic systems, and employ alternative routes. A key lesson learned is that the loss of a single logistical node can necessitate the reconfiguration of the entire operational logistics architecture within a given tactical or joint area of operations.

4.1. Elements of logistical support required by combat forces in the Pokrovsk area of operations

This area has played a significant role in the structure of the Donbas front, primarily due to its location along major east-west transportation corridors. Beyond its geographical importance, the locality has functioned as a critical link between the operational (joint) level and the tactical level, making it an area of high logistical relevance [16].

Under conditions of high-intensity warfare, this area has evolved into an environment in which operational logistics is continuously exposed to adversary pressure. Persistent monitoring and the frequent use of precision strikes have reduced the stability of resupply routes and limited the use of fixed infrastructure [17].

This situation has been further intensified by the extensive use of attack drones for both reconnaissance and strike missions. These systems have significantly shortened reaction times and accelerated the identification and targeting of logistical assets compared to previous conflicts [13, 15, 18].

As a result, the logistical flows supporting Ukrainian combat forces have become increasingly dependent on mobility and reduced exposure in both space and time. As a result, the logistical infrastructure specific to each tactical operation has undergone a rapid reorganization. Large, fixed depots - although efficient in terms of capacity - have proven vulnerable and have been progressively replaced by smaller, dispersed or temporary storage sites [13, 19, 22]. These are more difficult to detect and allow for faster adaptation to changes in the operational environment.

Mobility has thus become a central feature of logistical support in this area of operations. Logistical nodes are no longer permanent but are relocated based on threat evolution and combat intensity. While this flexibility enhances the adaptability of tactical and joint logistical systems, it also increases the complexity of operational planning, coordination, command, and control [7].

Available open-source data indicate that logistical routes in this area have been subject to continuous adjustment, influenced by ISR activity, the intensity of enemy strikes, and frequent shifts in the front line [10, 17, 23]. Accordingly, operational logistical planning at the tactical and joint levels has evolved from a rigid process into one characterized by continuous adaptation. Based on the cited sources, the Pokrovsk area of operations can be understood as a

point of convergence between regional logistical flows and the operational demands of the Donbas front, with functions extending beyond its geographical position. Military analyses highlight increasing pressure on transport infrastructure and resupply corridors, particularly through long-range interdiction and targeted actions against operational logistical networks [1, 21].

In this context, the logistical system in the Pokrovsk area of operations can be characterized as dynamic, with effectiveness dependent on the ability to adapt to repeated disruptions and to maintain continuity of support under high-risk conditions [3, 4, 10]. Against this analytical background, differences between logistical organization models become essential for understanding how each side has sustained its operations, as summarized in Table 1.

Table 1. Comparative Operational Logistics Analysis (Pokrovsk Area of Operations)

Analytical Element	Ukrainian Combat Forces	Russian Combat Forces	Sources
Logistical architecture	Semi-centralized system based on hubs	Dispersed system, without a single node	[6], [7]
Force structure	Brigades with integrated logistics	Small tactical groups with logistical support	[13], [20]
Logistical flow	Axial: interior → hub → front	Fragmented: small modular transport-storage structures → assault units	[3], [17]
Function of Pokrovsk	Distribution and coordination center	Operational interdiction objective	[10], [13]
Operational objective	Continuity of logistical flow	Disruption of the adversary's logistical flow	[11], [15]
Type of operations	Defense under continuous enemy pressure, transport, rotation, evacuation	Destructive actions using drones, artillery, and infiltration	[9], [12], [13]
Control of space	Securing lines of communication (LOC)	Interdiction of adversary LOC	[7], [20]
Critical point	Fixed logistical corridors	Access to logistical corridors for strikes	[11]
Vulnerability	Sensitivity to local disruptions	Limited coordination between units	[4]
Flexibility	High at the tactical level, limited at the operational level	High at the tactical level, unstable at the operational level	[6]

Analytical Element	Ukrainian Combat Forces	Russian Combat Forces	Sources
Operational style	Continuity and flow efficiency	Attrition and systemic disruption	[12]

