

КИЇВСЬКИЙ ІНСТИТУТ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ

НАУКОВИЙ ВІСНИК КИЇВСЬКОГО ІНСТИТУТУ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ № 1 (8) 2026

Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine

Засновник – Київський інститут Національної гвардії України.

Видається з грудня 2022 р. *Періодичність* – двічі на рік.

Свідомство про державну реєстрацію друкованого засобу інформації

КВ № 25202-15142 Р від 03.08.2022 р.

ROR видавця: <https://ror.org/01q3vqr85>, DOI-prefix: 10.59226.

Кластер – Національна безпека та оборона.

Наукове видання внесено до Реєстру суб'єктів у сфері медіа. Ідентифікатор медіа у Реєстрі R30-01116 (рішення Національної ради України з питань телебачення та радіомовлення № 53 від 01.09.2023 р.).

Видання входить до категорії «Б» Переліку наукових фахових видань України у кластері «Національна безпека та оборона» відповідно до наказу Міністерства освіти і науки від 11.06.2026 р. № 928 за спеціальностями: К1 – Державна безпека, К5 – Військове управління (за видами Збройних Сил), К6 – Забезпечення військ (сил), К7 – Озброєння та військова техніка, К9 – Правоохоронна діяльність.

*Рекомендовано до друку та розміщення у мережі Інтернет
вченою радою КІ НГУ, протокол № 17 від 28.05.2026 р.*

Науковий вісник Київського інституту Національної гвардії України. Київ : КІ НГУ, 2026. № 1 (8). 260 с.

Напрями: теоретичні та прикладні аспекти забезпечення державної безпеки; військове управління та всебічне застосування і забезпечення військ (сил); створення, розвиток, експлуатація та відновлення озброєння, військової і спеціальної техніки; правоохоронна діяльність суб'єктів сектору безпеки і оборони в умовах сучасних викликів і загроз.

«Науковий вісник Київського інституту Національної гвардії України» є рецензованим виданням, що підтримує політику відкритого доступу до наукових публікацій.

Електронні копії видання зберігаються у базі даних «Наукова періодика України» Національної бібліотеки України імені В. І. Вернадського <https://surl.li/zjvams>.

Думка редакційної колегії може не збігатися з поглядами авторів матеріалів. За достовірність фактів, цитат, власних назв, посилань на використані джерела та інших відомостей відповідають автори наукових статей. У разі цитування посилання на журнал є обов'язковим.

Контакти редакції: вул. Оборони Києва, 7, м. Київ, 03179, Україна, +380660578940

Вебсайт видання: kingu-visnyk.kyiv.ua, email: visnyk_kingu@ukr.net

KYIV INSTITUTE OF THE NATIONAL GUARD OF UKRAINE

S C I E N T I F I C
B U L L E T I N
OF THE KYIV INSTITUTE
OF THE NATIONAL GUARD OF UKRAINE
No. 1 (8) 2026

Науковий вісник Київського інституту Національної гвардії України

It was founded by – Kyiv Institute of the National Guard of Ukraine.

It is published since December 2022. Frequency – twice a year.

Certificate of state registration of the printed media

KB No. 25202-15142 P dated 03.08.2022.

Publisher ROR: <https://ror.org/01q3vqr85>, DOI prefix 10.59226.

Cluster – National Security and Defense.

Amendments to the register of media entities – registrants No. 53 dated 09.01.2023 of the National Council of Ukraine on Television and Radio Broadcasting Register ID – R30-01116.

The publication is included in category "B" of the List of Scientific Professional Publications of Ukraine in accordance with the order of the Ministry of Education and Science of Ukraine dated 11.06.2026 No. 928 in the following specialties: K1 – State Security, K5 – Military Administration (by types of armed forces), K6 – Provision of Troops (Force), K7 – Armament and Military Equipment, K9 – Law Enforcement Activities.

*Recommended for publication and posting on the Internet
by the Academic Council of the KI NGU, protocol No. 17 of 28.05.2026.*

Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine. Kyiv : KI NGU, 2026. No. 1 (8). 260 p.

Topics: theoretical and applied aspects of ensuring state security; military management and comprehensive use and support of troops (forces); creation, development, operation and restoration of weapons, military and special equipment; law enforcement activities of security and defense sector entities in the context of modern challenges and threats.

The "Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine" is a peer-reviewed publication that supports the policy of open access to scientific publications.

Electronic copies of the Scientific Bulletin are stored in the "Scientific Periodicals of Ukraine" database of the Vernadsky National Library of Ukraine <https://surl.li/zjvams>.

The editorial board's opinion may not coincide with the authors' views of the materials. The authors of scientific articles are responsible for accurate facts, quotations, proper names, references to sources and other information. When quoting, reference to the Scientific Bulletin is mandatory.

Contacts of the editorial board: 7 Oborony Kyieva Str., Kyiv, 03179, Ukraine, +380660578940.

Website: kingu-visnyk.kyiv.ua, email: visnyk_kingu@ukr.net

РЕДАКЦІЙНА КОЛЕГІЯ

Полуніна Лілія Валентинівна, кандидат юридичних наук, доцент, Київський інститут Національної гвардії України (Україна) – *голова редакційної колегії*;

Власюк Валерій Васильович, кандидат військових наук, доцент, Київський інститут Національної гвардії України (Україна) – *заступник голови редакційної колегії*;

Медвідь Михайло Михайлович – доктор економічних наук, професор, Київський інститут Національної гвардії України (Україна);

Титаренко Олексій Олексійович, доктор юридичних наук, доцент, Київський інститут Національної гвардії України (Україна);

Дем'янишин Володимир Миколайович, кандидат педагогічних наук, доцент, Київський інститут Національної гвардії України (Україна);

Бацамут Володимир Миколайович, доктор військових наук, професор, Національна академія Національної гвардії України (Україна);

Баулін Дмитро Станіславович, кандидат технічних наук, доцент, Національна академія Національної гвардії України (Україна);

Горєлишев Станіслав Анатолійович, кандидат технічних наук, доцент, Національна академія Національної гвардії України (Україна);

Тушко Клавдія Юріївна, доктор педагогічних наук, професор, Національна академія Державної прикордонної служби України імені Богдана Хмельницького (Україна);

Фаріон Олег Борисович, доктор військових наук, професор, Національна академія Державної прикордонної служби України імені Богдана Хмельницького (Україна);

Боруцька Анна, PhD, доктор з цивільного будівництва, транспортування та дослідження безпеки, доцент цивільного будівництва, транспорту та дослідження безпеки, Військовий технологічний університет, Варшава (Польща);

Козіна Андрій, PhD з військових досліджень, доцент, Університет оборони та безпеки імені доктора Франьо Тудмана, Загреб (Хорватія);

Медвідь Юлія Іванівна, кандидат педагогічних наук, старший дослідник, Київський інститут Національної гвардії України (Україна) – *відповідальний секретар редакційної колегії*.

EDITORIAL BOARD

Polunina Liliia, Candidate of of Juridical Sciences, Associate Professor, Kyiv Institute of the National Guard of Ukraine (Ukraine) – *Head of the editorial board*;

Vlasiuk Valerii, Candidate of Military Sciences, Associate Professor, Kyiv Institute of the National Guard of Ukraine (Ukraine);

Medvid Mykhailo, Doctor of Economic Sciences, Professor, Kyiv Institute of the National Guard of Ukraine (Ukraine);

Tytarenko Oleksii, Doctor of Juridical Sciences, Associate Professor, Kyiv Institute of the National Guard of Ukraine (Ukraine);

Demianyshyn Volodymyr, Candidate of Pedagogical Sciences, Associate Professor, Kyiv Institute of the National Guard of Ukraine (Ukraine);

Batsamut Volodymyr, Doctor of Military Sciences, Professor, National Academy of the National Guard of Ukraine (Ukraine);

Baulin Dmytro, Candidate of Technical Sciences, Associate Professor, National Academy of the National Guard of Ukraine (Ukraine);

Horielyshev Stanislav, Candidate of Technical Sciences, Associate Professor, National Academy of the National Guard of Ukraine (Ukraine);

Tushko Klavdiia, Doctor of Pedagogical Sciences, Professor, Bohdan Khmelnytskyi National Academy of the State Border Guard Service of Ukraine (Ukraine);

Farion Oleh, Doctor of Military Sciences, Professor, Bohdan Khmelnytsky National Academy of the State Border Guard Service of Ukraine;

Borutska Anna, PhD in Civil Engineering, Transportation and Security Studies, Associate Professor, Military University of Technology, Warsaw (Poland);

Kozina Andriy, PhD in Military Studies, Associate Professor, Dr. Franjo Tuđman University of Defence and Security, Zagreb (Croatia);

Medvid Yuliia, Candidate of Pedagogical Sciences, Senior Researcher, Kyiv Institute of the National Guard of Ukraine (Ukraine) – *Executive secretary*..

ЗМІСТ

АРТЮШЕНКО Олександр, МОРОХОВСЬКИЙ Микола, БРЯНКІН Андрій ДОДАТКОВИЙ АЛГОРИТМ ПРИЙНЯТТЯ ТАКТИЧНОГО РІШЕННЯ КОМАНДИРОМ У БОЙОВІЙ ОБСТАНОВІЦІ З УРАХУВАННЯМ ВИМОГ МІЖНАРОДНОГО ГУМАНІТАРНОГО ПРАВА: ДОТРИМАННЯ ПРИНЦИПУ ПРОПОРЦІЙНОСТІ	8
БАБАК Сергій, БАРКАТОВ Ігор, КРАСОВСЬКИЙ Павло КОНЦЕПЦІЯ ТА АРХІТЕКТУРА ГЕНЕРАТОРА ТАКТИЧНИХ СЦЕНАРІЇВ ДЛЯ ВІЙСЬКОВИХ СИМУЛЯЦІЙ ІЗ ВИКОРИСТАННЯМ АЛГОРИТМІВ ШТУЧНОГО ІНТЕЛЕКТУ	16
ВАСИЛЬЄВ Микола, РЕПЕНКО Олександр ЗАСТОСУВАННЯ ТАКТИКИ МАЛИХ ГРУП ПІДРОЗДІЛАМИ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ: ДОСВІД РОСІЙСЬКО-УКРАЇНСЬКОЇ ВІЙНИ	29
ВЛАСЮК Валерій, НАГОРНИЙ Роман УДОСКОНАЛЕННЯ ПРОЦЕСУ ПОБУДОВИ БОЙОВОГО ПОРЯДКУ ДЛЯ ВЕДЕННЯ НАСТУПАЛЬНОГО БОЮ СИЛАМИ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ	39
ГАЛАЙ Вікторія, КОРЕНЬ Денис ТРАНСФОРМАЦІЯ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ В КОНТЕКСТІ ЄВРОАТЛАНТИЧНОЇ ІНТЕГРАЦІЇ: УПРОВАДЖЕННЯ СТАНДАРТІВ НАТО Й ДОСЯГНЕННЯ ВЗАЄМОСУМІСНОСТІ	47
ГОНЧАРЕНКО Олександр, КІЗЯН Руслан, МАНЖОС Олексій ВИЯВЛЕННЯ ДЖЕРЕЛ ІОНІЗУЮЧОГО ВИПРОМІНЮВАННЯ, РАДІОАКТИВНИХ МАТЕРІАЛІВ ТА ІНШИХ ОБ'ЄКТІВ З ОЗНАКАМИ РАДІАЦІЙНОЇ НЕБЕЗПЕКИ ПОЗА РЕГУЛЯТОРНИМ КОНТРОЛЕМ В УКРАЇНІ ВПРОДОВЖ 2015–2025 РОКІВ	55
ГОНЧАР Андрій ДО ПИТАННЯ ЦИВІЛЬНО-ПРАВОВОГО МЕХАНІЗМУ ВИЗНАННЯ МАЙНОВИХ ПРАВ НА ОБ'ЄКТИ ІНТЕЛЕКТУАЛЬНОЇ ВЛАСНОСТІ, СТВОРЕНІ ВІЙСЬКОВОСЛУЖБОВЦЯМИ ПІД ЧАС ПРОХОДЖЕННЯ СЛУЖБИ	73
ГУТЧЕНКО Катерина, ШУЄНКІН Володимир, КОЗАЧУК В'ячеслав МЕТОДОЛОГІЧНИЙ ПІДХІД ДО ОБҐРУНТУВАННЯ СКЛАДУ СИЛ І ЗАСОБІВ СИСТЕМИ МЕДИКО- ПСИХОЛОГІЧНОЇ РЕАБІЛІТАЦІЇ ОСОБОВОГО СКЛАДУ ВІЙСЬКОВИХ ФОРМУВАНЬ	80
ДРУЧЕК Олена, ВОЛУЙКО Олексій ПРАВОВА БЕЗПЕКА: ПОНЯТІЙНИЙ КОНЦЕПТ, ОЗНАКИ, ПРИНЦИПИ	88
КОВАЛЬОВА Тетяна ОРГАНІЗАЦІЙНО-ПРАВОВІ ЗАСАДИ ЗАПОБІГАННЯ І ПРОТИДІЇ ВІЙСЬКОВІЙ ЗЛОЧИННОСТІ В УМОВАХ ВОЄННОГО СТАНУ	96
КОЗАЛЄТОВ Віталій МЕТОДИКА ОБҐРУНТУВАННЯ СКЛАДУ УГРУПОВАННЯ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ ДЛЯ ПРОЧІСУВАННЯ НАСЕЛЕНОГО ПУНКТУ НА ДЕОКУПОВАНИЙ ТЕРИТОРІЇ	108
МАРЧЕНКО Максим ПРАВОВЕ РЕГУЛЮВАННЯ ПРОТИМІННОЇ ДІЯЛЬНОСТІ: ЕВОЛЮЦІЯ ОТТАВСЬКОЇ КОНВЕНЦІЇ В УМОВАХ НОВИХ ВИКЛИКІВ БЕЗПЕКИ	118
МОРОЗОВ Олександр ЗАДАЧІ УПРАВЛІННЯ ТЕХНІЧНИМ СТАНОМ СКЛАДНИХ ТЕХНІЧНИХ СИСТЕМ	127
МОСКАЛЕЦЬ Валентин, СЕМЕНОВ Микола ОЦІНЮВАННЯ РИЗИКУ ЗАБРУДНЕННЯ ЗЕМЕЛЬ ВИБУХОНЕБЕЗПЕЧНИМИ ПРЕДМЕТАМИ: ПРИКЛАД ЧЕРНІГІВСЬКОЇ ОБЛАСТІ	135
ПАВЛОВ Ярослав, ПІСТРЯК Петро ОСОБЛИВОСТІ ПРОВЕДЕННЯ ДОСЛІДНИЦЬКОЇ ЕКСПЛУАТАЦІЇ РЕЧОВОГО МАЙНА В РЕАЛЬНИХ УМОВАХ	150
ПАВЛЕНКО Сергій, СУКОНЬКО Сергій, ЛУНЬОВ Олексій ФОРМУВАННЯ ПЕРЕЛІКУ ЕЛЕМЕНТІВ РЕЧОВОГО ТА ПРОДОВОЛЬЧОГО ЗАБЕЗПЕЧЕННЯ ВІЙСЬКОВОСЛУЖБОВЦЯ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ ДЛЯ ЯКІСНОГО ВИКОНАННЯ НИМ ЗАВДАНЬ ЗА ПРИЗНАЧЕННЯМ	158

