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### **PROBLEMATIC ISSUES IN THE ACTIVITIES OF SECURITY FORCES MANAGEMENT BODIES IN PLANNING SEARCH OPERATIONS IN SETTLEMENTS ON THE DEOCCUPIED AREAS OF UKRAINE: SOLUTIONS**

*The author investigates and highlights the problematic situations in the activities of security forces management bodies that arise in the course of planning and searching activities in settlements. It is emphasized that during the de-occupation of the Ukrainian territories and after-war period, one of the tasks of the security forces will be to search for armed criminals in populated areas. The known methods of searching, potential combat orders used in this regard were analyzed. It is established that exploitation of known search methods and related combat orders is impossible in settlements due to their network structure and certain building density.*

*The author offers to conduct search actions in settlements by searching groups, the aggregate of which will be a certain multi-agent system. Routes of movement of each agent are preliminary optimized. They give an opportunity to reach the aim of such a system – to find armed criminals. Taking into account the consideration of tactics, certain requirements concerning routing search groups and appropriate principles are formulated.*

**Keywords:** armed criminals, settlement, search, search methods, routes of searching, searching group, method.

**Statement of the problem.** Given the significant scope of service and combat tasks entrusted to the National Guard of Ukraine (NGU) [1], and its crucial role in ensuring the proper state of law and order and public security at the national and regional levels, it is important to improve the tactics of the NGU units (formations) during special operations (SO) in populated areas.

The experience of local wars and armed conflicts of our time, the conditions in which the russian-Ukrainian war in our country has been going on for the third year already [2], have outlined this trend. The actions of military (special) units in populated areas account for a significant share of the total number of all SOs. Detailing the service-combat (combat) tasks performed by the units and military units of the NGU in a full-scale war, analyzing the governing documents [1, 3, 4, 5] and predicting the direct participation of the NGU in the de-occupation of Donbas and other occupied territories of Ukraine, we can state that one of the ways for the NGU units (formations) to fulfill their tasks within the framework of the SO will be to search for representatives of illegal armed groups (IAGs), enemy sabotage and reconnaissance groups (SRGs), individual servicemen of the armed forces of the russian federation who are hiding, collaborators, etc. (hereinafter referred to as armed criminals).

Currently, there are detailed tactics for searching for armed criminals who have escaped from custody and are hiding in buildings and structures, and search methods for criminals (saboteurs, militants, etc.) in forested and mountainous areas have been revealed. The tactics of conducting a general military battle in urban areas have been studied quite fully. However, the issues of creating groups of forces and means, planning and organizing large-scale search operations for armed criminals in a settlement have not been fully developed. Even the widespread and frequently used term "mopping up", which is used to refer to large-scale search operations, is of a slang nature and is not used in the guiding documents regulating the service and combat activities of the NGU.

Thus, the need to improve the tactics of the NGU units (formations) during the search for armed criminals in populated areas, the lack of development of the theoretical foundations for planning and preparing search operations in populated areas make it important to develop these issues scientifically. In the context of the liberation of the occupied territories of Kharkiv, Luhansk, Donetsk, Zaporizhzhia and Kherson regions of Ukraine, the aspects of implementing modern approaches to developing rational options for search operations in populated areas by units (formations) of the NGU are of particular importance.

**Analysis of recent research and publications.** T. A. Sutyushev, P. V. Pistriak, V. Y. Panchenko, V. V. Obriadin, V. V. Kolyanda and others [6–11] dealt with the issues related to the study of the procedure for organizing and conducting a search for armed criminals by units and units of the former internal troops of the Ministry of Internal Affairs of Ukraine, and later the National Guard of Ukraine, in closed (rough) terrain.

V. I. Baratiuk, O. V. Lazorenko, V. B. Korchev [12, 13] considered the organization of the fight against enemy sabotage and reconnaissance group in the border area in their works.

On the Internet, one can find a considerable amount of methodological material, guidelines and articles on conducting "mopping ups" and assault operations in settlements (buildings and structures) [14, 15]. These materials contain subjective opinions, certain contradictions, and they are based on the personal experience of participants in armed conflicts.

The authors S. M. Banakh, V. R. Bulachek, Y. R. Yosypiv and others [16], as well as A. V. Sliusarenko [17] in their works use the term "mopping up" in the context of search operations in buildings, premises, structures, trenches, etc.

Thus, the analysis of special literature, guidance documents, as well as the authors' own experience of this article indicate that the issues of planning (development of search options) and tactics of the NGU units (formations) during the search for armed criminals in populated areas are not sufficiently developed.

