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JUSTIFICATION OF THE STRUCTURAL AND LOGICAL SCHEME DEVELOPMENT OF METHODOLOGY FOR SELECTING A RATIONAL OPTION FOR APPLYING THE BORDER GUARD QUICK REACTION FORCE IN CONDITIONS OF RESTORING CONTROL ACROSS THE STATE BORDER

The analysis of the participation of units of the State Border Guard Service of Ukraine in stabilization actions (operations) was carried out. Stabilization actions of troops were considered as a form of military actions aimed at stabilizing the situation in crisis areas, maintaining security and stability, as well as creating conditions that make it impossible to escalate a military conflict. It was concluded that they are components of stabilization, defense, offensive (counter-offensive) operations and can be carried out in conditions of emergency and martial law, as well as in a partial reconstruction period.

A structural and logical scheme of the methodology for choosing a rational option for applying the border guard quick reaction force in the conditions of restoring control over the state border has been developed, which involves the use of a set of methods to solve partial tasks. A number of methods have been identified that should ensure the solution of these tasks during the study, as well as an apparatus that belongs to known general scientific methods and is relevant to the purpose of the study and meets the requirements of reliability and validity.

Keywords: *structural and logical diagram, methodology, rational application, operational and service activities, stabilization actions, units of the State Border Guard Service of Ukraine, border guard quick reaction force, state border, restoration of control over the state border.*

Statement of the problem. With the entry into force of the Defense Plan of Ukraine, the forces and means of the State Border Guard Service of Ukraine (SBGSU) additionally perform the tasks provided for by it. During the special period, the SBGSU participates in stabilization operations (stabilization actions) aimed at maintaining security and stability in the controlled border area in the post-conflict period [1]. In addition, the special purpose law enforcement agency is tasked with restoring control over uncontrolled sections of the state border (SB).

However, the deoccupation of border territories, the expulsion of the enemy beyond the borders of Ukraine and the completion of the active phase of hostilities in these territories are not decisive indicators indicating the stabilization of the situation and the final restoration of control over the state border. There are a number of factors that significantly influence the development of the situation in the deoccupied border territories and to a certain extent make it impossible to carry out a full range of measures that would ensure the final restoration of control over the border [2].

As an example, it is worth citing the attempted Russian offensive on Kharkiv on May 10, 2024. It demonstrated the presence of a number of problematic issues that need to be recognized, analyzed and resolved in order to prevent the recurrence of similar situations. Since the Zhytomyr, Kyiv, Chernihiv, and Sumy regions of Ukraine are the same deoccupied border territories, a similar scenario is quite likely in these territories. An analysis of some information publications [3, 4] allows us to highlight the main miscalculations:

- construction of ineffective defense lines (inadequate level of fortification and mining);

- insufficient amount of weapons and ammunition (on average, Ukrainian military could only fire one artillery shell against 10 Russian ones, lack of air defense, electronic warfare and electronic warfare equipment);
- lack of understanding by the military command of the situation developing in this direction (lack of a clear system for obtaining intelligence data and information about what is happening);
- defense of important areas by units with low combat capabilities (subunits of the State Border Guard Service of Ukraine, rifle battalions that do not have armored vehicles and heavy weapons).

Today, the situation on the eastern section of the state border within the controlled border areas that were liberated by the defense forces from the occupiers has characteristic features:

- lack of direct control over individual sections of the state border;
- maintaining a high level of terrorist threat;
- the possibility of provocative actions by the enemy;
- the possibility of penetration into the controlled territory of Ukraine of sabotage and reconnaissance groups and individuals involved in the activities of illegal armed formations, regular and other military formations (private military companies) with the aim of destabilizing the situation and carrying out provocative actions and terrorist acts in Ukraine, etc.

The situation developing in hot areas reveals the need to involve the State Border Guard Service units in the implementation of tasks not defined at the legislative level [1, 5–8]. This involves participation in counter-offensive, assault operations, etc. This sharply and unpredictably increases the volume of tasks assigned to border units, and can lead to a decrease in operational and service capabilities (OSM) and losses among personnel. The involvement of border units in the performance of service and combat (combat) tasks requires a review of current regulatory legal acts, the development of relevant guiding documents that should regulate the activities of border units in modern conditions of martial law. The involvement of forces and means of all components of the security and defense forces of the state to repel armed aggression of the Russian Federation, which has a resource advantage not only in military equipment, but also in manpower, has led to *creation of the border guard quick reaction force (BG QRF) – one of the main units of the State Border Guard Service in the system of protection of the State Border Guard Service and defense of the state*. The border guard quick reaction force are armed with the latest armored vehicles, an organizational and staff structure adapted to modern combat conditions, trained personnel and appropriate weapons, and are capable of performing tasks in various combat situations [2].

At the same time, with the definition of tasks related to defense, repelling and deterring armed aggression and restoring the territorial integrity of Ukraine, there is a need to develop a methodology for selecting a rational option for using the Border Patrol System to perform tasks related to restoring control over the state border.

Analysis of recent research and publications. The issue of using rapid response units (mobile units, Border guard quick reaction force in various conditions was considered in their works by the following scientists: A. Mysyk, I. Katerynychuk, A. Horbatiuk, O. Hluzdan, V. Zalozh, Yu. Ivashkov, V. Lemeshko, and others.