ЗМІСТ

ПОЛУНІНА Лілія КРИМІНАЛІСТИЧНЕ ЗНАЧЕННЯ ІНФОРМАЦІЙНОГО ВИСВІТЛЕННЯ У ЗАСОБАХ МАСОВОЇ ІНФОРМАЦІЇ ФАКТІВ ВОЄННИХ ЗЛОЧИНІВ НА ТЕРИТОРІЇ УКРАЇНИ	175
ПОСМІТНА Вікторія, БОРИСОВ Назар ЦИВІЛЬНО-ВІЙСЬКОВЕ СПІВРОБІТНИЦТВО У ДІЯЛЬНОСТІ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ: МОВНОКОМУНІКАТИВНІ ЧИННИКИ РЕАЛІЗАЦІЇ ПРОФЕСІЙНИХ ЗАВДАНЬ У ПЕРЕГОВОРАХ	182
РОСЛЯКОВ Олексій МЕТОД РОЗРАХУНКУ СТІЙКОСТІ ОБОРОНИ ЯДЕРНИХ УСТАНОВОК ПІДРОЗДІЛАМИ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ	194
ФРАНЧУК Юрій, ОХРІМЕНКО Олександр МЕТОДИ ПСИХОЛОГІЧНОЇ ДОПОМОГИ ТА ПРОФЕСІЙНО-ПСИХОЛОГІЧНОЇ ПІДГОТОВКИ ВІЙСЬКОВОСЛУЖБОВЦІВ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ В УМОВАХ ЗАГРОЗИ ЗАСТОСУВАННЯ FPV-ДРОНІВ	204
ХАЦАЮК Олександр, АНАЦЬКИЙ РУСЛАН, КРИВИЧ Віталій ТЕОРЕТИКО-МЕТОДИЧНІ АСПЕКТИ ВИКОРИСТАННЯ СУЧАСНОГО ТРЕНАЖЕРНОГО ОБЛАДНАННЯ У ФІЗИЧНІЙ ПІДГОТОВЦІ МАЙБУТНІХ ОФІЦЕРІВ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ	212
ЧИГРИНА Галина МЕХАНІЗМ ЗАБЕЗПЕЧЕННЯ ВЗАЄМОДІЇ ПРАВООХОРОННИХ ОРГАНІВ У КОНТЕКСТІ ЄВРОІНТЕГРАЦІЙНИХ ПРОЦЕСІВ В УКРАЇНІ	225
ШАМАРА Олександр, КОМАШКО Володимир, ТИТАРЕНКО Олексій ПІДГОТОВКА КАДРІВ ДЛЯ СИСТЕМИ ОРГАНІВ ПРАВОСУДДЯ В КОНТЕКСТІ РЕАЛІЗАЦІЇ ОКРЕМИХ ПОЛОЖЕНЬ ДОРОЖНЬОЇ КАРТИ З ПИТАНЬ ВЕРХОВЕНСТВА ПРАВА	233
ШАМРУК Олег БОЙОВИЙ ДОСВІД ЯК ФОРМА ІНФОРМАЛЬНОГО НАВЧАННЯ: ПРОБЛЕМИ ВАЛІДАЦІЇ ТА ВИЗНАННЯ У СИСТЕМІ ВІЙСЬКОВОЇ ОСВІТИ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ	243
ЯХНО Ігор, ПАВЛОВ Дмитрій МОЖЛИВОСТІ ТА ПРОБЛЕМНІ ПИТАННЯ ЗАСТОСУВАННЯ РАДІОЕЛЕКТРОННОЇ РОЗВІДКИ ПІД ЧАС ВИКОНАННЯ ЗАВДАНЬ ІЗ ЗАБЕЗПЕЧЕННЯ ГРОМАДСЬКОЇ БЕЗПЕКИ ТА ОХОРОНИ ОБ'ЄКТІВ	253

CONTENTS

ARTIUSHENKO Oleksandr, MOROKHOVSKYI Mykola, BRIANKIN Andrii ADDITIONAL ALGORITHM OF TACTICAL DECISION-MAKING BY A COMMANDER IN A COMBAT SITUATION, TAKING INTO ACCOUNT THE REQUIREMENTS OF INTERNATIONAL HUMANITARIAN LAW: COMPLIANCE WITH THE PRINCIPLE OF PROPORTIONALITY	8
BABAK Serhii, BARKATOV Ihor, KRASOVSKYI Pavlo CONCEPT AND ARCHITECTURE OF A TACTICAL SCENARIO GENERATOR FOR MILITARY SIMULATIONS USING ARTIFICIAL INTELLIGENCE ALGORITHMS	16
VASILIEV Mykola, REPENKO Oleksandr THE USE OF LIGHT INFANTRY UNITS OF THE NATIONAL GUARD OF UKRAINE IN ENEMY CONTAINMENT TACTICS: LESSONS FROM THE RUSSIAN-UKRAINIAN WAR	29
VLASIUK Valerii, NAHORNYI Roman IMPROVEMENT OF THE PROCESS OF BUILDING THE COMBAT ORDER FOR CONDUCTING OFFENSIVE COMBAT BY THE FORCES OF THE NATIONAL GUARD OF UKRAINE	39
HALAI Viktoriia, KOREN Denys TRANSFORMATION OF THE NATIONAL GUARD OF UKRAINE IN THE CONTEXT OF EURO-ATLANTIC INTEGRATION: IMPLEMENTATION OF NATO STANDARDS AND ACHIEVING INTEROPERABILITY	47
GONCHARENKO Oleksandr, KIZIAN Ruslan, MANZHOS Oleksii IDENTIFICATION OF SOURCES OF IONIZING RADIATION, RADIOACTIVE MATERIALS, AND OTHER OBJECTS WITH SIGNS OF RADIATION HAZARD OUTSIDE REGULATORY CONTROL IN UKRAINE IN 2015–2025	55
HONCHAR Andrii ON THE ISSUE OF THE CIVIL-LEGAL MECHANISM FOR RECOGNITION OF PROPERTY RIGHTS TO INTELLECTUAL PROPERTY OBJECTS CREATED BY MILITARY SERVICEMEN DURING THEIR SERVICE	73
HUTCHENKO Kateryna, SHUENKIN Volodymyr, KOZACHUK Viacheslav METHODOLOGICAL APPROACH TO JUSTIFYING THE COMPOSITION OF THE FORCES AND RESOURCES OF THE SYSTEM OF MEDICAL-PSYCHOLOGICAL REHABILITATION OF PERSONNEL IN MILITARY FORMATIONS	80
DRUCHEK Olena, VOLUIKO Oleksii LEGAL SECURITY: CONCEPT, FEATURES, AND PRINCIPLES	88
KOVALOVA Tetiana ORGANIZATIONAL AND LEGAL FOUNDATIONS OF PREVENTING AND COUNTERING MILITARY CRIME UNDER MARTIAL LAW	96
KOZALIETOV Vitalii METHODOLOGY FOR SUBSTANTIATING THE COMPOSITION OF THE GROUP OF THE NATIONAL GUARD OF UKRAINE FOR SCRUBBING A POPULATED POINT IN THE DEOCCUPIED TERRITORY	108
MARCHENKO Maksym LEGAL REGULATION OF MINE ACTION ACTIVITIES: EVOLUTION OF THE OTTAWA CONVENTION IN THE CONTEXT OF NEW SECURITY CHALLENGES	118
MOROZOV Oleksandr TASKS OF MANAGEMENT OF THE TECHNICAL CONDITION OF COMPLEX TECHNICAL SYSTEMS	127
MOSKALETS Valentyn, SEMENOV Mykola ASSESSMENT OF LAND CONTAMINATION RISK BY EXPLOSIVE ORDNANCE: CASE STUDY OF THE CHERNIHIV REGION	135
PAVLOV Yaroslav, PISTRIAK Petro SPECIFIC FEATURES OF EXPERIMENTAL OPERATION OF CLOTHING AND EQUIPMENT UNDER REAL CONDITIONS	150

PAVLENKO Serhii, SUKONKO Serhii, LUNOV Oleksii APPROACHES TO FORMING A LIST OF ELEMENTS OF MATERIAL AND FOOD SUPPLY FOR A MILITARY SERVICEMAN OF THE NATIONAL GUARD OF UKRAINE FOR THE QUALITY PERFORMANCE OF HIS ASSIGNED TASKS	158
POLUNINA Liliia CRIMINALISTIC SIGNIFICANCE OF MEDIA COVERAGE OF WAR CRIMES COMMITTED ON THE TERRITORY OF UKRAINE	175
POSMITNA Viktoriia, BORYSOV Nazar CIVIL–MILITARY COOPERATION IN THE ACTIVITIES OF THE NATIONAL GUARD OF UKRAINE: LINGUISTIC AND COMMUNICATIVE FACTORS OF THE IMPLEMENTATION OF PROFESSIONAL TASKS IN NEGOTIATIONS	182
ROSLIAKOV Oleksii METHOD FOR CALCULATING THE STABILITY OF DEFENSE OF NUCLEAR INSTALLATIONS BY UNITS OF THE NATIONAL GUARD OF UKRAINE	194
FRANCHUK Yurii, OKHRIMENKO Oleksandr METHODS OF PSYCHOLOGICAL ASSISTANCE AND PROFESSIONAL PSYCHOLOGICAL TRAINING OF NATIONAL GUARD OF UKRAINE SERVICEMEN UNDER THE THREAT OF FPV DRONE EMPLOYMENT	204
KHATSAIUK Oleksandr, ANATSKYI Ruslan, KRYVYCH Vitalii THEORETICAL AND METHODOLOGICAL ASPECTS OF USING MODERN TRAINING EQUIPMENT IN THE PHYSICAL TRAINING OF FUTURE OFFICERS OF THE NATIONAL GUARD OF UKRAINE	212
CHYHRYNA Halyna MECHANISM FOR ENSURING INTERACTION OF THE LAW ENFORCEMENT AGENCIES IN THE CONTEXT OF EUROPEAN INTEGRATION PROCESSES IN UKRAINE	225
SHAMARA Oleksandr, KOMASHKO Volodymyr, TYTARENKO Oleksii TRAINING OF PERSONNEL FOR THE JUSTICE SYSTEM IN THE CONTEXT OF IMPLEMENTATION OF CERTAIN PROVISIONS OF THE ROADMAP ON THE RULE OF LAW	233
SHAMRUK Oleh COMBAT EXPERIENCE AS A FORM OF INFORMAL LEARNING: PROBLEMS OF VALIDATION AND RECOGNITION IN THE MILITARY EDUCATION SYSTEM OF THE NATIONAL GUARD OF UKRAINE	243
YAKHNO Ihor, PAVLOV Dmytrii OPPORTUNITIES AND PROBLEMS OF USING RADIO-ELECTRONIC INTELLIGENCE WHEN PERFORMING TASKS IN ENSURING PUBLIC SAFETY AND PROTECTION OF OBJECTS	253



ARTIUSHENKO OLEKSANDR

*Head of the Scientific and Methodological Department for Quality Assurance of Educational Activities and Higher Education of the Military Law Institute, Yaroslav Mudryi National Law University
<https://orcid.org/0000-0002-2831-8518>*



MOROKHOVSKYI MYKOLA

*Associate Professor at the Department of General Military Disciplines of the Military Law Institute, Yaroslav Mudryi National Law University
<https://orcid.org/0009-0000-5116-3529>*



BRIANKIN ANDRII

*Student of the Military Law Institute, Yaroslav Mudryi National Law University
<https://orcid.org/0009-0002-3641-6975>*

ADDITIONAL ALGORITHM OF TACTICAL DECISION-MAKING BY A COMMANDER IN A COMBAT SITUATION, TAKING INTO ACCOUNT THE REQUIREMENTS OF INTERNATIONAL HUMANITARIAN LAW: COMPLIANCE WITH THE PRINCIPLE OF PROPORTIONALITY

This article examines the specifics of tactical decision-making by commanders in combat situations through the lens of international humanitarian law, particularly the principle of proportionality. The relevance of the topic stems from the fact that modern combat operations increasingly take place in urban environments, where military targets, civilian objects, dual-use objects, and the civilian population are in close spatial proximity. Under such conditions, the commander is forced to make decisions within a limited time frame, with incomplete information, and under the influence of dynamic changes in the operational-tactical situation, which significantly complicates proper adherence to the principle of proportionality. This paper substantiates the advisability of further procedural elaboration of this principle through the introduction of a short legal cycle as a special algorithm for assessing the legality of a commander's decision.

The scientific novelty of this study lies in the fact that the principle of proportionality is considered not merely as a general normative requirement, but as a practical tool for command judgment that can be implemented through a systematic procedure of verification, assessment, selection of alternatives, and minimal documentation. The proposed algorithm includes the following interrelated stages: verification of the target's status from the perspective of the principle of distinction; formulation of a specific and direct military advantage; assessment of the civilian environment and risks; prediction of direct and reasonably foreseeable indirect collateral damage; selection of all practically feasible precautionary measures and alternatives; decision-making followed by monitoring of its implementation, and, if necessary, correction or revocation. Particular attention is paid to minimal yet legally significant documentation of the grounds for the commander's decision, which is important for accountability, legal protection of the command, and learning from practical experience.



