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THE REVIEW OF THE EXITS GUIDANCE APPARATUS FOR THE FORMING OF INTERIOR TROOPS GROUP's EFFICIENT LOGISTICS SUPPLY SYSTEM

The analysis of the existing elements (principles, models, and conditions) of the forces activity logistics supply theory has been mentioned. The conclusion about their insufficiency to form a rational system of Interior Troops logistics supply has been made.

***Keywords**: the guidance apparatus, options logistics system.*

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ОГЛЯД ІСНУЮЧОГО НАУКОВО-МЕТОДИЧНОГО АПАРАТУ ДЛЯ ФОРМУВАННЯ РАЦІОНАЛЬНОЇ СИСТЕМИ ТИЛОВОГО ЗАБЕЗПЕЧЕННЯ УГРУПОВАННЯ ВНУТРІШНІХ ВІЙСЬК

Наведено аналіз існуючих елементів (принципів, моделей, умов) теорії тилового забезпечення дій військ. Зроблено висновок про їх недостатність для формування раціональної системи тилового забезпечення внутрішніх військ.

***Ключові слова:** теорія тилового забезпечення, параметри системи тилового забезпечення.*

The problem setting and the analysis of the recent researches and publications. In papers [1 – 4] the analysis of the initial empirical basis of the logistics process (LoP) of the Interior Troops Action (InT) during emergencies of the regional, national levels and internal armed conflict has been conducted. This analysis highlighted the real and predicted problematic situations of the LoP of the action of groups InT, which became the basis for a conclusion about the insufficiency of the existing system of the LoP InT to create on its basis the of the LoP system of InT action group in these circumstances have been mentioned. Particular the following problem situations have been mention [4]:

The uncertainty of the characteristics, principles, standards of the LoP organizations of groups action;

– the discrepancy of the quality characteristics of the technical facilities and property of the logistic services for the conditions of their application;

– the insufficiency of the possibilities of the Interior Forces to meet the needs of groups in activities of the of the LoP ;

– lack of the methods of the LoP organization of the actions of InT;

– lack of coordination on joint operation of the systems of interacting entities defense and security sector of Ukraine.

These problematic situations can be divided into two groups: situations with a structural nature, associated with the relationships and the ordering of the system elements of the LoP groups and situations with the functional nature, related to the activities of the system as a whole. Accordingly, for the formation of sufficient and rational system of the LoP InT must have methodological apparatus, firstly, there are modeling of the processes and making of the decision in the terms of uncertainty and risk, which in practical terms would facilitate informed decision making by the management according to the composition of forces and means of the logistics of Interior Forces , their distribution by the level of management, the placement in space and time for emergency of regional and national levels of social, political, technological or natural character and in the internal armed conflict, and secondly, there are formations of organizational structures of the logistics systems.

The difficulties in setting of such pragmatic problem leads to the question: are there enough methods to solve this problem in the modern theory of the LoP?

The purpose of the article – in the frames of the theory of the LoP of the forces activity to analyze of the existing methods and techniques that might be appropriate and sufficient for the formation of a rational system of the LoP InT.

The main materials. The theory as a form of credible scientific knowledge about a set of objects, which is a system of interconnected allegations and evidence that contains methods explanation and forecasting of phenomena and processes of a particular domain is a fundamental and stable [5].

Still the same problem statement and purpose of the article can cause a range of readers share skepticism about the correctness of the use of the term "theory" to such subject as "logistics" in comparison, for example, quantum theory or the theory of relativity.

Therefore, in our opinion, at the beginning of the presentation of the basic material it is impotent to highlight two methodological refinements.