Models, methods and techniques of performing tasks by units of the State Border Guard Service of Ukraine during participation in stabilization operations were analyzed by A. Horbatiuk [9].

In his study, O. Hluzdan analyzed modern views on conducting stabilization operations and formulated the main tasks of rapid response units during participation in stabilization operations of troops (forces) [10].

The participation of units of the State Border Guard Service of Ukraine in stabilization operations was studied by A. Mysyk and A. Horbatiuk [11].

The issue of improving existing and developing new tools (indicators, criteria, and methods) that allow determining the expected operational and service capabilities of border rapid response units for use in conditions of aggravation of the military-political situation was considered by V. Lemeshko [12, 13].

In the work [14], V. Krutov and O. Yaichko provided proposals on the methodology of the work of the border detachment headquarters for organizing the use of a mobile unit.

Paying tribute to the existing scientific developments, it should be noted that they do not take into account the specifics of forming proposals for choosing a rational option for using the border guard quick reaction force to perform tasks related to restoring control over the state border.

The purpose of the article consists in substantiating the structural and logical scheme for developing a methodology for choosing a rational option for using the border guard quick reaction force to perform tasks related to restoring control over the state border.

Summary of the main material. Stabilization actions of troops are a form of military action that constitutes a set of coordinated and interconnected measures, actions and actions in terms of purpose, tasks, place and time, carried out by a certain composition of troops in cooperation with bodies and units of the Armed Forces and the Special Operations Command within the framework of a stabilization operation or independently to stabilize the situation in a crisis area [15]. Such actions may be carried out in a special period, in conditions of emergency and martial law, as well as in part reconstruction period (demobilization period) [15], that is, in the process of transition from one state of affairs to another during a special period.

Partial reconstruction period (demobilization period) – a stage, normatively defined as one that takes place after the end of hostilities [1, 7]. This is a stage of a special period when a set of measures is being implemented, the decision on the procedure and timing of which is made by the President of Ukraine, aimed at the systematic transfer of the national economy, state authorities, other state bodies, local self-government bodies, enterprises, institutions and organizations to work and function in peacetime conditions, and the Armed Forces of Ukraine, other military formations, civil defense forces to peacetime organization and staff [7] (Table 1).

Table 1 – Modes of operation of the State Border Guard Service of Ukraine in different conditions

Peaceful time		Special period					Peacetime
Daily activities	Escalation of the situation	Extraordinary state	Military state		Part recovery period (demobilization)		Daily activities
Everyday protection SB	Reinforced protection SB (RPSB)	Stabilization actions	Stabilization actions	Military actions			Everyday protection SB
		Strengthening security SB	Cover SB	Combat operations	Stabilization actions	ON SB	
					Restoring control For SB		

Having analyzed the information in Table 1, we can conclude that one of the main tasks of the SBGS units in stabilization operations (stabilization actions) in border areas after the end of hostilities is to restore control over the uncontrolled area of the border. Such tasks will be performed at the end of martial law and in the partial reconstruction period (demobilization period) by the forces and means of existing or newly created border units and with the involvement of SBGS reserves.

The results of the study, presented in [16], show that the security of the state borders is achieved by observing two international legal principles: the inviolability and inviolability of state borders. The principle of the inviolability of state borders determines that the state must consider all the borders of all other states as inviolable and inviolable. The principle of the inviolability of state borders consists in the obligation of states to adhere to the existing state border line on the ground and not to allow its unauthorized movement on the ground and crossing without appropriate permission or outside the established rules. Therefore, the need to restore control over the state border is urgent, which affects the full implementation of vital national interests, because the integrity and inviolability of the territory of Ukraine are directly related to its legitimacy and functionality.

So, *the restoration of control over the state border should be considered as a process (a set of measures) aimed at neutralizing threats*, which are implemented using the state border, to restore and strengthen effective control and management of the state border after violations, crisis situations or threats to national security, in order to ensure the security of the vital interests of the individual, society, and the state [2, 5, 6].

In the process of restoring control over the uncontrolled area of the SB, a set of measures is being taken to provide operational and military cover for the liberated sections of the border and the organization of assigned tasks on them in order to ensure the safety of citizens and personnel of units involved in carrying out these measures.

Measures are also being taken to identify agents, sabotage and reconnaissance forces and other armed formations of the aggressor in the controlled border area, their destruction (neutralization), regime restrictions are being introduced on residence, movement and performance of any work in the controlled border area, etc. [17].

After the end of hostilities and the withdrawal of the forces and means of the State Border Guard Service of Ukraine from the interdepartmental groupings of troops (forces), they will be assigned tasks within the framework of the stabilization operation (stabilization actions) aimed at maintaining security and stability in the controlled border area in the post-conflict period, as well as tasks to restore control over the uncontrolled section of the Border Guard Service.

Analysis of guiding documents [5–8, 15, 18, 19, 20] and experience of participating in combat operations make it possible to group the main tasks assigned to the border guard quick reaction force by characteristic features, as well as to synthesize a system of tasks determined by the border guard quick reaction force in the conditions of restoration of control over the state border (Figure 1). A characteristic feature is revealed – the presence of the probable need to carry out the specified tasks in a certain period of time (from task one to task six, in any sequence and logical dependence).