© O. Artiushenko, M. Morokhovskiy, A. Briankin, 2026

© Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine, 2026

The practical value of the article lies in the possibility of using the proposed algorithm in the educational process, during the training of commanders and staff, as well as in the further development of standardized decision-making cards for various types of combat situations.

Keywords: *international humanitarian law; the principle of proportionality; tactical decision-making; commander's discretion; collateral damage; military advantage; precautionary measures; distinction; decision documentation; supplementary algorithm.*

Statement of the problem. A commander's tactical decision-making in a combat environment requires the simultaneous achievement of two interconnected goals: ensuring military necessity – meaning the attainment of a specific combat result – and complying with the norms of international humanitarian law (hereinafter referred to as IHL). In practice, such decisions are made under time constraints, incomplete intelligence, rapidly changing tactical situations, and intense information operations.

An additional risk factor is the urbanization of warfare, where military objectives, civilian populations, and infrastructure are spatially intertwined, and a significant portion of objects acquires dual-use characteristics. Striking these objects can cause collateral damage to the civilian population due to disruptions in the functioning of life-support systems, medical care, power supply, water supply, and other critical infrastructure.

Under these conditions, a pervasive problem in tactical commander's decision-making is compliance with the principle of proportionality. Even if an object is a lawful military objective, an action (attack) is prohibited if it may be expected to cause incidental loss of civilian life or damage to civilian objects which would be excessive in relation to the concrete and direct military advantage anticipated.

At the same time, the assessment of proportionality is not carried out outside the planning process but within existing command and staff procedures. At the tactical level, these procedures include the Troop Leading Procedures (TLP), within which the METT-TC factors are analyzed. At the level of units with a deployed staff, the Military Decision-Making Process (MDMP) is utilized.

Consequently, the problem lies not in the absence of algorithms as such, but in the insufficient detail regarding the assessment of the lawfulness of the commander's decision – specifically from the perspective of predicting potential collateral damage, selecting feasible precautions, and maintaining minimal

documentation of the grounds for making the respective decision.

Analysis of recent research and publications.

In modern scientific literature, the principle of proportionality is viewed as a legal test of commander's judgment, applied after distinction is made and in conjunction with precautionary measures. Among foreign researchers who address the issues of proportionality and precautions, notable contributions have been made by E. T. Jensen, J.-M. Henckaerts and L. Doswald-Beck, E.-C. Gillard, G. Jasutis, R. Mikova, and E. S. Bates.

The domestic (Ukrainian) body of research is represented, in particular, by the works of M. M. Gnatovsky, T. R. Korotky, N. V. Hendel, V. Aliev, and others.

However, existing studies and doctrinal provisions leave room for applied refinement. Although concise decision-making algorithms within TLP and MDMP exist, it is advisable to more clearly isolate a legal module for proportionality assessment, taking into account the forecast of potential collateral damage to civilians and civilian objects. Specifically, there is a need for a further structured description of the sequence of actions that combines verifying the status of the target, formulating a concrete and direct military advantage, predicting collateral damage, selecting feasible precautions, minimal documentation of the grounds for the commander's decision.

This article is dedicated to addressing this gap as an element of the practical refinement of current planning procedures.

The purpose of the article is to substantiate an additional tactical decision-making algorithm for a commander in a combat environment. Within this framework, the principle of proportionality is used as a control node of the command process and is embedded into the already existing TLP and MDMP procedures. The algorithm integrates target distinction, assessment of expected collateral damage, selection of feasible precautions, and continuous monitoring of decision execution with readiness for adjustment when initial data changes.

To achieve this goal, the following tasks are addressed: the legally significant parameters of the proportionality test are defined (military advantage, expected collateral damage, feasible precautions), an additional step-by-step algorithm for a "short legal cycle" in tactical command decision-making is proposed, a minimal data set for documenting the grounds of the commander's respective decision is outlined, recommendations are formulated regarding the legal support and proper training required for the stable application of the algorithm at the tempo of combat operations.

Presentation of the main material. The baseline legal position for a commander is that proportionality in IHL does not permit everything that appears militarily expedient. It allows the use of force only within limits where the expected collateral damage to civilians and civilian objects does not become excessive in relation to the concrete and direct military advantage anticipated from the specified actions. This means that proportionality is always secondary to distinction: before weighing damage and advantage, the commander is obliged to establish in good faith that the object constitutes a military objective. In practical terms, this transforms distinction into a managerial requirement, as the commander must establish a decision-making procedure that minimizes the risk of misidentification through information verification and the use of all practically available means of clarification.

E.-C. Gillard emphasizes that the key difficulty lies in the evaluative nature of the proportionality test and, in particular, in defining "concrete and direct military advantage". Within this criterion, only military advantage must be considered, while political, economic, or social factors (benefits) do not inherently constitute part of the military advantage. At the same time, when evaluating the expected military advantage, the probability of its actual occurrence matters; a substantial time lag between the attack and the expected result can reduce this probability and, accordingly, the "weight" of the claimed advantage in balancing.

Customary practice dictates that military advantage should be assessed in relation to the attack considered as a whole, rather than merely by its isolated elements. However, even within such a framework, the advantage must remain military in nature and be linked to the objective of the specific

action, rather than being substituted by a reference to general strategic benefits. Therefore, it is fundamentally important for the commander to record what exactly constitutes the concrete and direct military advantage within the decision being made: what tactical result is expected, how it affects the current combat situation, and why achieving this result requires the chosen method of force application.

The second difficulty is determining the scope of "expected" collateral damage. In modern armed conflicts, it can manifest not only as an immediate consequence of a strike but also as long-term (reverberating) effects caused by disruptions to the functioning of objects that maintain a civilian (life-sustaining) role for the population. Proportionality assessments include those indirect consequences that are reasonably foreseeable at the time of planning or executing the actions.

In this context, dual-use objects, which can simultaneously serve both military and civilian purposes, are of particular significance. When assessing expected collateral damage, the foreseeable consequences of terminating their civilian function must be taken into account, particularly regarding systems providing critical civilian services, such as medical facilities, electricity generation and distribution, water treatment systems, etc. Damage to such infrastructure must be given enhanced weight within the proportionality test. Furthermore, E. T. Jensen notes that in an urbanized environment, these risks are exacerbated by the high density of the civilian population and infrastructure, meaning the spatial intertwining of civilian and military elements significantly complicates the forecasting of consequences.

The third difficulty lies in the connection between proportionality and precautionary measures. IHL operates on the premise that a proportionality assessment is not a one-time "subjective balancing act" but the legal outcome of a proper procedure of constant care during the planning and execution of combat operations. The Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I) of 8 June 1977, and customary norms of IHL require constant care, verification of targets, and the choice of means and methods of warfare to

avoid or minimize civilian harm. They also mandate control during execution, with an obligation to cancel or suspend an action if it becomes apparent that the target is not a military objective or that the expected collateral damage may become excessive.

Given these challenges, it is advisable to "proceduralize" the principle of proportionality at the tactical level – meaning to embed it not into a process separate from combat planning, but into already existing preparation and decision-making procedures. For platoon and company commanders, this basic procedure is TLP, while for military command organs with a staff, it is MDMP. Within TLP, the analysis of the mission and situation occurs, inter alia, through the METT-TC variables, where civilian factors constitute a separate element of assessment. Therefore, the algorithm proposed in this article does not contradict existing approaches but refines the legal assessment of proportionality and the method of brief record-keeping within them. On this basis, in the applied dimension, such a procedure requires at least two supporting pillars: legal support and proper training (education):

– In legal support, primary importance belongs to the role of military lawyers and legal advisers as officials who provide commanders and other planning participants with legal assessments – from general policy formulation to the planning and conduct of combat operations, particularly regarding the application of IHL in specific decisions. This role should not be reduced to a mere formality "at the very end". Regarding this, R. V. Aliev rightly emphasizes that the success of future operations depends on integrating the application of IHL into decision-making processes at the tactical (and operational) level, naming the appointment and proper training of legal advisers among the necessary measures.

– Regarding proper training, it is worth agreeing with G. Jasutis and R. Mikova, who emphasize that merely "teaching statutory norms" is insufficient for real behavioral compliance. What is required is the integration of IHL into training and management practices, as well as education through scenarios, exercises, and practical field training, with performance evaluations at all levels of command and the use of after-action reviews (AAR).

In our view, the success of future combat operations depends on integrating the application

of IHL into tactical decision-making processes and into combat orders, which creates the necessary conditions for compliance with the law of armed conflict. In terms of the principle of proportionality, this means that the assessment of expected collateral damage and the selection of "all practically feasible" precautions must be built into the planning and order-dissemination procedure. In practice, this integration is achieved through staff procedures that ensure the development of plans and orders with proper and effective application of legal norms, particularly through the appointment and proper training of legal advisers.

It is worth noting that in a combat environment, documentation cannot be cumbersome; however, minimal recording of the key grounds for a decision is critical for accountability, future training, and protecting the command itself from legal liability. Institutional reports on IHL compliance demonstrate that problems often arise not only due to an "on-the-spot error" but also due to weak reporting procedures and poor retention of materials regarding alleged violations. Thus, eliminating these gaps is seen as a necessary condition for the command to have a full information base for the proper functioning of a program for compliance with the law of armed conflict.

In the tactical dimension, this means the commander must ensure a brief record of what was considered a concrete and direct military advantage, what civilian risks (expected collateral damage) were identified, what precautions were selected as feasible, what formed the basis for the conclusion that the expected collateral damage was not excessive at the time the decision was made.

In light of the above, the modern practical dilemma of a commander is that the combat environment forces decisions to be made under tight time constraints and with incomplete data, whereas IHL requires due diligence and verification of available information. A realistic approach to resolving these issues lies in organizing the commander's decision-making as a legally guided team process within which legal requirements are embedded into tactical procedures. In this context, E. S. Bates, summarizing the modern approach, demonstrates a shift from the simple "dissemination of knowledge" to the integration of IHL, as law must become continuously relevant to military doctrine, training, equipment, as well as real-time command

decision-making and communication within the chain of command.

The article proposes an additional algorithm for a "Short Legal Cycle" (hereinafter referred to as the SLC algorithm) for tactical decision-making, within which the commander sequentially ensures: good-faith verification of the target status, forecasting of expected collateral damage, balancing expected harm against the concrete and direct military advantage, selecting all feasible precautions, and monitoring execution with readiness to adjust or cancel the action if the situation changes. It is advisable to apply the SLC algorithm as an additional legal module within the structure of TLP or MDMP, depending on the command level.

Applying the principles of IHL is a complex task constantly faced by commanders in combat environments. That is why, at the tactical level, it is expedient to format proportionality as a short checklist algorithm compatible with the general process of planning and executing combat missions. For the SLC algorithm to be viable at the tempo of an armed conflict, it must rely on a professional standard of assessment described in law and military practice as the standard of a "reasonable military commander". Its essence is that the lawfulness of a decision is evaluated in light of the combat environment and the

information available at the specific moment in time, provided there is good-faith commander's judgment under the "fog of war".

In this logic, the requirement for "all practically possible" actions is specified through the criterion of "feasibility", which in customary IHL is interpreted as precautions that are practically possible taking into account all circumstances ruling at the time, including humanitarian and military considerations. This has direct managerial significance, as the commander and staff must configure the information flow so that key assumptions (regarding target status, presence of civilians, expected consequences, etc.) are verifiable and, as far as possible, confirmed.

In the tactical command process, a decision typically encompasses situational assessment, development of courses of action (COAs), issuance of the order, and supervision. At the same time, legally significant elements, such as the proportionality assessment and the selection of all practically possible precautions, are frequently not isolated into a concise, separate block convenient for rapid application and brief recording of grounds. The SLC algorithm integrates these legal requirements directly into the decision-making cycle and sets a minimal set of steps and brief recordings (documentation) available even under time deficits.

Table 1 – "Decision Matrix" of the Additional SLC Algorithm

Algorithm Stage	Commander's Actions	Documentation
1. Verification of target status (Distinction)	Clarifies the object (target), its function, and its contribution to military action; verifies available intelligence.	Provides a brief description of the grounds for identifying the object as a military objective.
2. Determination of military advantage	Formulates the expected tactical effect of the specific action (attack) and its connection to the current situation.	Records the concrete and direct military advantage (what exactly is to be achieved and why it is military in nature).
3. Assessment of the civilian environment and risks	Establishes the presence of civilians, civilian objects, and dual-use objects within the strike zone.	Lists civilian risks (who and what might be affected).
4. Forecast of expected collateral damage	Evaluates direct damage and reasonably foreseeable indirect (reverberating) consequences.	Describes the expected collateral damage (what the consequences are and why they are foreseeable at that specific point in time).
5. Precautions and alternatives	Selects all feasible precautions and compares alternatives.	Records the chosen precautions, rejected alternatives, and the reasons for their rejection.
6. Decision, control, and adjustment	Makes the decision and establishes triggers for review upon the emergence of new data; supervises execution.	States the final decision and the conditions for suspension or cancellation.

The article substantiates an additional SLC algorithm for tactical decision-making, which transforms the requirement of proportionality from an abstract principle into a sequential procedure. The algorithm includes interconnected steps:

- Verifying target status (distinction);
- Formulating a concrete and direct military advantage from the respective action;
- Forecasting direct and reasonably foreseeable indirect collateral damage;
- Selecting all feasible precautions and alternatives;
- Making, adjusting, or cancelling the decision (under certain conditions) with execution control and minimally sufficient documentation of grounds.

Such "proceduralization" allows for maintaining the tempo of combat operations while simultaneously demonstrating the good faith and lawfulness of the commander's judgment at the time the respective decision is made. The proposed algorithm does not replace current TLP and MDMP procedures but refines the legal assessment of proportionality within them.

