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ASPECTS OF THE IMPACT OF THE MODERN SECURITY ENVIRONMENT ON THE ORGANISATION OF AMMUNITION PROCUREMENT IN OPERATIONS

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Abstract: *This article presents a novel analysis of the impact of the modern security environment on the organization of ammunition supply in operations. It draws on modern logistics theory to highlight the unique features of some of the leading logistics functions applied in ammunition supply operations. Based on these findings, it formulates innovative proposals and guidelines for improving the logistics subsystem for ammunition supply, offering fresh perspectives on enhancing operational effectiveness.*

Keywords: supply, ammunition, logistical functions

1. Introduction

The complexity and unpredictability of threats to national security require adequate responses to the changing security environment. To this end, the logistics system in the armed forces must continuously transform, adapt, and provide the necessary resources and services and participate in building and maintaining military capabilities.

Lessons learned from more than two years of fighting in Ukraine raise several issues for military logistics, many of them related to stockpiles and the supply chain of material resources, with an emphasis on the provision of Class V material resources - missiles and ammunition [1], [2] - critical to the outcome of the fighting. Thus, the focus is on analyzing the status, lessons learned, and evolution of the munitions supply subsystem.

2. Aspects of the Organisation of Ammunition Procurement in Operations

2.1. Organization of Supply

First of all, if we grade the process of supplying material resources, we can highlight the organization and timely supply of ammunition to the military formations as an essential element for the operation's success. This task of paramount responsibility should be solved with priority for commanders and logistics personnel, as its solution largely depends on implementing the set functions and the operation's success [3]. The conduct of combat operations in Ukraine shows that, at some points, there was underestimation by officials and formalism in the course of planning and supplying the formations with ammunition, which led to a slowdown in the pace of the operation, and, in some cases, to high combat losses due to the lack of sufficient quantities of essential ammunition in the formations (end users).

The supply of ammunition in the logistic chain is further complicated and hampered in the preparation and operation due to several peculiarities of ammunition, which are related to its excellent technical specificity and complexity as an object of supply. Therefore, in the process of distribution of ammunition in the logistic supply chain, compliance with

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strictly defined rules is required in the implementation of some of the logistical activities related to the organization of their storage in stationary and field conditions; their transportation by different modes of transport, as well as the performance of loading and unloading activities with them [4].

The analysis of the combat operations conducted shows that in several cases, the following have a significant impact on the organization of the supply of ammunition: the large volume of supply (quantity of ammunition) between the different units in the supply chain (network); the great variety of missiles and ammunition by systems, caliber and type of action; the significant losses in preparation and the course of combat, as well as the lack of uniformity and interchangeability.

The capability to establish and maintain stocks of munitions immediately with users in quantities adequate to the expected expenditure and therefore requiring deliveries more frequently and in more significant amounts than other material resources is severely limited because of their high specific mass, relatively high cost, and the enemy's ability to influence supply sources. In all modern armies, the creation of ammunition stockpiles in military formations is observed, which are echeloned by location as follows: stockpiles at the weapons (combatants and machines), stockpiles in the depots of military formations (company, battalion, brigade, etc.) located along the hierarchical chain of the ammunition supply subsystem. It can be concluded that a threshold stock exists in the above system, and reaching its level determines the point in time for a replenishment request. For example, within a military unit with the rank of a brigade, such a stock should be considered as the stock at the weapons (combatants and machines) and in the companies (batteries), the beginning of the depletion of which is the signal for replenishment of the stocks in the battalion (division) stores. A part of the stock of weapons (men and machines) constitutes the so-called inviolable stock, which may be expended only with the permission of the battalion (division) commander. According to logistic theory, this stock is permanent and can be defined in practice as a guarantee and insurance stock.

The provision of ammunition should follow such an organization that at any moment of the operation, the logistics specialists can carry out the complete and timely provision of the formations with all the necessary resources and components under any conditions of the environment while being as economically advantageous as possible, i.e., the implementation of the task should be carried out with a minimum expenditure of forces and funds. At the same time, the requirement for the resistance of the supply to the enemy's impact must be met, i.e., regardless of losses, the task must be accomplished. Therefore, the objective of ammunition supply can be formulated as follows: maximum satisfaction of the formations' requirements for ammunition with minimum expenditure of forces and resources and losses due to enemy impact.