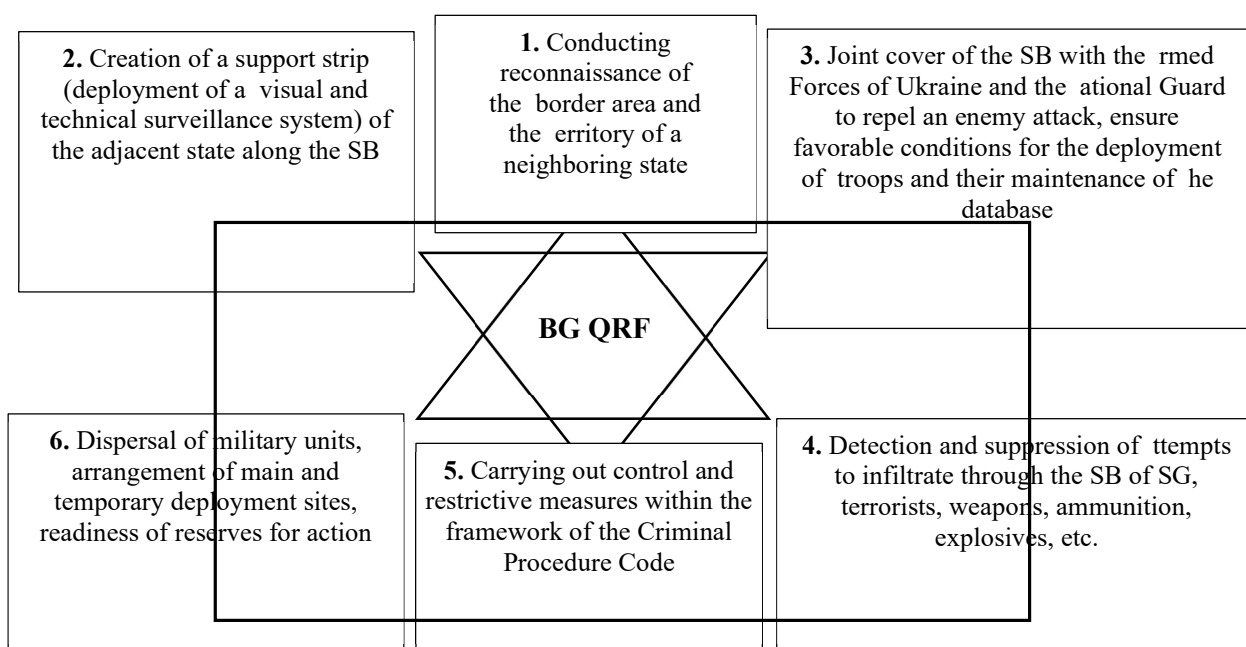


Figure 1 – System of tasks assigned to the Border Guard Service in the context of the restoration of control over the state border

Ineffective implementation of the above system of tasks can lead to significant military and non-military losses in the area of responsibility of the BG QRF.

It should be noted that there is a discrepancy between the need to counter threats that may arise during the performance of tasks in the conditions of restoring control over the SB, and the lack of a methodological apparatus that would allow for the rational distribution of elements of the service order of the BG QRF to perform tasks in the context of restoring control over the state border.

Therefore, the scientific and applied task of the study is to develop recommendations management body regarding the application of the BG QRF in the conditions of restoration of control over the state border on the basis of a rational distribution of elements of official order.

Analysis of modern approaches to the organization of official activities on deoccupied sections of the state border [2, 17, 20] made it possible to establish that the construction of state border protection includes the systems shown in Figure 2.

The principle model of protection and defense of the state border on the Ukrainian-russian and Ukrainian-belarusian sections, as well as an explanatory note to the principle scheme of protection and defense of the state border are presented in Figure 3, 4.