Institutionally, the SLC algorithm requires the support of two complementary components: legal support and training. Legal support must consist of embedding legal requirements into standard targeting and planning procedures so that legal constraints operate "inside" the command process rather than merely as a final check. A legal adviser (or a designated official) must be integrated into the planning and targeting cycle to assist the command in accounting for legal constraints at each stage without substituting the commander's decision. Training must develop proportionality as a professional skill through scenario-based sessions, decision-making training, and competency assessments at various levels of command.

Additionally, minimally sufficient documentation of key decision grounds (such as the SLC log – the "decision matrix") and proper material retention procedures serve as necessary conditions for accountability and learning from mistakes, ultimately strengthening the prevention of violations by the command.

Perspectives for further research are related to:

1. Piloting the SLC algorithm in exercises and case analysis, recording typical errors and the execution time of each stage;

2. Developing standardized "decision matrix" templates for different branches of the military and target types;

3. Refining approaches to evaluating the long-term (reverberating) consequences of striking dual-use objects in urban environments;

4. Investigating the role of digital decision-support tools (without removing responsibility from the commander) within the standard of a "reasonable military commander".

Thus, improving the legal quality of tactical decisions must be achieved through procedural feasibility – pre-practiced, integrated, and controlled actions that allow for IHL compliance within the real tempo of combat operations.

References

1. Henckaerts, J.-M., & Doswald-Beck, L. (2005). Customary International Humanitarian Law. Vol. I: Rules. Geneva; Cambridge: ICRC; Cambridge University Press. 689 p. Retrieved from: <https://surl.li/igwydi> (accessed 3 January 2026) [in English].
2. FM 5-0. Headquarters, Department of the Army (2022). Planning and Orders Production. Washington, DC [in English].
3. FM 6-0. Headquarters, Department of the Army (2022). Commander and Staff Organization and Operations. Washington, DC [in English].
4. Gillard, E.-C. (2018). Proportionality in the Conduct of Hostilities: The Incidental Harm Side of the Assessment. London : Chatham House. Retrieved from: <https://surl.li/hohhwq> (accessed 3 January 2026) [in English].
5. Jensen, E. T. (2016). Precautions against the effects of attacks in urban areas. *International Review of the Red Cross*, no. 1 (98), pp. 147–175. DOI: <https://doi.org/10.1017/S1816383117000017> [in English].
6. *Protokol OON "Dodatkovy protokol do Zhenevskikh konventsii vid 12 serpnia 1949 roku, shcho stosuetsia zakhystu zhertv mizhnarodnykh zbroinykh konfliktiv (Protokol 1)"* [Additional Protocol to the Geneva Conventions of August 12, 1949, relating to the Protection of Victims of International Armed Conflicts (Protocol I)]. (1977, June 8). *Zakonodavstvo Ukrainy*. Retrieved from: https://zakon.rada.gov.ua/laws/show/995_199#Text (accessed 3 January 2026). [in Ukrainian].
7. Lovin A., Poiedynok O., Syvko L. (trans.) (2006). *Zvychaie mizhnarodne humanitarne*

pravo. Normy [Customary international humanitarian law. Norms]. *Ukrainskyi chasopys mizhnarodnoho prava*, no. 2, pp. 7–16. Retrieved from: <https://surl.li/frrne> (accessed 3 January 2026) [in Ukrainian].

8. Aliiev R. V. (2025). *Operatsiine pravo v systemi viiskovoho prava Ukrainy* [Operational law in the system of military law of Ukraine]. *Analitichno-porivnialne pravoznavstvo*, no. 6 (part 3), pp. 330–336. DOI: <https://doi.org/10.24144/2788-6018.2025.06.3.50> [in Ukrainian].

9. Jasutis, G., Mikova, R. (2023). Parameters of Effective Military Training in International Humanitarian Law. Geneva : DCAF. Retrieved

from: <https://surl.li/asjdde> (accessed 3 January 2026) [in English].

10. Bates, E. S. (2014). Towards effective military training in international humanitarian law. *International Review of the Red Cross*, no. 96 (895/896), pp. 795–816. DOI: <https://doi.org/10.1017/S1816383115000557> [in English].

11. Hnatovskyi M. M., Korotkyi T. R., Korynevych A. O., Lysyk V. M., Poiedynok O. R., Handel N. V. (2016). *Mizhnarodne humanitarne pravo* [International Humanitarian Law]. Kyiv–Odesa : Ukrainska helsynska spilka z prav liudyny, Fenix. Retrieved from: <https://surl.li/cc/nzhgvs> (accessed 3 January 2026) [in Ukrainian].

Received / Стаття надійшла до редакції: 13.01.2026

Reviewed and accepted for publication / Проце́нзовано та прийнято до друку: 11.02.2026

Published / Опубліковано: 30.06.2026

АРТЮШЕНКО ОЛЕКСАНДР ВІКТОРОВИЧ

*начальник науково-методичного відділу забезпечення
якості освітньої діяльності та вищої освіти*

Військово-юридичного інституту,

Національний юридичний університет імені Ярослава Мудрого

<https://orcid.org/00000-0002-2831-8518>

МОРОХОВСЬКИЙ МИКОЛА ЛЕОНІДОВИЧ

доцент кафедри загальновійськових дисциплін

Військово-юридичного інституту,

Національний юридичний університет імені Ярослава Мудрого

<https://orcid.org/0009-0000-5116-3529>

БРЯНКІН АНДРІЙ СЕРГІЙОВИЧ

курсант Військово-юридичного інституту,

Національний юридичний університет імені Ярослава Мудрого

<https://orcid.org/0009-0002-3641-6975>

**ДОДАТКОВИЙ АЛГОРИТМ ПРИЙНЯТТЯ ТАКТИЧНОГО РІШЕННЯ КОМАНДИРОМ
У БОЙОВІЙ ОБСТАНОВЦІ З УРАХУВАННЯМ ВИМОГ МІЖНАРОДНОГО
ГУМАНІТАРНОГО ПРАВА: ДОТРИМАННЯ ПРИНЦИПУ ПРОПОРЦІЙНОСТІ**

У цій статті розглядається специфіка прийняття тактичних рішень командирами в бойових ситуаціях крізь призму міжнародного гуманітарного права, зокрема принципу пропорційності.

Актуальність теми впливає з того, що сучасні бойові операції все частіше відбуваються в міських умовах, де військові цілі, цивільні об'єкти, об'єкти подвійного використання та цивільне населення знаходяться в безпосередній просторовій близькості. За таких умов командир змушений приймати рішення в обмежені часові рамки, з неповною інформацією та під впливом динамічних змін оперативно-тактичної обстановки, що значно ускладнює належне дотримання принципу пропорційності.

Розроблено й обґрунтовано додатковий алгоритм короткого правового циклу для оцінювання пропорційності під час прийняття тактичного рішення командиром.

Визначено його основні етапи: перевірка статусу цілі, встановлення конкретної воєнної переваги, прогноз побічної шкоди, вибір здійснених запобіжних заходів, контроль виконання та мінімальне документування рішення командира.

Доведено можливість інтеграції алгоритму у процес підготовки бою без зміни чинних процедур планування на тактичному рівні управління.

Наукова новизна дослідження полягає в тому, що принцип пропорційності розглядається не просто як загальна нормативна вимога, а як практичний інструмент для командного судження, який може бути реалізований через систематичну процедуру перевірки, оцінки, вибору альтернатив та мінімальної документації.

Практична цінність статті полягає в можливості використання запропонованого алгоритму в навчальному процесі, під час навчання командирів та штабу, а також у подальшому розвитку стандартизованих карток прийняття рішень для різних типів бойових ситуацій.

Ключові слова: міжнародне гуманітарне право; пропорційність; розрізнення; запобіжні заходи; воєнна перевага; побічна шкода; тактичне рішення; алгоритм.



BABAK SERHII

*Ph.D. in Military Sciences, Senior Researcher,
Military Institute of Armored Forces,
National Technical University "Kharkiv Polytechnic Institute"
<https://orcid.org/0000-0002-2248-454X>*



BARKATOV IHOR

*Associate Professor,
Military Institute of Armored Forces,
National Technical University "Kharkiv Polytechnic Institute"
<https://orcid.org/0000-0003-2605-574X>*



KRASOVSKYI PAVLO

*Head of the Simulation Center,
Kyiv Institute of the National Guard of Ukraine
<http://orcid.org/0009-0004-7957-6279>*

CONCEPT AND ARCHITECTURE OF A TACTICAL SCENARIO GENERATOR FOR MILITARY SIMULATIONS USING ARTIFICIAL INTELLIGENCE ALGORITHMS

This study introduces the concept and system architecture of an intelligent tactical scenario generator for military simulations, with a particular focus on integration into the Steel Beasts Professional (SBPro) platform. The primary objective of the research is to enhance the realism, adaptability, and efficiency of officer training by automating the creation of tactical scenarios through artificial intelligence (AI) algorithms. The generator is designed to formalize scenario development as a multi-factor optimization problem, taking into account terrain, force composition, operational objectives, and dynamic adversary behavior.

Methodologically, the study employed a combination of mathematical modeling, optimization theory, and simulation-based validation. The generator's architecture was structured into modules responsible for scenario generation, adaptive difficulty adjustment, OPFOR (opposing force) control, and integration with the After-Action Review (AAR) system. AI algorithms were applied to automate mission planning, generate nonlinear adversary behavior, and adapt training complexity to the level of cadet proficiency.

The results demonstrate that the proposed generator significantly reduces the time required to prepare training exercises – from several hours to minutes – while simultaneously increasing the variability and unpredictability of combat scenarios. Preliminary validation confirmed the technical feasibility of the concept, showing that the system can replicate complex tactical situations, including combined-arms operations, without the resource costs associated with live training. Moreover, the integration of AI-driven adversary models ensures that cadets encounter dynamic and adaptive challenges, fostering tactical flexibility, decision-making under uncertainty, and resilience in stressful environments.

In conclusion, the intelligent tactical scenario generator represents a qualitative leap in military education by combining the high-fidelity simulation capabilities of SBPro with advanced AI technologies. Future research directions include the development of a national repository of AI-generated scenarios based on current operational experience, integration with multi-domain simulations (land, air, cyber), and the creation of methodological standards for AI-assisted training in line with NATO practices.

Keywords: *tactical scenarios; simulation system; Steel Beasts Professional; military education; artificial intelligence.*



© S. Babak, I. Barkatov, P. Krasovskyi, 2026

© Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine, 2026

Statement of the problem. The widespread use of precision weapons, particularly unmanned systems, has led to significant changes in the tactics of modern combined-arms warfare and requires a revision of approaches to unit command and control. This particularly concerns reducing decision-making cycles and improving the accuracy of forecasting the course of combat operations.

At the current stage of military science development, an active integration of intelligent systems into combat training, operational planning, and combat modelling processes is observed. An additional catalyst for the implementation of innovative technologies based on artificial intelligence (AI) has been the full-scale invasion of Ukraine by the Russian Federation.

The training of officers of tank and mechanized units requires not only technical skills but also developed tactical thinking under conditions of uncertainty. At the same time, conducting full-scale field exercises is resource-intensive, necessitating the use of high-fidelity simulators, particularly SBPro, in the military education system [1].

The existing approach to the creation of training scenarios is characterized by significant time consumption, subjectivity, and limited variability. This negatively affects the development of cadets' situational awareness and planning skills. Thus, the key problem is the absence of tools for automated generation of tactically correct scenarios adapted to the conditions of modern warfare and the needs of military education.

Analysis of recent research and publications. The theoretical foundations of the use of simulation technologies in military education have received considerable attention in recent years, with both foreign and domestic researchers conducting systematic studies.

With the rapid development of artificial intelligence, intelligent decision-making methods have gradually surpassed human performance in various human-machine competitions, especially in complex multi-agent collaboration scenarios, as considered by Weiqiang Jin, Hongyang Du et al. [2]. The authors provide an analysis of major simulation environments from different perspectives, including task formats, reward distribution, and underlying technologies, as well as a comprehensive review of key approaches to intelligent decision-making, algorithms, and models for multi-agent systems (MAS). In the

NATO Science and Technology Organization report [3, pp. 55–56], it is emphasized that the use of artificial intelligence enables a comprehensive approach to operational planning, in particular through automated generation and analysis of courses of action (COA), modelling of adversary behavior, and predictive assessment of decisions. In addition, integrating large data volumes and deep learning technologies enables automated content generation (including scenarios and environment models), which is conceptually similar to procedural content generation in military simulations.

In works [4, pp. 2–3, 5], it is substantiated that the integration of AI technologies, machine learning, big data analytics, and cloud computing with immersive reality tools (VR/AR/XR) forms the basic components of a modeling architecture based on the Modeling and Simulation as a Service (MSaaS) paradigm. Such integration creates a unified information-modeling environment in which service-driven systems provide commanders with tools for operational decision-making and improving professional competence.

Saastamoinen, K., and Nuutinen, J. [6] examine the potential of AI to improve the productivity, adaptability, and decision-making value of simulation systems currently used by the Finnish Army, particularly in the land forces. The study considers how large language models (LLMs), generative agents, and edge AI can be applied to tactical simulators, command and staff exercises, and educational platforms to support mission planning, learning processes, and after-action review (AAR).

The article [7] presents a multi-agent, multimodal reasoning framework that uses large language models (LLMs) to generate critical training artefacts such as operational orders (OPORD). The framework is improved by decomposing scenario generation into a hierarchy of subtasks, assigning AI roles for each: (1) generation of options for human author selection, (2) creation of candidate products for human approval or modification, or (3) fully automated generation of textual artefacts.

Giberna M., Voos H. et al. [8] study the integration of digital twins into defense programs, focusing on key use cases ranging from system design and development, operational planning and training, to mission execution and analysis. The application of digital twin technologies across defense platforms highlights key advantages such as improved operational performance, predictive

capabilities, and increased system uptime. This enables the scenario generator to use real geospatial data and equipment technical specifications to create mathematically accurate tactical situations. In turn, Garrett, R. K., Jr. et al. (2016) [9] emphasize that simulator architecture should be modular, allowing an AI generator to dynamically adjust force composition within scenarios depending on training objectives.