**The purpose of the article** is to highlight the problematic situation in the activities of the military command and control bodies of the National Guard of Ukraine when planning search operations in settlements and to identify the ways to eliminate it.

**Summary of the main material.** After analyzing the current legislation, in particular, the statutes of the Armed Forces of Ukraine, we can conclude that stabilization measures will be carried out in the form of military operations to stabilize and control the situation in the de-occupied territories, as well as in the process of reintegration of these territories in order to ensure the safety of the population and return the territories to the jurisdiction of Ukraine [18].

It should be noted that recently the number of functions of the NGU defined by the relevant Law of Ukraine has not decreased, but rather the functions of the NGU have been expanded, and some of them have been set out in a new version (such changes were made in 2015, 2018, 2021 and 2023) [1]. However, one of the main functions of the NGU remains participation in special operations to neutralize armed criminals, to combat the sabotage and reconnaissance forces of the aggressor (enemy), to stop the activities of paramilitary or armed groups (groups) not provided for by law, organized groups and criminal organizations on the territory of Ukraine, as well as in measures related to the suppression of terrorist activities.

In fact, similar tasks are also spelled out in the NGU doctrinal document "Doctrine of the National Guard of Ukraine" [5], which defines the basic principles of the NGU, outlines its main approaches to performing tasks as a component of the security and defense sector of Ukraine, and introduces the main provisions of AJP-01 Allied Joint Doctrine, Edition F, Version 1 (STANAG 2437), December 2022.

In particular, the Doctrine states that the forces and means of the NGU, which are part of the joint forces grouping, can independently or in cooperation with other components of the defense forces perform tasks to neutralize armed criminals, stop the activities of paramilitary or armed groups (groups), organized criminal groups and organizations not provided for by law.

In the course of performing such tasks, the NGU formations use various methods of action, namely their sequential or parallel combination according to a certain logic in order to achieve the goals of the operation. One of the methods of such actions is the search for armed criminals.

Usually, search as a method of action is understood as the actions of military units, subdivisions, consolidated detachments, which consist in identifying the location of criminals, saboteurs, armed groups, illegal armed groups, victims of accidents, disasters, natural disasters in a given area, as well as in identifying and seizing items belonging to them that may be material evidence [19].

Unfortunately, there is still any guiding document of the NGU that would fully regulate all aspects of planning and organizing search operations.

The Statute of the Combat Service of Special Units of the Internal and Convoy Protection Troops [4], which remains in force, defines the rights and duties of technicians performing the relevant tasks as assigned, and regulates a number of aspects, including tactics, discipline, interaction and responsibility of officials. With regard to the procedure for conducting searches, this Statute specifies only the types of searches: continuous and selective (Figure 1).

Thus, during a continuous search, the entire area in which criminals (the enemy) are known to be hiding or objects belonging to them are examined. During a selective search, individual objects, directions, areas where criminals (the enemy) are most likely to be located or items belonging to them are examined.

The Statute identifies the following methods of searching:

Unilateral – simultaneous advancement of search units in one direction within the borders of the lanes designated for them. It is used in a blocked area;

Two-way – counter advancement of search units within the designated lanes. It is used in a blocked area;

Search by directions – conducted by search units in the directions (places) of the alleged location of criminals. It is used in a non-blocked area;

Search by areas – conducted in cases where a simultaneous inspection of the entire search area is excluded due to insufficient forces and means or when difficult obstacles cross the terrain in the search area. It is used in an unblocked area;

Search by object – used in settlements to inspect individual buildings and farms by search units in case of receipt of operational information about the presence of search objects there.

It is used in unblocked areas;

Combined – when several search methods are used simultaneously to search for armed criminals. It depends on the availability of forces and means in the operation, the nature of the terrain and other situational conditions [4].