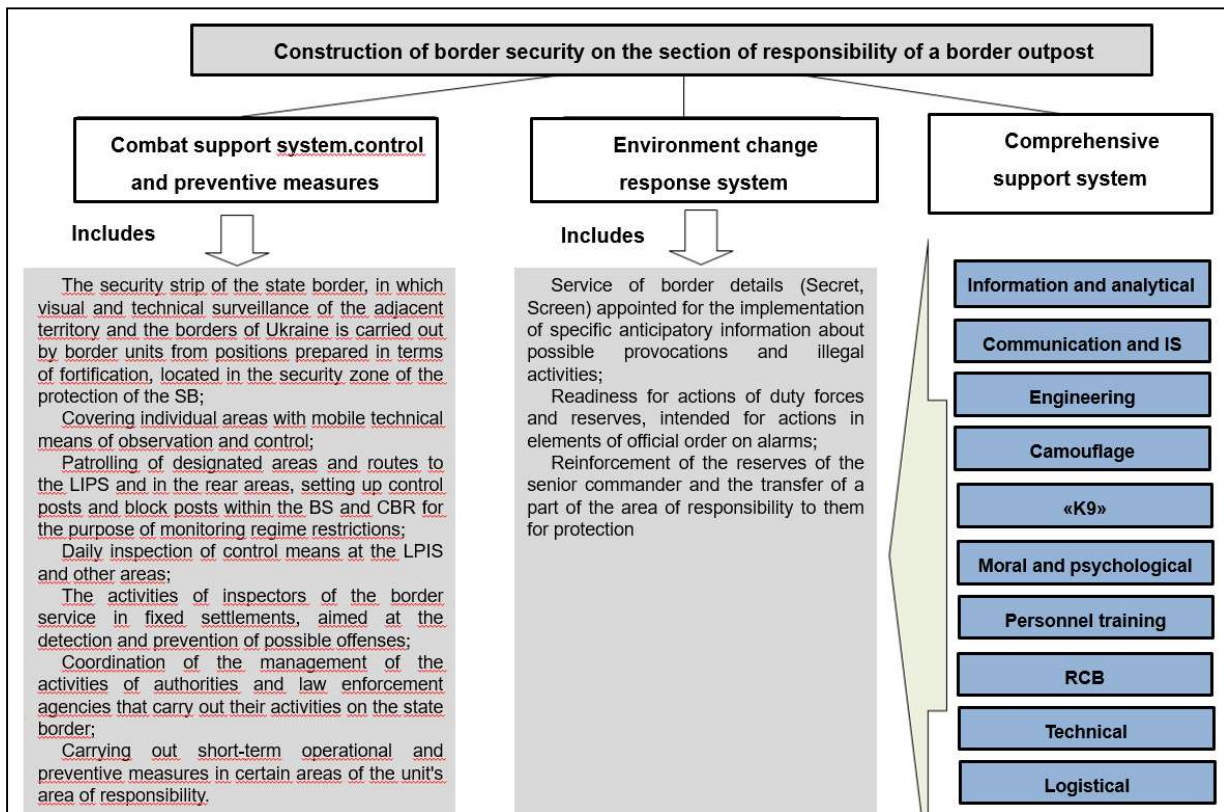


Figure 2 – Construction of state border protection on the site border post

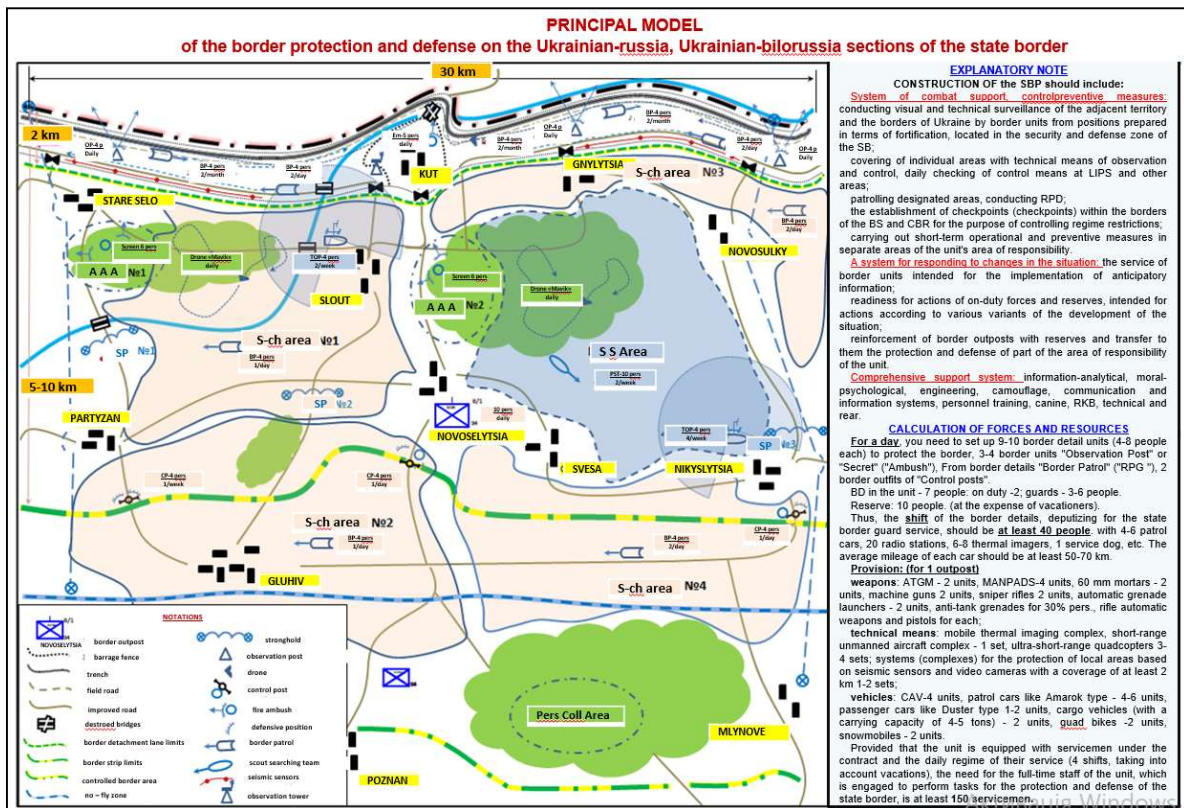


Figure 3 – Principle model of protection and defense of the state border on the Ukrainian-russian and Ukrainian-belarusian sections of the state border