In tactical terms, the organization of the supply of ammunition depends on: the quantity and quality of the vehicles; the march capabilities; the degree of autonomy; the area required for deployment; the time for deployment and occupation of the depot area in field conditions, etc.

2.2. Main Logistical Functions in the Supply of Ammunition

We can highlight several key and supporting logistical functions that apply to the supply of ammunition in operations and reveal the following features:

- In the purchasing function, munitions of war are referred to the items (products) with the so-called interrelated demand since they are intended for use by a specific weapon system, i.e., they lack such an essential characteristic of almost all other types of material means as interchangeability, which predetermines the supplier to a large extent; moreover, when determining the

requirements and the size of orders, the price, their sizeable specific mass and volume, as well as the intensity of their consumption must be taken into account. At present, this is one of the main problems concerning the possibilities of production, purchase and supply of the necessary ammunition to the military formations of the Ukrainian Army;

- In the implementation of the logistic function of stockpile management must take into account: their large specific mass, leading to a large mass of the accounting - supply unit for the supply of ammunition combat set (for example, in artillery ranges in volume from 40 to over 200 tons), which does not allow the creation and maintenance immediately at their users (soldiers or weapon systems) of stocks adequate to the needs of a day of combat, and requires more frequent delivery of ammunition compared to other material resources. As ammunition is an active means of influencing the enemy, to avoid shortages among users, it is necessary in wartime to use an effective stockpile management system to provide it;

- All modes of transport may be used in the distribution of ammunition, but a number of requirements must be observed in the transport and handling of ammunition; in addition, the following must be taken into account: the large specific mass and the high consumption of ammunition in combat operations, requiring that the majority of the means of transport be allocated to the transport of ammunition (up to 60-70 % of the transport of material is accounted for by ammunition); the great variety of ammunition, due both to the diversity of armaments and to the need to solve different firing tasks with the same armament, makes it necessary to select the means of transport for the transport of specific types of ammunition with a view to maximising their carrying capacity, i.e. The need to transport the ammunition directly to the users (firing positions) imposes additional requirements on the cross-country capability and manoeuvrability of the ammunition transport vehicles; it is also essential to bear in mind that ammunition transport is carried out in conditions of limited visibility, on dirt roads, especially when transporting to firing positions, and also at the most responsible moments of operations;

- In performing the logistical function of stockpiling, it should be taken into account that the high consumption of ammunition, due to the intensive use of modern weapon systems, requires the creation and maintenance of not only echeloned but also sufficiently large ammunition stocks; the importance of ammunition and its large mass necessitates that ammunition stocks in the rear of the army be mobile (stocks on the move) and that only stocks necessary for the execution of a specific firing task be established on the ground; ammunition requires special storage conditions, as it is a complex and dangerous electro-mechanical device containing gunpowder and explosives. An essential feature of ammunition as a supply item is that it is not interchangeable, making it necessary to carefully plan and organise its supply.

An essential feature of the ammunition, also leading to increased requirements for the logistics authorities when planning their provision, is the specificity in the organization of the provision of their most significant users - the ground artillery, the anti-aircraft artillery, the mortars, the anti-tank vehicles, the rocket artillery, and the tanks. The organization of the provision of ammunition to each of these types of assets must take into account the nature of their combat use for different kinds of warfare, as well as the potential impact of enemy high-precision weapon systems and drones on the organization of supply.

Analyzing the nature of modern operations and new concepts of combat employment of military formations significantly increases the requirements for their ability to conduct independent combat operations [5]. This determines the necessity of

increasing the degree of autonomy of logistic units, emphasizing the supply of ammunition.