Firstly, different sciences are differing in their epistemological level – one pole gravitate "strong" science, epistemological ideal of science – mathematics and physics, whose theories are built on a rigid deductive basis. In line with the strong version of the theory of science – is the highest form of scientific knowledge, which provides a holistic view of the essential links in a particular area of expertise – the object of the theory. The second pole – "weak" (in epistemological terms) science, including humanities and social sciences, because of the extraordinary complexity of their facilities, weak predictability of phenomena and processes. In line with the weaker version of science theory – a set of beliefs, concepts, ideas, aimed at explaining phenomena, processes and relationships between them. In this sense, the word "theory" is often replaced by the word "concept". [6]

Secondly, military science at the junction of the natural and social sciences. Branches of the military science-related developments of the LoP for the military-industrial complex, commonly used methods of mathematics, computer science, physics, chemistry, etc. For theoretical research in traditional martial arts is the use of scientific methods such as logical, historical, heuristic, extrapolation, systems analysis, modeling, and empirical [7, 8].

The review of the literature gives reason to concern that there is domestic theory of the LoP of the forces activities is part of military science and explores the theoretical foundations of planning, preparation, management measures logistics operations of appropriate scale. It is based on the writings and research of literature based on the writings of Soviet and methodological literature Soviet-era [9 – 12 et al.] and from modern noteworthy work [13 – 15].

The theory of the LoP of the forces activities assigned to provide data for the logistics management necessary for the decision about logistics development and for the organization and applying of the actions of the LoP forces. The main data are the composition and the volume of needs for major actions of the LoP of forces, survivability and management of logistics departments.

The above theory is based on the principles of [9] which are based on a priori idea of a certain structure of logistics department, which includes the groups, which is created for the LoP forces in the period of preparation and during the operation and includes: the logistics supply department are providing forces of the first line and are placed in the area of operation; the logistics supply groups that perform tasks for the benefit of unit and are located on the major communication lines deep in the rear lane; reserves and capabilities of logistics supply groups.

The key principles of logistics supply operations are:

a) the compliance of the LoP plan of operations and tasks of forces;

b) the organization of the LoP groups according to the areas of their actions and elements of operational alignment;

c) the concentration of main efforts of the logistics supply departments on the main tasks of operations;

d) ensure maximum autonomy grouping of forces in logistic respect;

e) the organization of the LoP considering the interests of other forces, participating in the operation;

g) the creation in the operation the conditions for sustainable LoP of the following force activities without operational pause.

The most important factors and parameters of the LoP system of forces are needs of transportation, the norms of accumulation, expenses and the process of recovering of the resources, the availability of transport facilities and their traffic capacity, the availability and the possibility of vehicles, the capabilities of management, protection, and defense departments in the logistics supply system.

The need of transportation of the materiel is a number of recourses are necessary to transport to the groups, units and departments, and to the warehouses of groups, units and logistics in the specific context of operational logistical departments in specific situation and according to the norms of supply. This is the main measure that

characterizes the amount of problems of the logistics supply (as the main form of the LoP) of the operations of groups (units).

The obtainment of the data was mentioned within the frames of the theory of the LoP supplement the models and methods were created. For example in the work [12] for the logistics management departments the models were suggested. These models estimate the condition of the state logistics supply system and individual elements of it and can help to prepare in a short time the variations of decisions about the distribution of resources according to the information about operational and logistical environment. Regard of this, two statements of the problems of the logistics supply systems were established. The first statement of the problem is to organize the logistics supply system to meet all needs, taking into account losses and norms of recourses supplement. The second statement of the problem differs from the first in that resources are allocated according to their deficit - if they do not provide the total demand. In this case, the logistics supply department decides which types of groups (units) will be supplied on the basis of the importance of each group (unit). The methods of simulation and linear programming for the environment of arms operations help to define need in resources, the number of common elements of logistics supply system and rational ways of their distribution, distribution of material resources of each logistics supply department for groups (units).

In [13, 14, 9, 10] works methodological apparatus for determining the parameters of logistics supply, listed above (at the beginning of this paragraph) have been proposed. There are two approaches for determining the parameters of logistics supply.