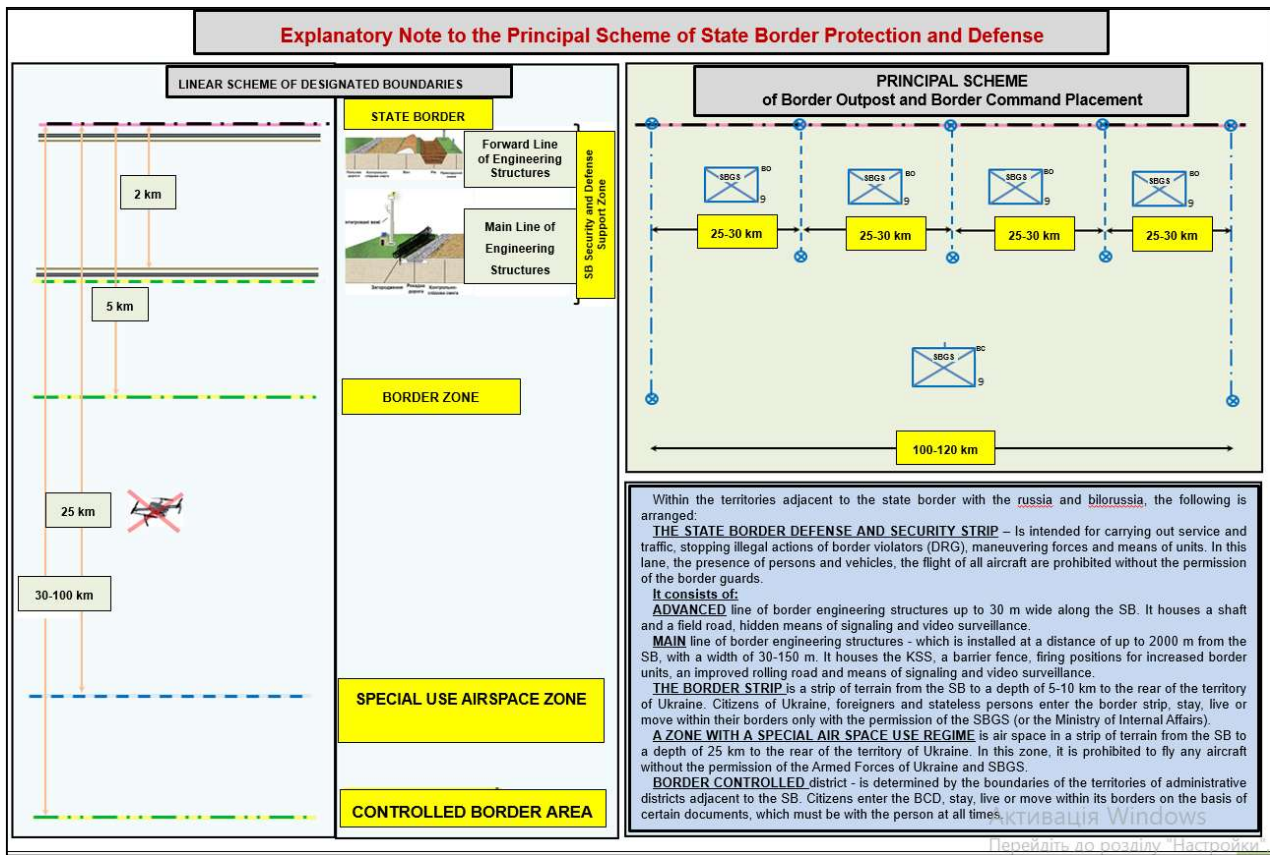


Figure 4 – Explanatory note to the principle scheme of protection and defense of the state border

When performing security and defense tasks in the specified areas of the SB, technical means of security of various physical capabilities are used, for example, radar stations (Table 2).

Table 2 – Some radar stations in service with the State Border Guard Service of Ukraine

Ref. No.	Name of the product, code	Country of origin, year of development	Range, km
1	"Holothuria" IRL232-MP	ussr, 1985	30
2	"Bagulnyk" IRL133	ussr, 1981	15
3	"Bars" IRL133 AM	Ukraine, 2004	15
4	"Credo" IRL133	ussr, 1981	15
5	"Headlight" IRL136	ussr, 1983	4
6	"ELTA EL/M-2129"	Israel, 2006	25
7	"Lys-1"	Ukraine	3
8	"Lys-2M"	Ukraine	7
9	"FURUNO" FAR-2228BB/AC.	Japan	22
10	ELR 55303	Ukraine, 2022	30
11	EASYRAD GPR ground penetrating radar	Ukraine, 2009	0.024

It can be concluded that the technical capabilities of radars for detecting an offender have different ranges (from 24 m to 30 km) and different technical capabilities, as do other technical means (UAVs, thermal imagers, binoculars, seismic sensors, etc.). A practical question arises: how, given the availability of a particular technical means of detecting an offender (offenders), to implement their rational distribution in the area of responsibility of the border unit (taking into account the terrain, dead zones, etc.)? To perform the tasks considered, it would be appropriate to

use appropriate software. Yes, and with the beginning of the Russian aggression against Ukraine, the number of auxiliary devices and gadgets in the units of the state defense forces has significantly increased. The Armed Forces of Ukraine currently use thousands of tablets with the combat control system of the tactical link "Kropyva". The system has been tested in real combat conditions and has received many positive reviews. During this period, more than 10 thousand copies of the program have been installed. In addition, a technical support service has been established, which is constantly improving the software product. This system has a number of technological bonuses for the military on the battlefield or during exercises [21].