The degree of autonomy in the supply of formations with different types of ammunition should be considered an indicator of their ability to conduct combat operations for a certain period with their stocks of the respective type of material without having to carry out supply. Therefore, as an indicator of the effectiveness of the ammunition supply subsystem in this respect, the coefficient of the degree of autonomy of formations in supplying different types of ammunition in operations, **Kav,** may be used, expressed by the formula

$$\mathbf{Kav = Nav/Pav,} \quad (1)$$

Where: **Nav** - available quantity of mobile stocks of a given type of ammunition in the formation at the beginning of combat operations in combat load; **Pav** - authorized consumption of the respective material kind of ammunition for combat operations by the formation for the period of execution of the assigned task in combat load.

The results show that the most significant problems in ensuring autonomy regarding the supply of formations with ammunition exist in the supply of artillery, mortar, and jet ammunition, where the Kav ratio of military formations is the lowest.

An essential place in the functioning of the ammunition supply subsystem is occupied by the loading and unloading operations, which take a significant part of the distribution process to the end users and thus increase the required delivery time. Ammunition handling expresses the essence of the complex logistics function of cargo handling. In modern operations, **ammunition handling** has gained significant importance and has become a topical problem for logistics authorities to solve. Their considerable volume conditions this in comparison with other solid cargoes in the supply chain to military formations; the necessity of shortening the time for their performance in connection with the high degree of maneuverability of their users and the great possibilities of the enemy to influence the areas for their delivery and reception.

At this stage, this is the only and easily applicable solution from a technical and organizational point of view. Still, it does not ensure high productivity, as it does not allow to effectively apply several modern systems that contribute to increasing the level of mechanization of loading and unloading works - palletizing, packaging, containerization.

Increasing the capabilities of the supply units for fifth-class material for carrying out loading and unloading operations should be sought in the way of their saturation with modern loading and lifting vehicles, the tactical-technical and operational characteristics of which best meet the requirements arising from the specifics of loading and unloading operations with ammunition in contemporary operations.

The functioning of the ammunition supply subsystem in modern operations should be focused on the timely: planning of the supply of all types of missiles, ammunition and their components; preparation of requests for the shortage of ammunition; bringing the necessary information to the military formations on the authorized expenditure and on the stocks at the end of combat (operation), as well as on the order of receiving the allocated material resources; managing the activities of supply warehouses throughout the supply chain (network) related to the implementation of: Dispersal; bringing to projectile form; loading and dispatching of ammunition to troops; controlling the condition and storage conditions of ammunition in troops and depots; organizing the collection and evacuation of fired items and packages; keeping operational records of ammunition and providing debriefings; organizing the loading and unloading of ammunition; organizing the security, defense, and protection of ammunition depots and transports.

2.3. Aspects to Adapt the Logistics System to Operate in a Multinational Environment

As a result of the crisis between Russia and Ukraine and the resulting need to improve the ammunition storage system on the Eastern flank of the Alliance, the Republic of Bulgaria joined NATO's **Multinational Ammunition Warehousing Initiative - MAWI** in May 2023. This is a step towards improving the logistical capabilities of the Republic of Bulgaria regarding the host nation support organization and will contribute to enhancing the collective defense of NATO allies.

To address the need to adapt the logistics system to operate in a multinational environment and to solve the tasks set before it regarding the supply of ammunition, the areas on which it is appropriate to focus efforts are:

- the further formation and construction of stocks of munitions critical to the outcome of combat (BDM), as well as other types of material resources for which sufficient industrial capacity is required. Collective mechanisms (e.g., use of NSPA and EU) can help to achieve this;
- seeking forward deployment of stockpiles of munitions by providing new infrastructure to be funded from NATO common funds;
- activities to improve interoperability and interchangeability of capabilities to reduce the volume of resources required and the length of supply chains.

3. Conclusions

The analysis of the changed security environment and lessons learned from the practice of modern military conflicts and operations show that ammunition is one of the most important material resources that troops are supplied with, because it is an active means of influencing the enemy. At the same time, they are characterized by several peculiarities as objects of supply, which determines a specific organization for their provision and the existence of a specially created logistics subsystem in this area.

Timely and full implementation of the key and supporting logistic functions of supplying these material resources, namely delivery, inventory management, storage, transportation, and reverse distribution (collection and evacuation of empty packaging and fired items), will have a significant impact on the operation's success.

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