The first approach involves obtaining of the values of system parameters by using the of the methods of accelerated calculations. Its essence is to use tabular data of the average values of norms the resources, their expenses and losses per day in operation, and need in typical logistics organization on different levels to recover of the resources. Using of these data is determined by the need in transportation of the resources, which have the largest relative weight in carriage traffic. (Ammunition and fuel). Thus, the need in transportation of ammunition and fuel per day of operation is determined by the established norms of expenses and losses and the average values of expenses and losses of recourses including the allocated of resources for an operation by the following dependence [9, 13]:

$$Q_{БП(П)} = \sum_{1}^{n} (R_i + P_i) \cdot q_i \,, \qquad (1)$$

where $Q_{БП(П)}$ – the need in ammunition (fuel), t; R_i – the consumption norm of the i-type of ammunition (fuel), RPO; R_i – the average losses of *i*-type of ammunition (fuel), RPO; q_i – weight and RPO of *i*-type of ammunition (fuel), t.

Using this dependence has the condition that the value of reserve at the end of the day will be the same as at the beginning of the next.

If it is known the need in ammunition and fuel and the value of the coefficient $K_{інш}$, takes into account part of other materials in dependence to the general traffic, the need of transportation of other resource can be calculated [9, 13]:

$$Q_{інш} = Q_{БП(П)} \cdot K_{інш} \,. \qquad (2)$$

The total demand for transportation is in dependence [9, 13]:

$$Q_{заг} = Q_{БП(П)} + Q_{інш} \,. \qquad (3)$$

If the norms of expenses have not been established or unknown, there is the need in transportation can be defined according to the standard norms of expenses and losses by using the coefficient according to the dependence [9, 13]:

$$Q_{БП(П)} = \sum_{1}^{n} R_{БП(П)} \cdot C_i \cdot K_{yi} \cdot K_{ei} \,, \qquad (4)$$

where $R_{БП(П)}$ – average norm of the expenses of the ammunition (fuel) of group (unit), t; C_i – duration of the participation of *i*- group (unit) in operations in a given period, day; K_{yi} – the coefficient of staffing level of *i*- group (unit); K_{ei} – the coefficient of equivalence of *i*- group (unit).

The value $R_{БП(П)}$ can have different meanings in the conduct of hostilities with the use of different weapons.

The coefficient of the equivalence shows the ratio of the cost of ammunition (fuel) of specific group (unit) to the average norm of the expenses of the material resources [9, 13]:

$$K_{ei} = \frac{R_{БП(П)i}}{R_{БП(П)}} \,, \qquad (5)$$

where $R_{БП(П)i}$ – the value expenses of the ammunition (fuel) of *i*- group (unit), t; $R_{БП(П)}$ – average norm of the expenses of the ammunition (fuel) of group (unit), t.

The second approach is used to obtain more accurate results, factors and parameters of logistics and based on the method for determining the needs

of transportation, and the method of calculation of the transport capacity and the necessary number of vehicles for transportation.

The essence of the methodology for determining the need for transportation is in the following. While using the initial data (values of expenses for the relevant period, the value of possible losses during this period, established reserves at end of period and value of stocks at the beginning of the period, and weight of settlement supply units) need for transportation is determined by the following dependence [9, 13]:

$$Q = (R + P + Z - N) \cdot q, \quad (6)$$

where Q – the need for transportation of materiel, t; R – norm costs of materiel RPO; P – the amount of probable losses of materiel, RPO; Z – reserves are established at the end of the period, RPO; N – size of reserves at beginning of, RPO; q – RPO weight.

The complexity of the application of this method for the conditions specified in the beginning of this article is that typical norms of spending and losses of materials determined by the method of mathematical statistics on the basis of training. There are at least 20 experiments for the statistical stability of the results (one experiment it is the specific group training). The trainings of the InT groups and units with simulations of complex operational environment require a significant expense of funds and impossible today's.