1. Access to an electronic map of the area with your own GPS position displayed.
2. Data exchange with other system subscribers. The data generally includes the positions of interacting units, coordinates of detected targets, and short text messages.
3. Solving individual calculation problems (for example, calculating the march, the fire zone, or artillery corrections).
4. Ensuring interaction and automatic transmission of data from UAV reconnaissance equipment, radar and sound measurement systems.

The "Kropyva" system allows you to reduce the time of deployment of artillery battery assets by a factor of five. At the same time, the time to defeat an unplanned target is reduced by a factor of three, and the time to open counter-battery fire by a factor of ten.

The program has the function of taking data from the general weather forecast, portable weather stations or from devices that are part of individual sniper complexes. To work with the "Kropyva" system, you only need to know the coordinates of the targets and the locations of your artillery battery and weather conditions. The data is entered into the tablet, then the direction of fire and the distance to the target are automatically calculated.

It is worth noting that the functions of the "Kropyva" system provide work with radio stations, data from rangefinders, UAVs and other tablet users, intelligence officers, etc.

Today Ukrainian Defense Forces also use national military systemsituational awareness "Delta". She integrates information about the location of enemy forces and assets and in real time allows you to track the position of enemy troops and promptly record detected objects for their subsequent fire destruction [22]. The system integrates information about the enemy on a digital map, data is taken from various sources: from suppliers satellite images, from radars, sensors, GPS trackers, radio interception, etc. Users see what is happening on land, at sea, in the air, in space and cyberspace.

Through a secure messenger Element, which is a component of the Delta system, coordination between departments and secure exchange of information takes place. The Delta system platform and services are built according to NATO standards [23], support the specification MIP (Multilateral Interoperability Programme) and provide the opportunity to conduct tactics network-centric wars. It is worth noting that all modern Western equipment provided by the Allies Ukraine to repel Russian aggression, is automatically integrated into the Delta system.

However, unfortunately, we have to conclude that the existing software does not meet the needs that arise during the organization of border patrol units in the context of solving the task of restoring control over the state border.

Today, there is a lack of software capable of performing tasks related to the rational distribution of technical means of protecting the state border for their use during the organization of operational and service activities in the conditions of restoring control over the state border.

In addition, it should be noted that the existing methodological apparatus does not take into account the specifics of the implementation conditions. system of tasks (Figure 1) assigned to the Border Guard Service when organizing control over the state border section, and does not allow for the implementation of an appropriate rational distribution of personnel of the border guard quick reaction force, which is armed with regular weapons and uses regular military equipment to perform their tasks.

Therefore, a scientific task needs to be solved to develop a methodology for choosing a rational option for applying the border guard quick reaction force in the conditions of restoring control over the state border.

The purpose of the study is to determine the effectiveness of the actions of the PCSR in the conditions of restoring control over the SB through the rational distribution of elements of the official order.

To develop this methodology in accordance with modeling theory, there is a need for synthesis a structural diagram of the methodology for forming proposals for making decisions on the rational distribution of available forces and means to perform tasks in the conditions of restoring control over the state border.

The structural and logical diagram should reflect the need to achieve a specific goal and solve a scientific problem (Figure 5).

It was determined that at the first stage the research objective is substantiated. The research objective is actualized by the discrepancy between the regulatory and legal support [5–8, 15, 18, 19, 20], the existing methodological developments and the practical application of the border guard quick reaction force in the conditions of restoration of control over the state border. The elimination of this discrepancy will make it possible to solve the pragmatic task, which is formed on the basis of the analysis of the known scientific and methodological apparatus, directive documents on the performance of tasks by border units during the special period. The results of the analysis indicate the current lack of approaches to solving the pragmatic task of the research, which determined its relevance.

The selected structural and logical scheme of the study involves the use of a set of methods to solve partial tasks (Figure 5).

1. The method of comparative target analysis is used to familiarize yourself with the known scientific and methodological apparatus, directive documents on the methods of using the forces and means of the BG QRF in the conditions of restoring control over the SB, and also allows you to establish the main problematic issues that arise during the performance of the required volume of assigned tasks in the conditions of restoring control over the SB.

The method of comparative target analysis makes it possible to identify a discrepancy between the existing need to counter threats that arise during the performance of BG QRF tasks in the conditions of restoring control over the SB (as part of stabilization actions), and the lack of a methodological apparatus that would allow for the formation of a rational distribution of elements of the border guard quick reaction force service order to perform tasks in the specified conditions. Such a discrepancy creates a threat of inefficient use of the available resource and changes (deterioration) of the conditions of the situation in the border guard quick reaction force area of responsibility.

2. Using the generalization method, it is possible to form conclusions regarding the practical and scientific relevance of the methodology under consideration, as well as justify the purpose and scientific objective of the research.

3. The expert evaluation method is used to rank the scale and evaluate in points the factors significant for modeling purposes that have varying degrees of influence on the effectiveness of performing the tasks of the BG QRF in the conditions of restoring control over the SB.