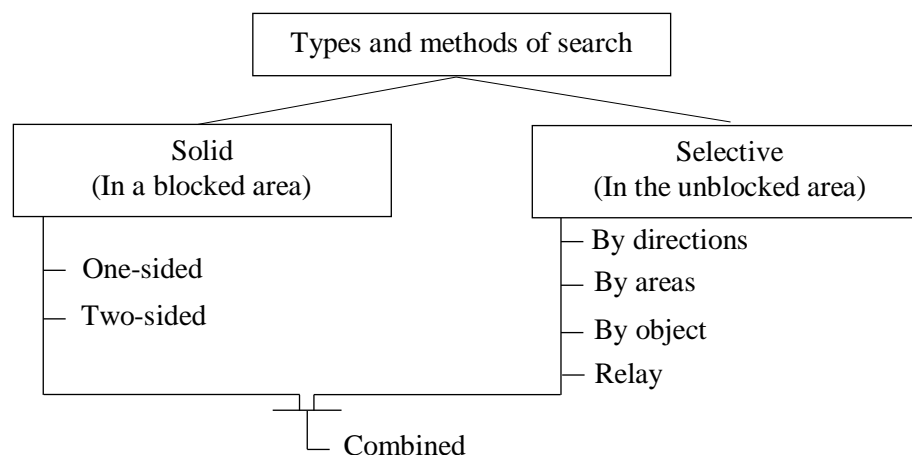


Figure 1 – Classification of known methods of searching for armed criminals

The authors of [6, 8] distinguish another search method – relay search, the essence of which is the sequential introduction of "fresh" search groups into the search (passing the so-called baton, hence the name of the method) to maintain a high rate of progress in highly rough (mountainous) terrain and when the route of movement of armed criminals is known (predicted) or by their traces.





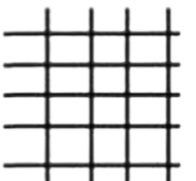
It should be noted that virtually all search methods (except for the "by object" method) are designed to be used in closed (rough) terrain (hilly, marshy, forest, mountains, etc.). Among the combat formations used in this case are the following: single line chain; two-line chain; search group line; "rhombus" and others (depending on the chosen search method and the conditions).

If a senior officer has assigned the task of searching for armed criminals in a settlement, then the "object-based" search method can be used. This method is usually used when the location of the armed criminals within the settlement is precisely established. If the location of armed criminals is not established, but only reliable operational information about their presence in a certain locality is available, then the search methods presented in Figure 1 are not suitable for the search task. This unsuitability is due to the tactical features of these search

methods, the combat orders used, and most importantly, the network structure of settlements. It is worth noting that each settlement has its own characteristic features, inherent structure, and building density, which must be taken into account when organizing and conducting search operations (combing) (Table 1).

A settlement is a densely populated place of residence formed because of historical traditions, economic and other activities, with a stable population, its own name and a separate territory with boundaries established in accordance with the procedure prescribed by law. The study of the characteristic features and the most important features of a settlement is one of the important conditions for the effective performance of search actions (sweeping).

Table 1 – Typical structures for the organization of settlements

Name	Typical View	Features
1. Free (chaotic) structure		It is characteristic of old settlements with a disorganized street road network. Narrow, curved streets with frequent intersections characterize it, which is a serious obstacle to the organization of search operations (sweeping). Basic structure for most settlements
2. Radial structure		It is typical for old settlements that have not been redeveloped and have not been further developed. This street structure has a negative impact on search operations (sweeping) due to its low capacity, especially in the central part of the city, where all the main streets converge, due to the lack of ring-like connections linking radial streets, and the maneuverability of search teams is limited
3. Radial-ring structure		The layout facilitates search operations (sweeping) from several directions, converging from the outskirts of the settlement to the center along the main streets. Roads lead from the periphery of the settlement to the center along ray lines that gather in the central ring
4. Beam (fan) structure		Mainly in the central parts of large settlements in combination with other systems
5. Rectangular or checkerboard structure		It is typical for most new cities. Main streets in two mutually perpendicular directions form the structure. In these structures, the territory of the settlement is divided into approximately the same type of blocks with wider streets, squares and parks, which increase the capabilities of search teams, as well as facilitate the organization of the observation and fire system in cases of fire resistance

It is the network organization of the structure of settlements that determines that the combat order of the unit assigned to conduct the search will be forced to split into several search groups, which will be forced to move separately from each other along different streets along certain routes in order to cover as many objects of inspection as possible. Thus, in populated areas, the actions of a search unit will fully resemble the actions of a

multi-agent system (MAS), in which each agent (in this case, a search group) will act according to a specific algorithm. The joint actions of individual agents will provide the general logic of the MAS functioning to achieve the goal of such a system, in this case, to find armed criminals as quickly and reliably as possible.

Thus, in the course of planning search operations in a settlement (developing options for such operations), the activities of the military command and control body of the security forces face a problematic situation, which is the impossibility of reasonably determining the rational option for combing a settlement without the use of the appropriate scientific and methodological apparatus (proper tools). If we analyze the problematic situation in detail, we should highlight the following aspects:

- the difficulty of quickly determining sufficient forces and means to effectively comb a particular settlement is a direct task to be solved. This aspect may become much more complicated in the course of the task, as it may involve combing (searching for armed criminals) in parallel (simultaneously) or sequentially in several small settlements within a specified period of time;

- the difficulty of developing a rational variant of combing a settlement given the available (limited) forces. It is worth noting that military command and control bodies will mostly have to solve the problem in this formulation – the inverse problem;

- the difficulty (and in most cases impossibility) of determining the optimal routes for search groups and the number of such routes that together optimize the actions of a group of security forces as an IAS within a particular settlement, given its structure and building density in different areas;

- the difficulty of reasonably determining the appropriate points of entry into the search, points of withdrawal from the search and their (points) number, taking into account the structure of the settlement.