The work of Park, J. S., O'Brien, J., Cai, C., Morris, M. R., Liang, P., & Bernstein, M. S. (2023) [10] is critical for understanding generator logic. The authors explore Human-AI Teaming principles, which, in the context of scenario generation, can be used to create agents that adapt to the trainee's level (Adaptive Difficulty). This ensures a high level of immersion, consistent with Sottolare R. A., Goldberg B. S. [11], who view a military scenario not as a static set of objectives but as a dynamic hierarchical system. Such an approach transforms the virtual environment into a tool for developing tactical thinking through accumulated experiential learning under uncertainty.

The issue of AI implementation and combat simulation automation is receiving close attention from leading Ukrainian military scientific schools. A key aspect of this transformation is the transition from static training scenarios to dynamic, adaptive environments that can reproduce the complexity of the modern multi-domain battlefield. In this context, the development of the concept and architecture of an intelligent tactical scenario generator for simulation systems, in particular Steel Beasts Professional (SBPro), becomes of strategic importance for the Armed Forces of Ukraine, the National Guard of Ukraine, and other components of the Defense Forces.

The study of the experience of the Russia–Ukraine war emphasizes that AI technologies are no longer a futuristic concept but a critical tool in armed and information warfare [12]. Ukraine, facing numerical superiority of the adversary, is forced to rely on technological advantage, where software and autonomous systems become means of preserving personnel and improving strike accuracy. However, realization of this potential requires appropriate officer training, which is impossible without the use of modern combat simulation tools.

Works [13, 14] note that the SBPro system has proven itself as one of the leading tools for practicing small-unit armored tactics. It allows

modelling ballistics, fire control systems, and unit interactions with high-level detail. However, the traditional process of scenario creation in SBPro is extremely labor-intensive, requiring instructors to manually input a large number of parameters – from movement routes to adversary behavior algorithms.

The issue of AI integration into higher military education in Ukraine is widely discussed. In works [15, 16, 17], the authors note that the use of AI systems, including adaptive learning and neurosymbolic models, can significantly enhance the analytical abilities of future officers. They highlight successful NATO experience in which AI simulations are integrated into training standards.

Study [18] analyzes the implementation of simulation tools in the educational process of military higher education institutions using the MOODLE platform. The authors substantiate the advantages of combining simulation systems with LMS platforms, enabling the structuring of training scenarios as separate digital objects, while also highlighting challenges related to technical compatibility and the need for practical guidelines for instructors. This directly correlates with the need to create a scenario generator that can be integrated into modular MOODLE structures.

Despite significant achievements, the reviewed works insufficiently address the issue of an autonomous architecture capable of integrating combat experience acquisition, transforming it into tactical algorithms, and directly exporting it into simulation-ready scenario formats within a single cycle.

In the context of intelligent generator development, special attention should be given to transforming the classical Military Decision-Making Process (MDMP). According to the Military Review analytical report (2025) [19], the integration of AI into this process enables automated generation of courses of action (COA). This is critical to the architecture of a tactical scenario generator, as it enables the system to create not only visual content but also logically justified tactical situations that align with doctrinal planning principles adapted to the rapidly changing conditions of modern warfare.

The analysis of sources reveals three key directions requiring further research. First, despite significant theoretical advances in LLMs for military simulations, practical studies of their direct integration into specific commercial platforms, such as SBPro, are virtually absent.

Second, most publications do not consider the technical limitations of specific simulation systems: data formats, scenario editors, APIs. Third, there is a lack of research on verifying the quality of automatically generated scenarios according to pedagogical criteria. In the domestic context, the problem remains insufficiently studied despite the urgent practical need for accelerated training of officers of the Armed Forces of Ukraine. Thus, the development of methods and tools for AI-based tactical scenario generation is a scientifically novel and practically significant task.

The purpose of the article is to substantiate the concept, develop the architecture, and analyze the implementation results of an intelligent tactical scenario generator for simulation systems, particularly SBPro, using artificial intelligence algorithms.

Presentation of the main material. At the current stage of military technology development, the SB Pro simulation system serves not merely as a training simulator but as an intelligent environment for developing the operational and tactical competencies of future officers. Unlike procedural simulators focused on the mechanical mastery of control interfaces, SB Pro emphasizes the cognitive dimension of combat – command and control of a military unit as an integrated system.

The main functional capabilities of the system within the educational process include:

- Scalability of combat simulation. The simulator's technical architecture enables the implementation of scenarios ranging from individual crew training to complex operations at the tank platoon, company, and battalion levels. This provides cadets with an understanding of their role within the overall combat formation and allows them to practice interaction with attached units (mechanised infantry, artillery, and engineer forces).

- Joint integration of weapons and military equipment. The system provides high-fidelity simulation not only of tanks (Leopard 2, Abrams, T-series, etc.) but also of a wide range of light armored vehicles, air defense assets, and anti-tank guided missile systems. This enables the study of both the strengths and weaknesses of friendly and adversary equipment, which is critical for developing effective battlefield countermeasures.

- Creation of multi-user training environments. Through its networking capabilities, SB Pro allows the organization of collective training events in which each cadet performs a specific role within a

military unit. This approach promotes the development of communication skills, radio communication procedures, and commanders' abilities to control the fire and maneuver of subordinate forces in real time.

- Objective After Action Review (AAR). AAR technology is a fundamental instrument of military education. It enables a detailed analysis of every phase of combat, including the tracking of projectile trajectories, angles of impact, decision-making timelines, and the appropriateness of maneuvers. The ability to “see the battle through the eyes of the adversary” fundamentally transforms the learning process by making error analysis visual and indisputable.

Currently, SB Pro is employed in the educational process at the Kyiv Institute of the National Guard of Ukraine and the Military Institute of Tank Troops of the National Technical University “Kharkiv Polytechnic Institute,” contributing to the development of adaptive tactical thinking among cadets. Upon completion of the relevant training course, tank personnel demonstrate improved interaction among crews and units, enhanced tactical thinking, and greater effectiveness in employing SB Pro as a comprehensive combat simulation tool.

The preparation of an initial tactical situation (scenario) requires a high level of instructor expertise and continuous monitoring of each participant, which significantly enhances training outcomes. The software environment also allows instructors to modify cadet actions in real time, making combat simulation highly flexible at both unit and command levels. In this context, the need arises for a tactical scenario generator that automates the creation of initial tactical situations, increases the variability of training scenarios, and adapts them to different simulation platforms.

Thus, the use of SB Pro within the educational process contributes to the development of tactical thinking by moving beyond standardized training approaches. Cadets are provided with opportunities to practice both standard procedures (in accordance with military regulations and manuals) and non-standard tactical tasks under conditions of dynamic opposition generated by artificial intelligence, another cadet, or an instructor acting as the adversary. This contributes to the development of:

- Flexibility of tactical thinking: the ability to adapt a battle plan to continuously changing conditions.

- Decision-making resilience under stress: the ability to operate effectively under conditions of the “fog of war” and limited time.

- Predictive capabilities: understanding the consequences of decisions without risking personnel or expensive and scarce military equipment.

Accordingly, SB Pro integrates theoretical knowledge from tactics, weapons training, and related disciplines to develop comprehensive practical skills, ensuring high-quality officer training that meets the requirements of modern network-centric warfare.

The traditional development of a scenario by an instructor requires from four to ten hours. We propose the implementation of an AI Scenario Engine based on:

- Generative design. AI analyzes terrain features (e.g., dominant elevations) and automatically positions OPFOR elements in accordance with military doctrine (e.g., Russian Armed Forces or NATO doctrine).

- Adaptive difficulty. If a cadet demonstrates a high rate of mission progress, AI introduces enemy reserves or initiates remote mining operations in real time.

- Natural Language Processing (NLP) interface. The instructor formulates a task in natural language (e.g., “Create a tank platoon ambush during movement under limited visibility conditions”), and AI converts it into a *.sce* scenario file with predefined triggers.

The scenario development process in SB Pro traditionally relies on a mission editor in which unit logic is defined through a system of ternary conditions and triggers. However, creating an “intelligent” adversary (OPFOR) requires moving beyond linear scripting.

The technical implementation of this process includes:

- API utilization and data exchange. Since SB Pro has a closed architecture, integration with external AI modules (e.g., Python-based scripts) is achieved through parsing scenario files or via the Distributed Interactive Simulation (DIS) protocol. This enables the external AI module to observe cadet coordinates in real time.

- Decision Tree generation. Unlike static orders, the AI model constructs a dynamic decision tree. For example, if a cadet unit loses more than 30% of its combat capability, AI automatically changes the adversary’s tactics from “defense” to “counterattack,” initiating the corresponding scripts within SB Pro.

- Complexity scaling. The AI module analyzes the “heat map” of cadet fire effects. If fire is conducted

with excessive accuracy (indicating a high level of proficiency), AI introduces uncertainty elements such as smoke screens, decoys, or electronic warfare interference, visualized through communication-channel restrictions within the simulator.

The stage of automating scenario generation based on GIS data and Large Language Models (LLMs) enables the transition from manual object placement to automated design of the operational environment and tactical situation.

The automation process includes the following components:

- Terrain analysis. The AI agent employs elevation data (DTED) and vegetation classification derived from GIS maps. The algorithm calculates Line of Sight (LOS) sectors for every point on the map. Based on these calculations, AI automatically determines optimal locations for revetments, anti-tank guided missile positions, and concealed tank maneuver routes.

- Use of LLMs for doctrine-to-code transformation. The instructor enters input data such as: “Battalion tactical group offensive against a prepared defense in the area of [Coordinates].” An LLM (e.g., GPT-4 or a specialized Llama model) generates a formalized operations order (OPORD), while a dedicated converter transforms this order into a set of XML instructions for the SB Pro mission editor, positioning units according to the combat formation (intervals and distances between vehicles, depth of echeloning, etc.).

- Dynamic environment. Automation includes the randomization of weather conditions and time of day generated by AI for each training iteration. This prevents cadets from becoming accustomed to a particular scenario and compels them to conduct reconnaissance anew during each exercise.

During the study, the software complex’s concept and architecture were developed. The software complex architecture (Fig. 1) was based on the requirement that all components function as a unified system rather than as separate applications. The software complex consists of three main components: the Editor, the Simulator, and the Visualizer.

Figure 1 illustrates the interaction of the software suite components during the development and pilot operation phases. Subsequently, the training dataset can be excluded from the software suite, and during the operational phase, its architecture transitions to the form presented in Figure 2.