4. Using the method of mathematical modeling, partial and complex models of rational application of the BG QRF in the conditions of restoration of control over the SB are being developed.

5. Analytical methods are used to calculate intermediate indicators for which it is generally recognized that there is an analytical relationship in the form of a mathematical dependence. For example, the ratio of the distance to the average speed of movement of border detachments determines the time of entry into battle against the enemy's SG.

6. Methods of probability theory and mathematical statistics are used to predict the values of the desired indicators in partial models. The application of the method of correlation-regression analysis makes it possible to build models to identify the dependence of the indicator of the ability to perform the required volume of tasks on the actual levels of provision with material resources. The results of the regression model assessment are simultaneously checked for the correctness of practical calculations and the closeness of the correlation relationships of the model parameters, the significance of the correlation relationship and the regression model itself, as well as the adequacy of the model type to the set of initial data using the Fisher criterion.

7. The provisions of the theory of mass service, namely Markov processes with continuous time and discrete states, make it possible to analyze the available statistical data and evaluate the measured values of the main probabilistic parameters of a serviceman of the State Border Guard Service of Ukraine, which affect the bilateral results of the battle (fire contact) at the actual levels of provision of supplies, material means (for example, ammunition). The found probabilistic indicators and the efficiency criterion make it possible to obtain predictive information on the results of the combat mission, taking into account the probable shortage of each type of material means, as well as to quantitatively assess the possible combat losses of the State Border Guard Service of Ukraine, the effectiveness of the actions of each serviceman, and the expected losses of the enemy. Using the idea of the Chebyshev inequality, which is part of the central limit theorem, with a given probability we predict the moment when the level of provision will take on a value less than the established (irreducible). Using the theorem of A. Ya. Khinchin on the conditions for the formation of the simplest flow of events, the compilation and solution of the system of Chapman–Kolmogorov differential equations, we estimate the value of the probability of timely delivery of supplies to each object of task performance (Figure 1).

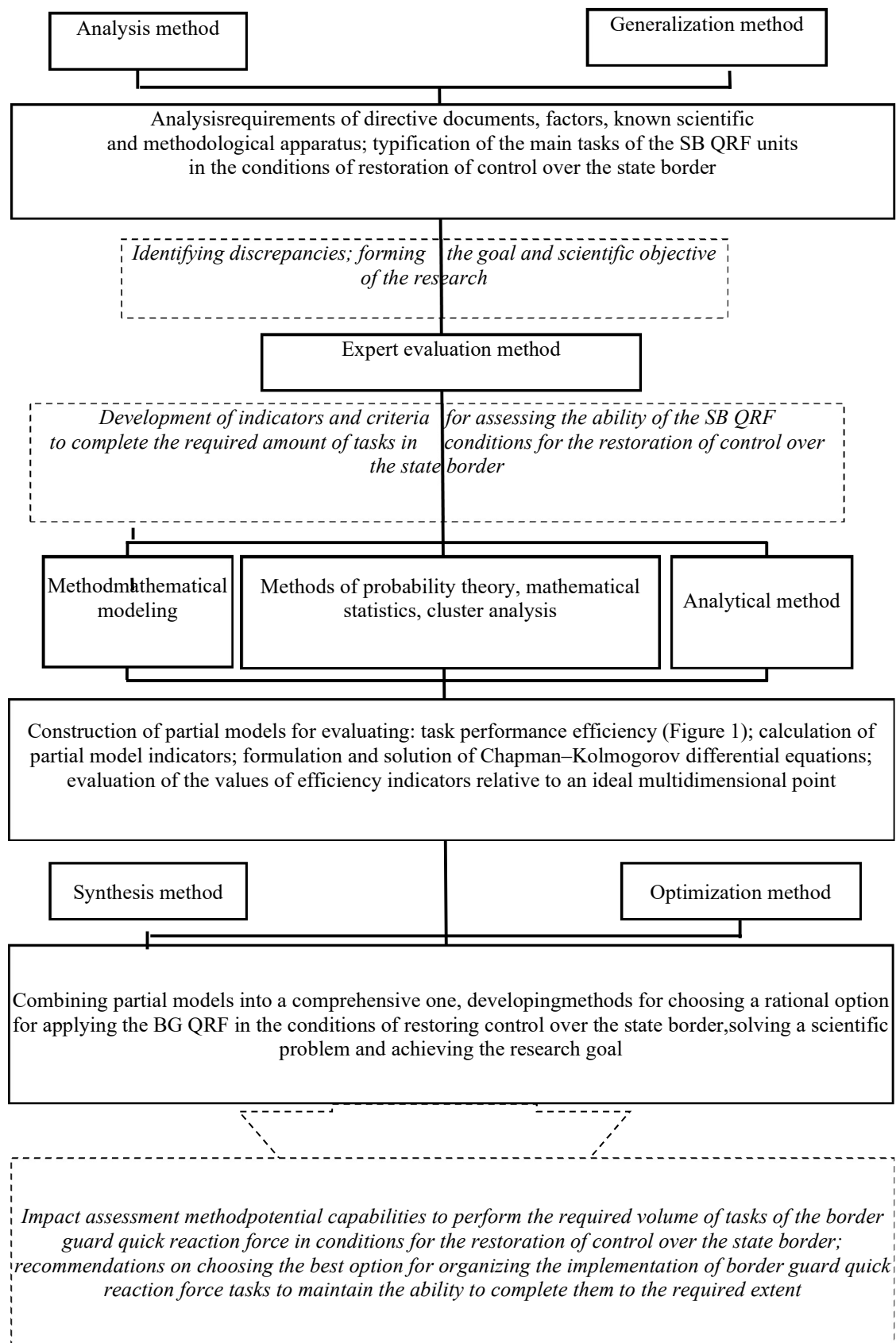


Figure 5 – Structural and logical diagram of the development of a methodology for choosing a rational option for applying the BG QRF in conditions of restoration of control across the state border