The logistical configuration in the Pokrovsk area of operations must be understood as the interaction between two distinct tactical and joint operational models. On one hand, the Ukrainian logistical support system has been structured around a semi-centralized architecture, in which logistical flows are concentrated to ensure efficiency, synchronization, and economies of scale. This approach is broadly consistent with NATO sustainment doctrines, which emphasize the use of logistical hubs and relatively stable lines of communication [11-13]. On the other hand, Russian combat operations reflect a model of distributed interdiction, in which the primary objective is not territorial occupation, but the systematic degradation of the adversary's operational functionality. Through the combined employment of attack drones, artillery, and small tactical units, the intended effect has been to disrupt and reduce the opponent's ability to sustain logistical flows. This operational logic has been widely discussed in military analyses, which highlight an ongoing shift toward a form of attritional and interdiction-based warfare [3, 4].

4.2. Operational Logistical Determinants

From a systemic perspective, the operations associated with high-intensity confrontation in the Pokrovsk area of operations highlight a fundamental distinction between optimization and resilience. The Ukrainian model prioritized efficiency through concentration of logistical resources, but this approach increased vulnerability to disruptions targeting joint-level integrated logistics, particularly strikes against critical nodes and lines of communication. In contrast, the Russian model, while less efficient and more fragmented, reduced dependence on fixed infrastructure by distributing risk across multiple axes of

action, thereby increasing tolerance to tactical-level losses [10, 17, 22].

As a result, the confrontation in this area was not primarily determined by static territorial control, but by the ability to influence the continuity of logistical flows through degradation, disruption, or interruption. Operational effectiveness became dependent on the capacity to sustain or undermine lines of communication (LOC), transforming the battlespace into a contested functional network rather than a conventional theater of operational maneuver [3, 7, 20].

Viewed more broadly, the Pokrovsk case reflects a broader paradigm shift in the organization of combat logistics. The traditional model based on fixed storage and distribution hubs, supported by linear supply chains, is increasingly being replaced by a network-based model in which logistical functions are dynamically distributed and reconfigured according to operational requirements [21]. In such a system, the loss of a node does not necessarily result in systemic failure, but instead triggers the rapid reorganization of logistical flows through alternative routes and nodes.

At the same time, a key feature is the increasingly tight integration between information and logistics. In this regard, data collected and exploited in real time directly inform decisions on resupply and resource distribution, enabling faster reaction times but also increasing dependence on digital and communication infrastructures [6, 8].

Overall, the situation in the Pokrovsk area of operations demonstrates that operational logistics at the tactical and joint levels is no longer functionally separate from battlefield dynamics. Instead, it has become an active component of the battlespace itself. In this context, logistical effectiveness is no longer determined solely by the concentration of resources, but increasingly by the capacity

for dispersion, mobility, and continuous adaptation to evolving operational conditions [7, 14].

The integration of counter-drone capabilities is becoming a critical determinant of the survivability of logistical infrastructure. In this regard, unmanned aerial interception systems, electronic warfare assets designed to disrupt command-and-control links, and early-warning sensor networks contribute to the development of an adaptive defensive logistics ecosystem. The synchronization of these capabilities within a joint architecture enables rapid data fusion and enhances the responsiveness of logisticians embedded in tactical and joint command structures [7, 10, 18].

Consequently, the protection of logistical execution structures can no longer be regarded as an auxiliary function, but rather as an integral and essential component of the combat system, indispensable for sustaining operational effectiveness across the national theatre of operations and, where applicable, within NATO frameworks [19-21].

As the armed conflict in Ukraine reveals, the military power of a nation does not reside in its territorial dimension, but rather in its capabilities to design, implement and manage the functioning of the specific defense mechanism with the tactical and joint forces at its disposal and with the available logistical support resources.

According to what has been revealed, it follows that operational power and the related logistics must be evaluated and dimensioned through their dependence on several essential national factors, such as: the economy; national industry (civilian and defense); strategic and territorial infrastructure (civilian and military); efficient supply chains (military and civilian), etc. In this regard, despite all the losses suffered, the Ukrainian army and population have carried out multiple actions of operational support for the combat and support forces, so that they benefit from a resilient logistical infrastructure. Here, we consider both the adaptive potential of

logistical support structures (including UAVs and UGVs for operational logistical transport), as well as the existence, condition and protection of transport-resupply areas and routes (main and secondary transport - resupply - evacuation), as well as roads from sources provided by the higher echelon or identified in the areas of operations.