Now we need to focus on the requirements for the routes of movement of search groups in a settlement. The main requirements are as follows.

1. The set of routes should provide the most complete survey of the settlement in one "wave" of sweeping. This strategy of MAS behavior will be written in the form of a target functionality (without specifying a number of restrictions):

$$F = \sum_{i=1}^n O_i \rightarrow \max,$$

where  $O_i$  – is the amount of checking objects on  $i$ -route of movement;

$n$  – is the amount of possible routes of movement for search groups in a frame of network structure.

The requirement is dictated by the need to ensure that armed criminals are found in one pass of search teams from one side of the settlement to its opposite side in order to avoid unnecessary time spent on repeated actions within the same settlement (Figure 2).

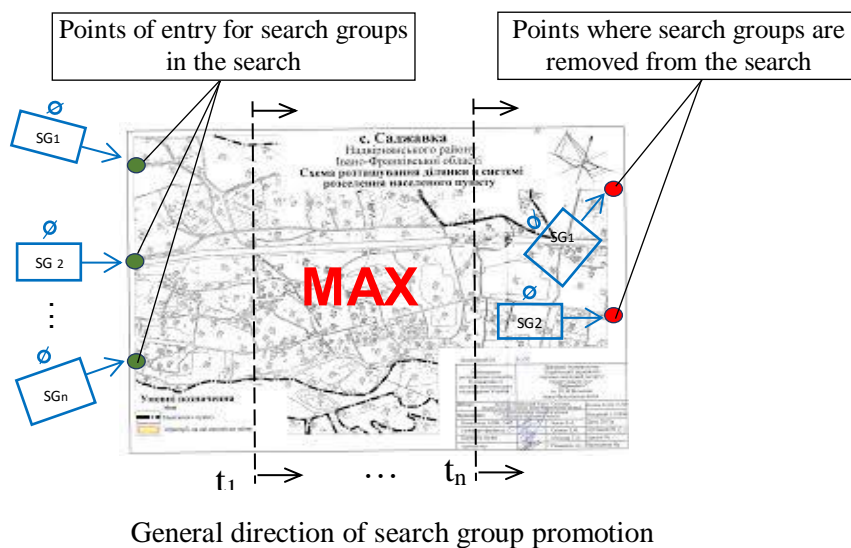


Figure 2 – Sweeping the settlement along certain routes in one "wave"



2. Different groups should not review the same areas of the settlement repeatedly (in this case, the principle of "check and cross out" should be followed). The requirement is dictated by the need to ensure maximum productivity of the created group of security forces in the course of search activities (Figure 3, *a*). In this case, the number of buildings will characterize productivity and households (places of possible hiding of armed criminals) checked within a certain period of time.

3. Search teams should not interfere with each other by moving simultaneously along the same sections of the transportation network of the settlement (in this case, the principle of "one search team – one section" should be followed) (Figure 3, *b*). The requirement is dictated by the same considerations as in paragraph 2.

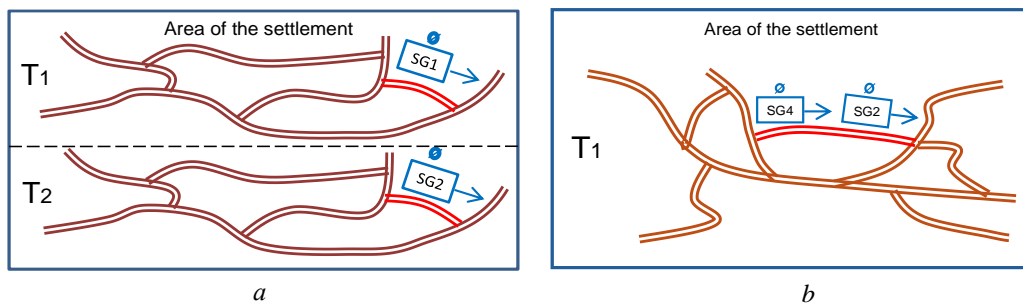


Figure 3 – Situations that should not occur when search teams are moving through a settlement:

- a* – the same areas should not be viewed at different times T1 and T2;
- b* – at a certain point in time T1, several search groups should not move through the area

The nature of the problem situation described in this article, as well as the requirements for the routes of search groups, suggest the need for routing for different search groups at the stage of planning search operations. Routing will consist in determining all possible edge-simple longest paths from the initial to the final boundary specified by the commander of the security forces group within the structure of a certain settlement.