The method of the calculation of transport capacity and the need for it is intended to define the scope of tasks of transportation for a specified period, which are characterized by two main factors: weight of cargo to be transported by road to the i-region (Q_{ABi}) and length and the *i*-region (l_i). It is known that the multiplying of the weight of cargo a distance of delivery is desired the required transport work volume. The required transport work volume in all areas $W_{ПОТ}$ can be defined by dependence [13]:

$$W_{ПОТ} = \sum_{1}^{n} Q_{ABi} \cdot l_i . \quad (7)$$

Possible transport work ($W_{МОЖ}$) for the same period can be determined by the multiplying of the actual carrying capacity of motorized group, unit ($G_Ф$), possible vehicle mileage (L) and coefficient of mileage usage ($K_{В.ПР}$)[13]:

$$W_{МОЖ} = G_Ф \cdot L \cdot K_{В.ПР} . \quad (8)$$

Therefore, by the terms of accomplishment of the traffic activities will be accordance between the values of required and possible transport work [13]:

$$W_{ПОТ} = W_{МОЖ} . \quad (9)$$

After setting the values (7) and (8) to the dependence (9), we obtain [13]:

$$G_Ф \cdot L \cdot K_{В.ПР} = \sum_{1}^{n} Q_{ABi} \cdot l_i . \quad (10)$$

This equation is the basis for the calculation of quantities into it. Thus, the need of carrying capacity of the vehicles, which can perform specified work of transportation, which consists of n parts,is determined by the dependences [13]:

$$G_{ПОТ.В} = \frac{\sum_{1}^{n} Q_{ABi} \cdot l_i}{L \cdot K_{В.ПР}}, \quad (11)$$

where $G_{ПОТ.В}$ – the need of carrying capacity of the vehicles, t; Q_{ABi} – weight to be carried on the i-th region, t; l_i – length of the i- section, km; L – the Possible mileage of the vehicles during the period, km; $K_{В.ПР}$ – the coefficient of the mileage usage.

The need in vehicles to perform the given traffic volume during a certain time in a specific situation can be also calculated in the required number of vehicles and is defined [13]:

$$A_{AB} = \frac{Q_{AB}}{q_H \cdot K_{В.В} \cdot n}, \quad (12)$$

where A_{AB} – the required number of vehicles (trailers), trucks, items; Q_{AB} – mass of cargo to be carried, t.; q_H – nominal carrying capacity of vehicles (trailers), trucks, t; $K_{В.В}$ – the coefficient of the carrying capacity usage; n – the number of possible vans.

In turn [13],

$$n = \frac{T_H}{T_{ПР} + \frac{2l}{V_{СР}}}, \quad (13)$$

or

$$n = \frac{T_{ПР.С}}{T_{ПР}}, \quad (14)$$

where T_H – the time of the drivers work during the day, hour.; $T_{ПР}$ – the downtime during loading (unloading) per vehicle hour.; $T_{ПР.С}$ – the downtime during loading (unloading) for the period, h; l – the distance transportation km; $V_{СР}$ – the average speed, km / h.

The time of drivers work during the day is 12–14 hours, and with two drivers it is up to

20 hours. The time is divided to the time of the movement of vehicles, cargo handling operations, time of documents execution, waiting loading (unloading).

The downtime during loading (unloading) depends on the capabilities, on the composition automotive columns, on the method of cargo (bulk, container, in standard containers) and their ratio in the total traffic. This time can be determined by the dependence [13]:

$$T_{HP} = \frac{Q_{AB}}{W} + t_{OЧ} , \qquad (15)$$

where W – loading -unloading capabilities, t / h.; $t_{OЧ}$ – waiting time loading (unloading) and registration, h.

In operational calculations and in the absence of specific data about the possibility of loading - unloading capabilities can be used in calculating of the rate of the average idle of the time and for the other regulations of the use of road transport for delivery of material.