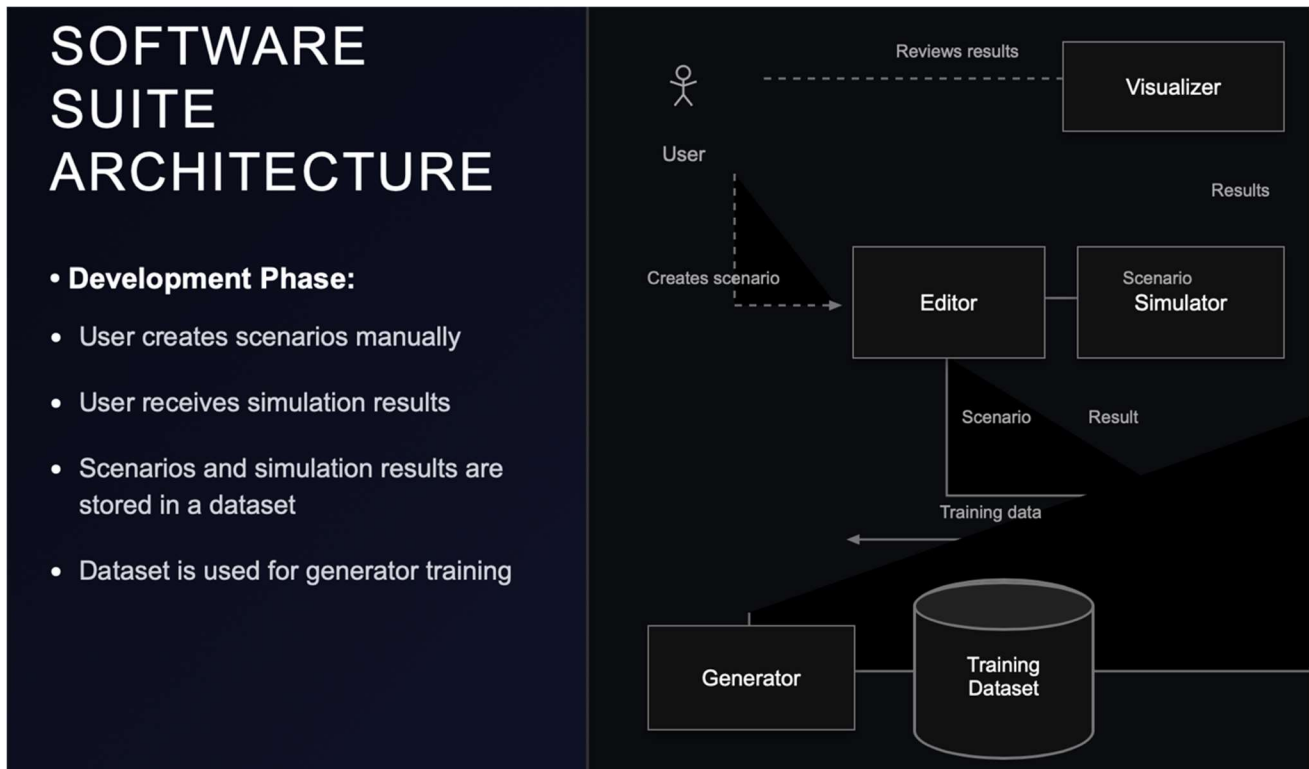


Figure 1 – Architecture of the software complex at the development stage

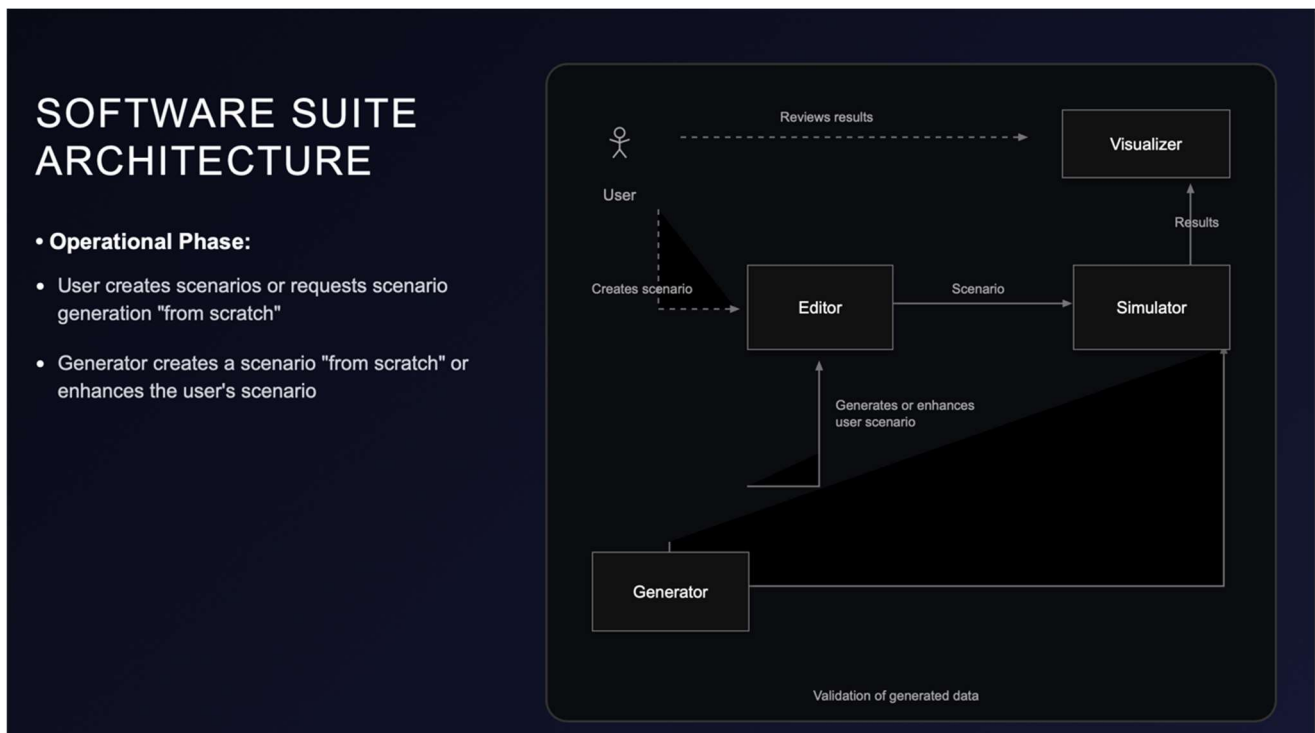


Figure 2 – Architecture of the software complex at the operation stage

Figure 3 presents the Editor web application – an interactive tool for creating and managing simulation scenarios.

The Editor is built with React.js and provides users with a convenient, intuitive interface for working with geospatial data. The screen displays an interactive terrain map with plotted objects, routes, and key reference points, representing a typical user-created scenario.

The main capabilities of the Editor include:

- placement and repositioning of individual objects on the map;
- configuration of routes and interactions between scenario elements;
- execution of simulations and simultaneous visualization of results within the interface.

The tool was designed for specialists without programming experience and requires only basic skills in working with web applications.

The Visualizer component is presented in Figures 4 and 5. It serves as a 3D environment for visualising simulation results.

The Visualizer is developed using the Unity engine and displays the simulation process as a three-dimensional environment that is intuitive

even for users without a technical background. The screenshots on the right illustrate an example of such visualization: road infrastructure, vehicles, and their movements are presented in a realistic 3D format from both top-down and angled perspectives, resembling a tactical simulation environment.

There is no doubt that tactical training of military personnel cannot be effectively conducted without reference to real terrain conditions. In this regard, SB Pro provides the following capabilities:

– **Terrain Fidelity.** The use of high-resolution maps in which microterrain features (depressions, small elevations, tree lines, and other terrain elements) possess physical properties within the simulation environment. This enables cadets to learn how to correctly select firing positions and concealed movement routes.

– **Environmental Impact on Military Operations.** Simulated changes in time of day, precipitation, and cloud cover directly affect the effectiveness of observation systems (thermal and night-vision devices), thereby influencing the tactics employed by individual soldiers, military units, and larger formations.



EDITOR

- Web application featuring an **intuitive user interface**
- Enables **manual scenario creation** and simulation results review
- Developed using the **React.js** framework

Figure 3 – Editor web application



Figure 4 – Visualiser

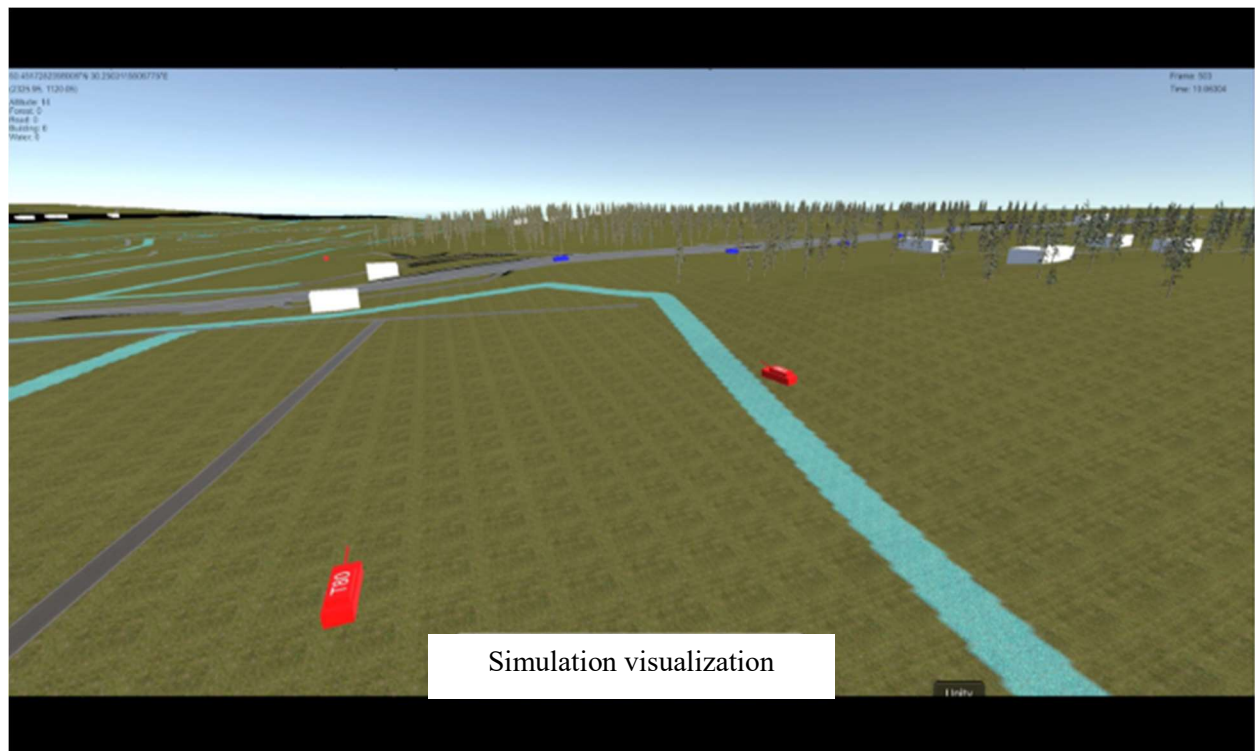


Figure 5 – The example of simulation

The primary advantage of the Visualizer is its ability not only to display the final outcome but also to provide insight into why a particular situation evolved as it did. Specifically, it enables users to identify where congestion occurred, where critical events occurred, and how objects moved over time (as shown in Figure 5).

This makes the tool particularly valuable for analysis and decision-making based on simulation results.

The key component of the system – the Simulator – is presented in Figure 6. It serves as the “mathematical core” of the entire solution. The simulator's algorithms are responsible for all computational processes: calculating the movement of military equipment on the battlefield, modeling the conduct of fire, and determining

target engagement outcomes, including which objects were destroyed or disabled and the degree of damage inflicted during combat operations. All calculations are performed in accordance with the rules and conditions defined in the scenario through the Editor.

To analyze combat dynamics and outcomes, the Simulator was used to model 100 alternative courses of action (100 simulation runs). The average computation time per simulation run was 0.42 seconds, demonstrating the system's high performance.

Simulation results are presented in the form of user-friendly graphs comparing performance indicators among the participating sides, Blue, Red, and Other forces, including victory rates and casualty rates.

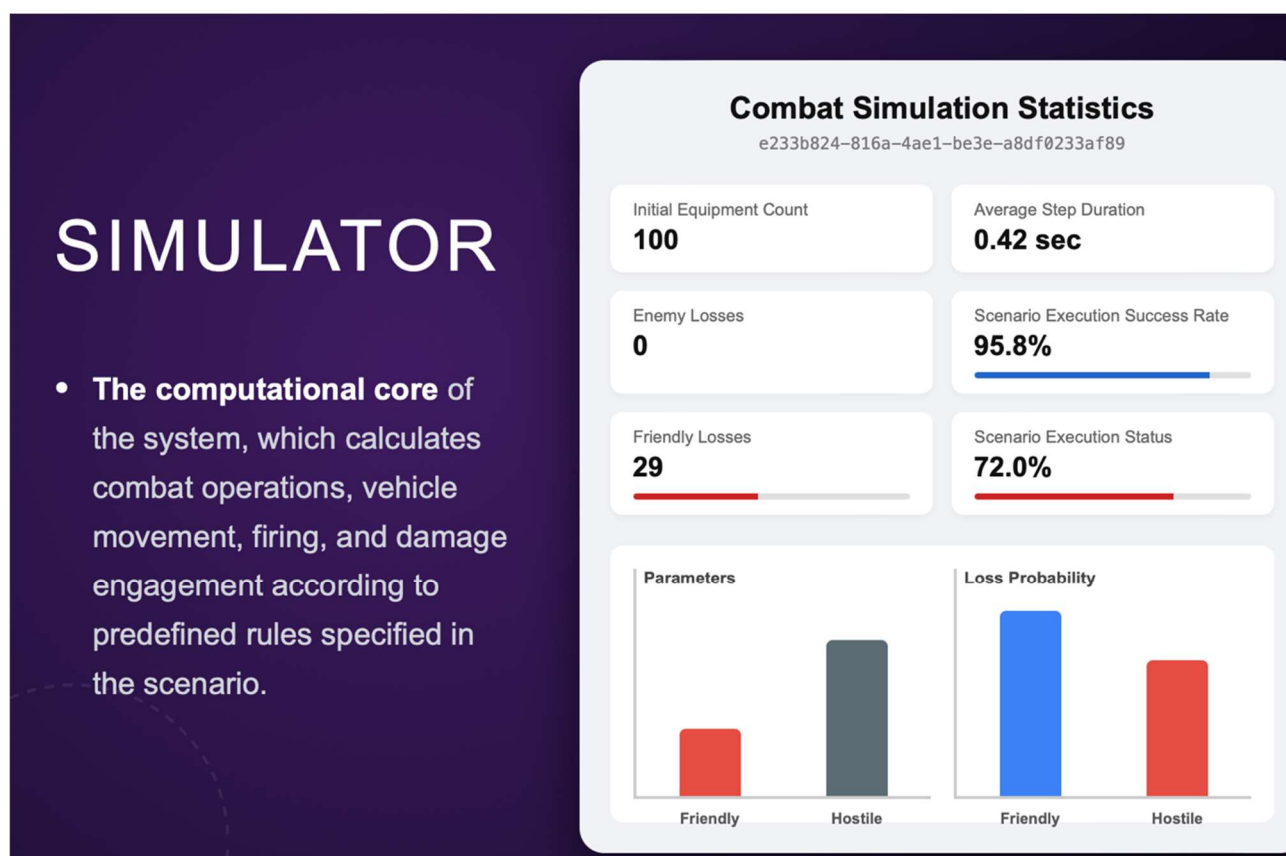


Figure 6 – The Simulator

Thus, the Simulator ensures objective, reproducible, and statistically significant evaluation of combat scenarios, making it a foundation for informed tactical decision-making.

Conclusions and prospects for further research. The focus of the presented study is the concept and architecture of a tactical scenario generator integrated with the SBPro simulation system. The concept and architecture of the tactical scenario generator determine the potential for achieving a significantly higher quality of the educational process in higher military educational institutions (HMIIs). The application of artificial intelligence in combination with SBPro opens, in particular, the following new capabilities:

- automated generation of scenarios based on combat experience and contemporary doctrines;
- adaptation of complexity according to the training level of cadets;
- variability of combat conditions: changes in terrain, weather conditions, and enemy composition;
- modelling of asymmetric threats and unconventional tactics.

Functional validation conducted under controlled conditions confirmed the system's technical operability, in particular, the stability of generation and the consistency of baseline tactical parameters across scenarios. At the same time, the main challenges in automated scenario generation include ensuring tactical correctness, dynamic variability, and the preservation of the logical progression of events.

Quantitative evaluation of the testing results allowed the following efficiency indicators (KPIs) to be established:

- scenario generation time averages 10–30 seconds, depending on complexity, which is 5–8 times faster compared to manual preparation;
- scenario variability level (share of unique scenarios under fixed input parameters) exceeds 85–90%;
- scenario reproducibility (identity of results under identical input data) is ensured at 100%;
- share of tactically correct scenarios according to expert evaluation is 80–90% (depending on the complexity of the operational environment);
- reduction in instructor workload (in terms of time spent on lesson preparation) is estimated at 60–70%.

Comparative analysis with the traditional approach to scenario development demonstrated that the use of the generator significantly increases the variability of training situations without a

proportional increase in time costs. At the same time, it was found that as scenario complexity increases, the proportion of fully tactically consistent variants decreases, indicating the need to improve validation mechanisms and expand the rule base.

The main limitations remain ensuring tactical correctness under conditions of high variability, avoiding illogical configurations, and formalising combat experience for further use in artificial intelligence algorithms.