5. Discussion

Drawing on operational lessons from the Pokrovsk area, it becomes evident that future reorganization of tactical and joint logistics structures will be necessary to sustain high-intensity operations. The complexity of the future operational environment, characterized by increased mobility, precision-strike capabilities, and the integration of ISR systems, requires the development of logistics networks based on controlled dispersion, functional redundancy, and dynamic adaptability. In this context, logistics nodes such as warehouses, distribution points, and maintenance facilities should be organized in a modular manner to reduce vulnerability to detection and ensure the continuity of resupply flows under conditions of multi-domain contestation.

At the same time, the adaptation of these structures introduces specific vulnerabilities related to the protection of critical infrastructure, particularly in light of an adversary's capabilities for persistent reconnaissance and the exploitation of identifiable operational patterns. ISR activities, including continuous surveillance, route mapping, and the analysis of logistical patterns and operational tempo, significantly increase the exposure of support structures. Within this framework, an integrated assessment of risks associated with logistical infrastructure in tactical and joint operational areas becomes essential, taking into account the adversary's ability to conduct covert infiltration and correlate collected data for strike planning. This, in turn, creates a requirement for concealed observation assets, or for their integration

into ostensibly non-combat structures, which can serve as information multipliers by enabling near real-time data transmission and supporting the planning and implementation of tailored protective measures.

6. Conclusions

The conducted analysis highlights that high-intensity warfare produces a significant transformation in the organization of operational logistical support. Rather than centralized structures designed for relatively stable and predictable environments, there is a clear shift toward dispersed, flexible, and adaptive entities capable of operating under conditions of persistent surveillance, elevated risk, and continuous interdiction threats. Within this framework, logistics in support of combat forces can no longer be treated as an auxiliary function, but must be understood as an integral component of the operational architecture.

The experience of the conflict in Ukraine confirms this evolution. The expansion of adversary ISR capabilities and the widespread employment of precision strike systems have significantly reduced the depth of what can be considered a secure operational rear at both tactical and joint levels. As a result, concentrated logistical structures have become increasingly vulnerable, while hub-based models with rigid supply flows have been repeatedly disrupted. This dynamic has accelerated the transition toward dispersed logistical networks characterized by multiple nodes, redundancy, and enhanced adaptability.

The study of the Pokrovsk operational area provides a relevant example, where sustained pressure on logistical infrastructure has led to the fragmentation of supply flows and the adoption of flexible approaches to support organization. Under these conditions, logistical routes can no longer remain static, but must be continuously adjusted in response to threat levels, surveillance activity, and evolving operational dynamics. Consequently, the

continuity of support depends increasingly on dispersion, redundancy, and mobility.

At the same time, the digitalization of logistical processes and the use of near-real-time data have significantly transformed decision-making by bringing planning closer to execution and increasing reaction speed. However, this increased reliance also introduces additional vulnerabilities, particularly in the context of electronic warfare and cyber operations, thereby requiring a balance between digital efficiency and operational resilience.

In this regard, the protection of logistical systems requires a layered approach that combines passive measures (such as fortification, concealment, and camouflage), techniques for reducing electromagnetic and thermal signatures, and strict emission control procedures, in accordance with doctrinal principles of force protection and signature management. An essential role in ensuring the survivability of logistical infrastructure is played by the integration of counter-UAS capabilities. Interception systems, electronic warfare assets designed to disrupt communications, and early-warning sensors contribute to the development of an adaptive defensive logistics system. Their integration and synchronization within a unified operational architecture enhance the decision cycle and improve the effectiveness of responses. Overall, operational military logistics is evolving toward a dynamic, distributed, and interconnected system in which the stability of centralized structures is progressively replaced by adaptability and controlled dispersion. This transformation has a direct impact on the sustainment of tactical and joint operations, as well as on their tempo and continuity.

Thus, the lessons of the high-intensity armed conflict in Ukraine confirm that the logistical effectiveness of combat forces increasingly depends on the ability of support structures to operate in a flexible, dispersed, and continuously adaptive manner within a complex and evolving operational environment.

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