Actual carrying capacity of motor units is determined by the dependencies [13]:

for dry cargo

$$G_{Ф} = \sum_{1}^{n} A_{CПi} \cdot q_{Hi} \cdot K_{B.Bi} \cdot K_{TTi} , \qquad (16)$$

for the bulk

$$G_{Ф} = \sum_{1}^{n} A_{CПi} \cdot V_i \cdot \rho_{CP} \cdot K_{TTi} , \qquad (17)$$

where $G_{Ф}$ – the actual carrying capacity of motor units, t; $A_{CПi}$ – the number of vehicles, trailers (train) of train in the list, items.; q_{Hi} – nominal carrying capacity of the vehicle, trailer (train) of *i*- type, t; $K_{B.Bi}$ – the coefficient of utilization vehicles and *i*- type; K_{TTi} – the coefficient of technical readiness of vehicles (trucks) of *i*- type; ρ_{CP} – the average density of bulk cargoes t/m^3; V_i – The capacity tanks (reservoirs) mounted on the vehicles and of *i*- type, m^3.

Possible mileage of vehicles automotive columns during a period that is determined by the dependence [13]:

$$L = T_P \cdot V_{CP} , \qquad (18)$$

where L – the possible mileage of vehicles in kilometers; T_P – the time spent on movement automotive columns, h; V_{CP} – the average automotive columns speed, km / h.

According to the above listed dependencies and with analytical method it can be calculated the values of the transport process. However, there are some limitations of using of this method. Thus, to determine the numbers of possible vehicles method need to use constant transport distance, vehicles have to use only on one particular area. However, such conditions, unfortunately, are not conducive for activities of group InT.

It is important to mention that the modeling of the processes of the logistics supply in conditions of uncertainty and risks in the frames of existing theory is based on the use of well-known scientific methods (theories) operations research [16 et al.]. The most developed of the theories of the LoP, that have opportunities for practical application in specific aspects of the logistics supply of the forces activity are:

a) the theory of optimal inventory management is for selection of rational decisions about inventory management, namely the establishment of the time and the volume of orders for replenishment and distribution rules of the party that came in with subordinate units, according the criterion of minimizing the cost of the transportation of the materiel within the system of the LoP;

b) the methods of linear programming and network planning are for efficient attachment to supply of forces to external and internal sources of support for the criterion of the minimizing the time of delivery of material resources and economic costs;

c) the queuing theory are for the optimization of the insertion of forces on the criterion of minimizing of the time required to perform certain activities of the LoP: treatment, food, bath, personnel laundry service, refuel vehicles.

The conclusion

1. The basis of the theory of the logistics supply of the forces activity is a practical tool for solving pragmatic problems, arising in logistics and aims to earn the practical system of the LoP parameters that make the data of the logistical situation, such as: the need for transportation, the rate of accumulation, costs, and the process of recovering, availability of transport facilities and their capacity, availability and capabilities of vehicles and others.

2. The parameters and methods of their obtaining, have been mentioned before, are important and relevant to make decision about the LoP of the operations (actions) according to the different conditions of environment. To some extent, they can be accepted for emergency situations at regional, national levels and internal armed conflict, but it is important to emphasize that in the frames of the existing theory of the LoP

priori decision focus on the construction of the logistics supply of the operational associations with the structure of the Soviet units, when front line and the rear bar of the forces clearly defined, main and secondary lines of action, and basic system of the LoP is consist of the hierarchically distributed elements, each of them are being deemed to have sufficient and rational structure for the complex of measures for logistics activities of military formation of appropriate level with a certain time interval.

3. Analysis of initial empirical basis of the process of logistics activities of the Interior Forces in emergency situations, regional and national levels and in the internal armed conflict has highlighted the real situations and projected problems of the logistics supply of the InT groups activity, whose solution requires structural change at all levels of government: as a system of the LoP of the group as a whole, the same as each individual element of the group. The complexity of this problem makes the need for scientific and methodological apparatus, which is absent in existing of the logistics supply of the forces activity.

Therefore there is a need to address other areas of science, such as organization theory, and in the frames of this theory it is considered the synthesis methods and models of organizational structures in their application for the formation of logistics supply.

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