Thus, the obtained results quantitatively confirm the feasibility of using an intelligent scenario generator within military simulation systems. Further research should focus on expanding the experimental sample, introducing metrics to evaluate training effectiveness (e.g., learning gain, decision-making time), and conducting comparative studies in real educational contexts.

The main result of the study is the confirmation of the conceptual and technical viability of an AI-based tactical scenario generator. The conducted research demonstrated the possibility of its integration into the educational process.

Directions for further research. The proposed concept and architecture for an AI-based tactical scenario generator lay the foundation for transitioning from static to dynamic modelling of the combat environment. Further development of the system and scientific inquiry should focus on the following key directions:

1. Formation of a national scenario repository. A priority task is the creation of a National Scenario Database, a centralised repository of AI-generated models based on the Armed Forces of Ukraine's current combat experience. This will ensure rapid updates to HMIIs' curricula, standardisation of tactical techniques, and a sustainable technological advantage in officer training.
2. Transition to multi-domain simulations. Future research should focus on expanding the architecture's capabilities by integrating ground operations scenarios with modelling in the air, maritime, and cyber domains. The goal is to create comprehensive training exercises that reflect the combination of different branches of the armed forces in modern conflicts.
3. Development of adaptive agent-based models. A promising direction is the implementation of algorithms for the non-linear behaviour of intelligent agents (enemy and friendly units). This involves the development of

mathematical models that take into account not only tactical doctrines but also personnel psychological state, effectiveness of information influence, and logistics dynamics.

4. Convergence of XR technologies and tactical simulators. Research on XR integration aims to combine individual procedural training (e.g., VR/AR) with collective tactical coordination in professional software environments (e.g., Steel Beasts Professional). This will enable HMIs to transform into comprehensive centres of digital competence.

5. Methodological support and standardisation. An important aspect is the development of scientifically grounded recommendations for teaching staff on implementing AI tools in the educational process. This includes unifying content-generation approaches and ensuring full compatibility of methodologies with current NATO standards.

6. Empirical validation and effectiveness assessment. The final stage of the research cycle should involve systematic trials involving cadets and officers. Quantitative and qualitative evaluation of the impact of automated scenario generation on tactical thinking levels will allow verification of architectural solutions and refinement of intelligent learning support systems.

Thus, the AI-based tactical scenario generator serves not only as a technical module of SBPro but also as a strategic platform for developing military education, combining innovative technologies with relevant combat experience.

References

1. Steel Beasts Pro PE User's Manual. eSim Games (2024). Retrieved from: <https://www.esimgames.com/downloads/> (accessed 2 January 2026) [in English].
2. Jin, W., Du, H., Zhao, B., Tian, X., Shi, B., & Yang, G. (2025). A comprehensive survey on multi-agent cooperative decision-making: Scenarios, approaches, challenges and perspectives. *arXiv*. DOI: <https://doi.org/10.48550/arXiv.2503.13415> [in English].
3. NATO Science & Technology Organization (2020). Science and technology trends 2020–2040: Exploring the science and technology edge. Retrieved from: <https://surl.lu/nzsnkj> (accessed 2 January 2026) [in English].
4. NATO Science and Technology Organization (2022). Modelling and simulation as a service: Rapid deployment of virtual training environments. Retrieved from: <https://surl.li/gdrsg> (accessed 2 January 2026) [in English].
5. NATO Science and Technology Organization (2022). Artificial intelligence augmented immersive simulation in training and decision-making course of actions analysis. Retrieved from: <https://surl.li/rfwpbu> (accessed 2 January 2026) [in English].
6. Saastamoinen, K., & Nuutinen, J. (2025). Next-generation readiness: Applying artificial intelligence to military simulators and wargaming in Finland. *Procedia Computer Science*, vol. 270, pp. 3479–3487. DOI: <https://doi.org/10.1016/j.procs.2025.09.473> [in English].
7. Hans, S. et al. (2025). Towards artificial intelligence assisted generation of military training scenarios. DOI: <https://doi.org/10.48550/arXiv.2511.07690> [in English].
8. Giberna, M., Voos, H., Tavares, P., Nunes, J., Sorg, T., Masini, A., & Sanchez-Lopez, J. L. (2025). On digital twins in defence: Overview and applications. <https://doi.org/10.48550/arXiv.2508.05717> [in English].
9. Garrett, R. K., Jr., et al. (2016). *Modular model and simulation architecture* (U.S. Patent No. 9,514,254). U.S. Patent and Trademark Office. Retrieved from: <https://patents.google.com/patent/US9514254B2/en> (accessed 2 January 2026) [in English].
10. Park, J. S., O'Brien, J., Cai, C., Morris, M. R., Liang, P., & Bernstein, M. S. (2023). Generative agents: Interactive simulacra of human behavior. Proceedings of the 36th Annual ACM Symposium on User Interface Software and Technology (UIST'23). Association for Computing Machinery, pp. 1–22. DOI: <https://doi.org/10.1145/3586183.3606763> (accessed 30 March 2026) [in English].
11. Sottolare, R. A., & Goldberg, B. S. (2014). Designing adaptive instructional content for real-time training and education. *Design Recommendations for Intelligent Tutoring Systems*, no. 2, pp. 55–68. Retrieved from: <https://lnk.ua/NIT4nCjMR> (accessed 2 January 2026) [in English].
12. Rakhmetov, B., & Murzagulova, K. (2025). Artificial intelligence in warfare: The case of the Russia–Ukraine war. *Journal of Strategic Security*, no. 18 (4), pp. 64–77. DOI: <https://doi.org/10.5038/1944-0472.18.4.2470> [in English].
13. Lavrinchuk O. V., Zaika L. A., Shcholak A. V. (2025). *Zahalnyi ohliad ta osoblyvosti vykorystannia systemy imitatsiinoho modeliuvannia boiovykh dii Steel Beasts* [General

overview and features of the use of the combat simulation system Steel Beasts]. *Zbirnyk naukovykh prats Natsionalnoi akademii Natsionalnoi hvardii Ukrainy*. Kharkiv : NA NHU, vol. 1 (45), pp. 87–93 [in Ukrainian].

14. Boryviter (2023). *Steel Beasts Pro: heimizatsiia u navchanni dlia viiskovykh* [Steel Beasts Pro: Gamification in training for military personnel]. Retrieved from: <https://lnk.ua/3QVoSPeGX> (accessed 2 January 2026) [in Ukrainian].

15. Bestyuk, O., & Pokhnatiuk, O. (2025). Integration of artificial intelligence into higher military education as a factor in increasing the efficiency of professional training. *Scientific Bulletin of Mukachevo State University. Series: pedagogy and psychology*, vol. 11 (2), pp. 60–71. DOI: <https://doi.org/10.52534/msu-pp2.2025.60> [in English].

16. Krasovskyi P. O., Zinchenko S. V. (2025). *Systema imitatsiinoho modeliuвання boiovykh dii u Kyivskomu instytuti Natsionalnoi hvardii Ukrainy* [System of combat simulation modelling at the Kyiv Institute of the National Guard of Ukraine]. Proceedings of the roundtable materials "Zastosuvannya novitnikh tekhnolohii, pidkhodiv ta metodiv u pidhotovtsi viiskovykh fakhivtsiv" (Kyiv, September 26, 2025). Kyiv : KI NHU, pp. 50–53 [in Ukrainian].

17. Trofymenko O., Lohinova N., Sokolov A., Chykunov P., Akhmametiieva H. (2024). *Shtuchnyi intelekt u viiskovii sferi* [Artificial intelligence in the military domain]. *Kiberbezpeka: osvita, nauka, tekhnika*, no. 1 (25), pp. 161–176. DOI: <https://doi.org/10.28925/2663-4023.2024.25.161176> [in Ukrainian].

18. Babak S. A., Barkatov I. V., Zinchenko S. V., Krasovskyi P. O. (2025). *Vprovadzhennia zasobiv imitatsiinoho modeliuвання v osvittinii protses vyshchykh viiskovykh navchalnykh zakladiv z vykorystanniam platformy MOODLE: perevahy, vyklyky ta praktychni rekomendatsii* [Implementation of simulation tools into the educational process of higher military educational institutions using the MOODLE platform: advantages, challenges and practical recommendations]. *Zbirnyk naukovykh prats Natsionalnoi akademii Natsionalnoi hvardii Ukrainy*. Kharkiv : NA NHU, vol. 2 (46), pp. 5–12. DOI: <https://doi.org/10.33405/2409-7470/2025/2/46/352547> [in Ukrainian].

Military Review (2025). Modernizing military decision-making: The impact of artificial intelligence on the military decision-making process. Retrieved from: <https://lnk.ua/iviANO7WR> (accessed 2 January 2026) [in English].

Received / Стаття надійшла до редакції: 13.01.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 11.02.2026

Published / Опубліковано: 30.06.2026

БАБАК СЕРГІЙ АНАТОЛІЙОВИЧ

кандидат військових наук, старший науковий співробітник,
Військовий інститут танкових військ НТУ «ХПІ»
<https://orcid.org/0000-0002-2248-454X>

БАРКАТОВ ІГОР ВАЛЕНТИНОВИЧ

доцент НТУ «ХПІ»,
Військовий інститут танкових військ НТУ «ХПІ»
<https://orcid.org/0000-0003-2605-574X>

КРАСОВСЬКИЙ ПАВЛО ОЛЕКСІЙОВИЧ

начальник центру імітаційного моделювання,
Київський інститут Національної гвардії України
<https://orcid.org/0009-0004-7957-6279>

КОНЦЕПЦІЯ ТА АРХІТЕКТУРА ГЕНЕРАТОРА ТАКТИЧНИХ СЦЕНАРІЇВ ДЛЯ ВІЙСЬКОВИХ СИМУЛЯЦІЙ ІЗ ВИКОРИСТАННЯМ АЛГОРИТМІВ ШТУЧНОГО ІНТЕЛЕКТУ

Подано концепцію та архітектуру інтелектуального генератора тактичних сценаріїв для військових симуляцій, зокрема системи імітаційного моделювання *Steel Beasts Professional*. Описано модульну структуру системи, механізм генерації та результати попередньої функціональної валідації прототипу. Підтверджено технічну працездатність розробленої концепції у контрольованих умовах.

Методологічно в дослідженні використовувалося поєднання математичного моделювання, теорії оптимізації та валідації на основі моделювання. Алгоритми ШІ були застосовані для автоматизації планування місій, генерації нелінійної поведінки супротивника та адаптації складності навчання до рівня підготовки курсантів.

Результати показують, що запропонований генератор значно скорочує час, необхідний для підготовки навчань – від кількох годин до хвилин – одночасно збільшуючи варіативність та непередбачуваність бойових сценаріїв. Попередня валідація підтвердила технічну доцільність концепції, показавши, що система може відтворювати складні тактичні ситуації, включаючи операції загальновійськових сил, без витрат ресурсів, пов'язаних з живими тренуваннями. Більше того, інтеграція моделей противника на основі штучного інтелекту гарантує, що курсанти стикаються з динамічними та адаптивними викликами, сприяючи тактичній гнучкості, прийняттю рішень в умовах невизначеності та стійкості в стресових умовах.

Подальші дослідження будуть спрямовані на розробку національного репозиторію сценаріїв, згенерованих штучним інтелектом, на основі поточного оперативного досвіду, інтеграцію з багатодоменими симуляціями (наземними, повітряними, кібернетичними) та створення методологічних стандартів для навчання за допомогою штучного інтелекту відповідно до практики НАТО.

Ключові слова: тактичні сценарії; система імітаційного моделювання; *Steel Beasts Professional*; військова освіта; штучний інтелект.



VASYLIEV MYKOLA

*Senior Lecturer, Department of Professional Military Training,
Center for Postgraduate Education,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0009-0001-2795-1717>*



REPENKO OLEKSANDR

*Senior Lecturer, Department of Tactics,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0009-0009-6888-6083>*

THE USE OF LIGHT INFANTRY UNITS OF THE NATIONAL GUARD OF UKRAINE IN ENEMY CONTAINMENT TACTICS: LESSONS FROM THE RUSSIAN-UKRAINIAN WAR

The article analyzes the use of small-group tactics by units of the National Guard of Ukraine during combat operations in the course of the full-scale Russian-Ukrainian war. The study is based on empirical data derived from the combat experience gained by the Defense Forces of Ukraine on various sectors of the front.

Special attention is paid to the use of methods and means of combat operations under specific conditions (urban combat, fighting in forests, mountainous terrain, and open areas).

Examples of effective tactical techniques applying during maneuvering are presented. The study also highlights several methods of countering enemy assault group tactics, as well as the specific features of countering the use of armored vehicles, various types of unmanned aerial vehicles, and electronic warfare systems.

Keywords: *National Guard of Ukraine, small-group tactics, "transparent battlefield," unmanned aerial systems, ground robotic systems.*

Statement of the problem. The full-scale armed aggression of the Russian Federation against Ukraine, which began in 2014 and intensified significantly on February 24, 2022, has fundamentally transformed perceptions of the nature of modern warfare, the role of individual units, and the requirements for the methods and means of applying tactical techniques in the combat zone. One of the important components that plays a key role in ensuring mobility, survivability, and rapid response to emerging threats is the use of small groups by units of the Defense Forces of Ukraine.

The use of small groups in modern combat confrontation is determined by the flexibility of the decision-making of commanders regarding the use of units while adapting to hybrid threats.

This approach makes it possible to respond effectively to dynamic challenges that often go beyond the methods and means of conducting combat operations prescribed in the Field Manual under special conditions (Field Manual of the Mechanized and Armored Forces of the Land Forces of the Armed Forces of Ukraine, Part III Platoon, Squad, Tank, and Field Manual of the Mechanized and Armored Forces of the Land Forces of the Armed Forces of Ukraine Part II Battalion, Company).

In this regard, a systematic approach to studying the combat experience of the use of small groups by units of the National Guard of Ukraine (NGU) is particularly relevant.

Scientific interest in this issue is driven by the need to analyze and generalize the real practices of



the NGU participation in combat operations in order to improve the effectiveness of planning, training, and employment of units in combat.

Analysis of recent research and publications.

The study of issues related to the use of light infantry in modern military conflicts takes an important place in both academic and applied discourse. In particular, attention is focused on the functioning of maneuverable units within the concept of deterrence tactics, which is relevant for armed combat in urbanized, forest-marsh, and open terrain.