The nature of the above problem situation also indicates that its elimination may be the subject of research within the scientific specialty 251 "State Security". The result of the research should be a method of routing search groups in the conditions of a settlement. In case of a positive result, it will be possible to confidently assert a contribution to the theory of service and combat activities of the NGU, which will consist in expanding the list of search methods with a new method – "search along established routes".

## Conclusions

Summarizing the materials of the article, we can draw the following conclusions.

1. The peculiarities of the theater of the Russian-Ukrainian war show that a significant part of the fighting takes place within the boundaries of settlements, which are considered by both the enemy and ally troops as defense centers in which to gain a foothold. In the event of the liberation of the temporarily occupied territories of Ukraine and the rapid withdrawal of the occupation forces of the Russian Federation, a certain number of armed criminals (collaborators, representatives of illegal armed groups, enemy sabotage and reconnaissance forces, and criminals) will remain in the settlements on this territory. The security forces will be tasked with searching for this category of criminals in the settlements.

2. The known search methods were mainly developed for use in rough terrain, which to some extent complicates their use in settlements due to the combat orders used, the network structure of settlements and the different building density of different areas. This state of affairs in the theory of service and combat use of the National Guard of Ukraine creates a problematic situation in the activities of military command and control bodies during planning and conducting search operations in populated areas.

3. This problematic situation in the activities of the security forces can be eliminated by introducing a new method of search – "search along established routes" – into the theory and practice of service and combat activities of the National Guard of Ukraine and other components of the security forces. A prerequisite for this is the development of a method of routing search groups for combing settlements.

Further research will be aimed at formalizing the routing problem, substantiating and developing a set of indicators and criteria, and developing an appropriate method.

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**ПРОБЛЕМНІ ПИТАННЯ У ДІЯЛЬНОСТІ ОРГАНІВ УПРАВЛІННЯ  
СИЛ БЕЗПЕКИ ПІД ЧАС ПЛАНУВАННЯ ПОШУКОВИХ ДІЙ  
У НАСЕЛЕНИХ ПУНКТАХ НА ДЕОКУПОВАНІЙ ТЕРИТОРІЇ УКРАЇНИ:  
ШЛЯХИ ВИРІШЕННЯ**

*Досліджено і висвітлено проблемну ситуацію у діяльності органів управління сил безпеки, яка виникає у ході планування та під час проведення пошукових заходів у населених пунктах. Наголошено, що у ході деокупації територій України та у післявоєнний період одним із завдань сил безпеки буде пошук озброєних злочинців саме у населених пунктах. Проаналізовано відомі способи проведення пошуку, можливі бойові порядки, які при цьому застосовуються. Установлено, що застосування відомих способів пошуку і притаманних їм бойових порядків є неможливим в умовах населених пунктів через їхню мережеву структуру та певну щільність забудови. Розглянуто і проаналізовано різні структури організації населених пунктів.*

*У статті доводиться, що саме мережева організація структури населених пунктів зумовлюватиме те, що бойовий порядок підрозділу, призначеного для проведення пошуку, вимушено дробитиметься на кілька пошукових груп, які окремо одна від одної просуватимуться різними вулицями за певними маршрутами з метою охоплення якомога більшої кількості об'єктів перевірки. Ці об'єктивні аспекти вимагають проводити маршрутизацію пошукових груп на мережевому об'єкті, яким є населений пункт.*



*Розроблено цільову функцію оптимізації маршрутів руху пошукових груп: максимум об'єктів перевірки на маршрутах руху за одну «хвилю» пошуку.*

*Сукупність пошукових груп розглядається як певна мультиагентна система, ефективність функціонування якої залежатиме від дії кожного агента. Унаслідок проведеної маршрутизації маршрути руху агентів будуть оптимізовані й у сукупності підвищуватимуть імовірність досягнення мети функціонування такої системи – знаходження озброєних злочинців.*

*З урахуванням міркувань тактики сформульовано низку вимог до маршрутів руху пошукових груп, а також певні принципи їх маршрутизації в умовах населеного пункту.*

*Запропоновано розширити теорію і практику службово-бойової діяльності Національної гвардії України новим способом пошуку – «пошук за встановленими маршрутами».*

**Ключові слова:** озброєні злочинці, населений пункт, пошук, способи пошуку, маршрути пошуку, пошукова група, метод.

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