8. The taxonomic analysis method is applicable to determine the degree of proximity of the expected result to the ideal.

9. The optimization method makes it possible to formulate recommendations on choosing the best option for using the available forces and means of the Border Guard in the conditions of restoring control over the state border.

10. The synthesis method is used to combine partial models into a comprehensive one and form a methodology for choosing a rational application option, which makes it possible to solve the task of assessing and preserving the possibility of performing the system of tasks (Figure 1) of the Border Guard Service in the conditions of restoring control over the state border by developing recommendations to management bodies.

Conclusions

The features of the participation of the State Border Guard Service units in stabilization actions (operations) in the current conditions are analyzed. The time periods for conducting stabilization actions (operations) are identified. The current regulatory documents on the participation of the State Border Guard Service, in particular the border guard quick reaction force, in stabilization actions and the implementation of tasks to restore control over the state border are studied. The main tasks assigned to the border guard quick reaction force in the conditions of restoring control over the state border are studied.

Attention is focused on the importance of measures to restore control over the state border and border territories of Ukraine, their demining and strengthening work with the local population of the border region, which was under occupation and the influence of Russian propaganda. All of the above are key aspects for the normal development of the security environment in the state.

The structural and logical scheme of developing a methodology for choosing a rational option for applying the border guard quick reaction force in the conditions of restoring control over the state border is substantiated, which involves the use of a set of methods to solve partial tasks. A number of methods have been identified that should ensure their solution during the study. An apparatus has been selected that belongs to the well-known general scientific methods and is relevant to the purpose of the study, and also meets the requirements of reliability and validity.

A further direction of scientific research is considered the development of the model is underway rational use of border commandant's office of rapid response to perform tasks in the context of restoring control over the state border.

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ОБҐРУНТУВАННЯ СТРУКТУРНО-ЛОГІЧНОЇ СХЕМИ РОЗРОБЛЕННЯ МЕТОДИКИ ВИБОРУ РАЦІОНАЛЬНОГО ВАРІАНТА ЗАСТОСУВАННЯ ПРИКОРДОННОЇ КОМЕНДАТУРИ ШВИДКОГО РЕАГУВАННЯ В УМОВАХ ВІДНОВЛЕННЯ КОНТРОЛЮ ЗА ДЕРЖАВНИМ КОРДОНОМ

Здійснено аналіз участі підрозділів Державної прикордонної служби України у стабілізаційних діях (операціях). Стабілізаційні дії військ розглянуто як форму воєнних дій, спрямованих на стабілізацію обстановки у кризових районах, підтримання безпеки і стабільності, а також створення умов, що унеможливають ескалацію воєнного конфлікту. Зроблено висновок, що вони як складники стабілізаційних, оборонних, наступальних (контрнаступальних) операцій можуть проводитися в умовах надзвичайного і воєнного стану, а також у частково відбудовний період.

Результати дослідження свідчать, що головна мета стабілізаційних операцій у прикордонних районах полягає у відновленні контролю над неконтрольованою ділянкою державного кордону силами й засобами існуючих або новостворених прикордонних загонів із використанням резервів Державної прикордонної служби України. Відновлення контролю за державним кордоном є процесом,

спрямованим на нейтралізацію загроз, відновлення ефективного контролю та управління кордоном після кризових ситуацій або загроз для національної безпеки.

Обґрунтовано необхідність розроблення методики вибору раціонального варіанта застосування прикордонної комендатури швидкого реагування для ефективної організації оперативно-службової діяльності в умовах відновлення контролю за державним кордоном. Сформульовано мету дослідження – підвищення ефективності дій прикордонних підрозділів в умовах відновлення контролю за державним кордоном шляхом раціонального розподілу елементів службового порядку. Це потребує синтезу структурної схеми методики вибору раціонального варіанта застосування прикордонної комендатури швидкого реагування в умовах відновлення контролю за державним кордоном. Розроблено структурно-логічну схему методики вибору раціонального варіанта застосування прикордонної комендатури швидкого реагування в умовах відновлення контролю за державним кордоном, яка передбачає використання сукупності методів для вирішення часткових завдань. Визначено низку методів, котрі мають забезпечити вирішення цих завдань під час дослідження, а також апарат, який належить до відомих загальнонаукових методів і є релевантним щодо мети дослідження та відповідає вимогам надійності й достовірності.

Ключові слова: структурно-логічна схема, методика, раціональне застосування, оперативно-службова діяльність, стабілізаційні дії, підрозділи Державної прикордонної служби України, прикордонна комендатура швидкого реагування, державний кордон, відновлення контролю за державним кордоном.

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