This area has been addressed in the scientific works of the following researchers: A. Kalloniatis, K. Hoek, L. Poladian, F. Bowden [1], M. Anderson [2], B. Phocas, J. Geroux [3], I. Romanenko, O. Kliuiev, A. Ovcharenko [4], R. Ahern, M. Zuparic, W. VanDamme [5].

During 2022-2025, a number of professional publications and analytical reports have appeared that focus on the transformation of combat operations in the context of the full-scale invasion of Ukraine by the Russian Federation, including works by I. Kryvoruchko [6], M. Pavlunko, O. Posmitiukh, S. Tyshchuk, O. Salii, O. Smolkov [7], F. Borsari [8], and A. Darwish [9]. Analytical documents of the International Institute for Strategic Studies (IISS) [10] indicate the gradual evolution of the tactics of small mobile units that conduct fire engagement, provide cover and withdrawal, and perform flanking maneuvers in conditions where the enemy has superiority in heavy weaponry.

In the process of analyzing the combat experience of representatives of the Security and Defense Forces of Ukraine, particular attention was drawn to the scientific works of O. Salnikova, V. Korendovych, S. Antonenko, P. Minieiev [11], S. Seheda, V. Shevchuk [12], and O. Lazorenko [13], who emphasize in their publications new doctrinal approaches combining classical principles of defense with nontraditional methods of combat conducted by small units (groups).

The works of researchers G. Grant [14] and P. Karber [15], published within the framework of the London School of Economics and Political Science Defence Studies (LSE DS), emphasize asymmetric confrontation and the role of trained light forces, including units of the National Guard of Ukraine, in protecting critical infrastructure and maintaining operational depth in areas where the regular forces of the Armed Forces of Ukraine (AFU) are overstretched. In turn, the monograph by T. Rid [16] reveals the essence of the phenomenon of

“distributed deterrence,” which is applied in modern warfare, including the Ukrainian reality.

Special attention should be paid to the Ukrainian analytical base created by the Centre for Defence Strategies (Kyiv) and the Centre for Army, Conversion and Disarmament Studies [17]. Their reports (2022-2024), such as *Light Infantry in the New War: Lessons of 2022*, are based on real cases of combat operations, testimonies of company and battalion commanders of the National Guard of Ukraine, as well as field journals of combat groups. In the scientific works of M. Bilenko and Yu. Kondratenko [18], the effectiveness of light assault units in counter-sabotage operations and tactical reconnaissance is analyzed, which directly correlates with the focus of this study.

The analysis of the use of small-group tactics makes it possible to identify both advantages and existing limitations in the combat capabilities of units, as well as to formulate scientifically grounded proposals for their improvement.

In general, the analysis of scientific and methodological (reference and analytical) literature indicates a growing academic interest in the topic of the combat use of light infantry formations, particularly within the units of the National Guard of Ukraine. However, a comprehensive and integrated analysis of deterrence tactics by NGU units within the framework of the Russian–Ukrainian war has not yet been conducted. This creates a research gap and substantiates the relevance of the chosen direction of the study.

Purpose of the article is to analyze the use of small groups in combat tactics during the Russian–Ukrainian war, taking into account current challenges, trends, and prospects for the development of tactics by units of the National Guard of Ukraine (NGU).

The practical value of the conducted analysis is determined by the urgent need to systematize advanced combat experience for its further integration into modern training of units. The obtained results may be directly used to update doctrinal and regulatory documents, develop new training and methodological manuals, and optimize programs of the professional military education as well as advanced training courses. The presented material will be particularly useful for tactical-level commanders, staff officers involved in the military decision-making process, as well as for academic and teaching staff, instructors, and trainees of postgraduate education centers and higher military educational institutions of the National Guard of

Ukraine, serving as a reliable applied basis for studying and implementing innovative methods of performing combat missions.

Presentation of the main material. In the modern “theater of combat actions” of the Russian-Ukrainian confrontation, the enemy, possessing superiority in manpower and equipment, continuously conducts offensive actions aimed at identifying weak points in the defense in order to create favorable conditions for further advancement into the depth of the territory. Considering the width of the front, combat operations are conducted under specific conditions (forests, populated areas, and open terrain). At the same time, the active use of unmanned aerial vehicles (UAVs) ensures the transparency of the battlefield for both the Defense Forces and the enemy.

An analysis of the tactics of the armed formations of the Russian Federation in the Bakhmut direction in November – December 2023 made it possible to identify two characteristic methods of conducting combat operations that create serious challenges for the Security and Defense Forces of Ukraine.

The first method of the enemy’s offensive actions involves the phased fire suppression of the positions of the Security and Defense Forces of Ukraine through the combined use of air strikes, artillery strikes, and various types of strike UAVs. The purpose of this tactic is to force personnel to leave their combat positions and move into shelters. In addition, when detecting firing positions of the defense forces, the enemy actively uses explosive charges dropped from UAVs or grenades containing toxic substances (such as chloropicrin or chlorine), for example the K-51 type. The chemical effects of these substances cause severe irritation of the respiratory tract, disorientation, panic reactions, and impairment of the ability to maintain organized defense, thereby forcing servicemen to leave shelters.

After Ukrainian soldiers are forced to move into open terrain, the enemy immediately intensifies attacks using high-precision means, including artillery, loitering munitions (kamikaze drones), or other available fire assets. Subsequently, small enemy assault groups of 2–4 personnel advance toward the positions and conduct so-called

reconnaissance by combat in order to identify gaps in the defense. If the assault proves unsuccessful, the enemy ceases the attack and withdraws to the initial positions, after which the tactical phase is repeated according to a similar pattern.

The second method of the enemy’s offensive operations involves organizing prolonged and intensive fire impact on the forward positions of the Security and Defense Forces of Ukraine using strike FPV drones, tank units, and artillery systems. The main objective of such actions is not only to inflict casualties on personnel and destroy engineering structures and shelters but also to cause moral and psychological exhaustion of the defending personnel, eventually forcing them to abandon their positions.

Following fire suppression, the enemy usually proceeds to assault actions using small mobile groups. One group may perform diversionary actions, another provides fire support, while a third conducts attacking actions from an unexpected direction. Such maneuvers of the units demonstrate adaptive close-combat tactics combining elements of flanking maneuvers, decentralized command, and deception.

It should be noted that the enemy’s maneuvering actions are accompanied by the active use of electronic intelligence systems. In particular, attempts are made to intercept radio communications of Ukrainian units in order to promptly adjust their own actions, improve tactical planning, and achieve the element of surprise in combat engagements.

The use of motorized vehicles in assault operations has become a characteristic feature of armed conflicts of the 21st century, especially under conditions of asymmetric warfare. A comparison of the Russian–Ukrainian war with combat operations in Syria and Afghanistan makes it possible to identify both similarities and differences in tactical approaches (see Tables 1 and 2).

One of the notable tactical methods intensively used by Russian units during the Russian–Ukrainian war is the organization of assault operations involving motorized vehicles – primarily ATVs, motorcycles, light buggies, and other highly maneuverable platforms.

Table 1 – Comparative Characteristics of the Russian-Ukrainian War with Combat Operations in Syria and Afghanistan

<i>I. The War in Syria (2011–2020)</i>
In Syria, a similar tactic was characteristic of Islamist groups, particularly ISIS, which used motorcycles and pickup trucks (so-called “technicals”) for rapid attacks on lightly defended government positions. The main features included: the absence of a linear front; an emphasis on speed, mobility, and unexpectedness; and the use of a “hit-and-run” tactic with immediate withdrawal and redeployment. At the same time, due to limited heavy weaponry, these units focused on local breakthroughs or reconnaissance-sabotage operations. Coordination was less technologically supported (with a smaller role for UAVs), but the emphasis was on quickly exhausting technique of the enemy.
<i>II. Afghanistan (1979–2001, including NATO operations)</i>
Mujahideen, and later the Taliban, extensively used motorcycles in mountainous and desert terrain. Key features included: difficult terrain favoring the use of motorized vehicles as the primary means of mobility; attacks carried out by small groups against patrols, convoys, and checkpoints; minimal armament and lack of armored vehicles; dispersed and highly autonomous units. Motorcycle attacks were generally not full-scale assaults on positions but proved extremely effective in disrupting logistics and wearing down the enemy’s morale.
<i>III. Russian–Ukrainian War</i>
In the Russian-Ukrainian war, the tactic of using light vehicles (motorcycles, ATVs, buggies, pickups) has taken on a new, high-tech dimension under conditions of a positional front. Motocross motorcycles are extensively used by Russian forces for rapid movement across the “grey zone.” Characteristics include the conduct of “motorcycle assaults” by small, highly dispersed groups (2–4 personnel) to enable rapid approach to defensive positions, followed by dismounting immediately in front of the trenches. Main features include conducting “motorized assaults” with small, highly dispersed groups (2–4 personnel) to quickly close in on defensive positions and dismount directly in front of trenches. The main objective is to compensate for the shortage of heavy armored vehicles through high speed and maneuverability, complicating artillery targeting and evading strikes from FPV drones in open, heavily mined terrain. At the same time, the Defense Forces of Ukraine extensively use pickups and buggies to support mobile fire teams (equipped with man-portable air defense systems, machine guns, and anti-tank guided missiles), rapidly deploy reserves, transport ammunition, and evacuate the wounded. The main distinction from previous conflicts is the unprecedented integration of light motorized vehicles with continuous aerial reconnaissance, real-time fire adjustment, electronic warfare systems (mounted directly on vehicles), and the widespread use of strike drones.

Table 2 – Comparison of Tactical Approaches to Conducting Combat Operations in Ukraine, Syria, and Afghanistan

<i>Criterion</i>	<i>Ukraine</i>	<i>Syria</i>	<i>Afghanistan</i>
Type of conflict:	conventional war with elements of hybridity;	civil war + insurgent movements;	asymmetric conflict;
Motorized vehicles:	ATVs, buggies, motorcycles;	motorcycles, pickups;	motorcycles;
Organization:	centralized command, drones, artillery;	semi-structured units;	centralized groups;
Objective:	breach defense lines;	raids, mobile assaults;	sabotage operations, ambushes;
Challenges for defense:	FPV drones, chemical agents, synchronized attacks;	massed and sudden attacks;	geographical elusiveness.

The main idea of small-group tactics lies in achieving a high tempo of movement of assault groups over short distances across rough terrain, which makes it possible to rapidly reduce the distance to Ukrainian positions, avoid fire engagement, and conduct sudden attacks [19–26].

The use of motorized vehicles enables units to reduce the time interval between the fire engagement of Ukrainian fortifications (by artillery or FPV drones) and subsequent assault actions. As a rule, assault groups consisting of 3–5 personnel advance toward the forward edge of the defense relying on the element of surprise, minimal time of contact with the enemy, and the rapid consolidation of captured positions. Despite its superiority in manpower and equipment, the enemy is forced to employ such methods of offensive operations because the use of various types of UAVs (reconnaissance and strike) by the units of the National Guard of Ukraine prevents the deployment of large infantry formations and attacks with armored vehicles.

The use of light, fast, and maneuverable vehicles is particularly effective in open or slightly rugged terrain, as well as in the so-called “gray zone,” where no clearly defined front line exists. In this context, the density of reconnaissance UAVs also plays an important role, as they ensure accurate targeting and coordination between artillery and mobile assault groups. It should be noted that such tactics involve significant personnel losses; however, they are used with the intention of demoralizing Ukrainian defenders and exhausting defensive resources. The enemy’s main advantage lies in its larger manpower and equipment resources. Under these conditions, the Defense Forces cannot maintain a static defense based on platoon or company strongpoints, since such formations involve the concentration of personnel and equipment in a limited area. For example, a platoon strongpoint may occupy up to 400 m along the front and up to 300 m in depth. A precision strike by a guided aerial bomb with an equivalent of 200 kg of explosives can affect an area with a radius of up to 250 m (considering the blast wave, fragmentation, and the probability of barotrauma among personnel). Therefore, in order to increase survivability of personnel and

equipment, the defense must be maneuverable. A combat formation that has proven effective involves organizing the first defensive line through observation posts consisting of 3–5 riflemen positioned to provide all-round defense, provided that proper camouflage measures and engineering preparation of the position are ensured. The second line includes collective fire assets (heavy machine guns, anti-tank rocket systems, grenade launchers, and light mortars) as well as UAV crews operating from shelters. The third line consists of artillery and mortar fire groups. These are usually small fire groups (one or two guns) positioned according to the principle of distance from the forward line:

- no more than 7 km for M777, FH70, CAESAR self-propelled artillery systems, 2A65, 2A36, 2S5, 2S7;
- no more than 5 km for other artillery systems of soviet and foreign production;
- no more than 2 km for mortars and artillery systems such as the L119 (M119).

Tank fire is generally conducted from closed firing positions.

The dispersion of personnel, equipment, and fire assets, strict adherence to camouflage measures, proper engineering preparation of positions, and the use of various anti-drone protection measures (nets, canopies, shotguns, portable electronic warfare systems, steel frames, etc.) significantly increase the survivability of personnel.

Small-group tactics involve the actions of highly mobile units consisting of 3–10 personnel who perform combat tasks in specific conditions such as urban environments, underground communications or open areas that are observable by aerial reconnaissance assets. This approach corresponds to modern battlefield realities, where the transparency of the battlefield caused by unmanned systems (UAVs, particularly FPV drones and quadcopters such as the “Mavic”) makes it extremely difficult for platoon-sized or larger units to operate with armored vehicles as prescribed in the Combat Manual of the Mechanized and Tank Troops of the Land Forces of the Armed Forces of Ukraine Parts III (platoon, squad, tank) and II (battalion, company). The main principles of small-group tactics include:

Concealment: the use of terrain features, underground communications, and camouflage to avoid detection.

Suddenness: delivering precise strikes or sabotage actions with minimal warning for the enemy.

Maneuverability: rapid movement of small groups to bypass or envelop enemy positions.

Integration of technology: the use of UAVs, thermal imaging devices, motion sensors, and electronic warfare systems to increase effectiveness.

Combat experience shows that the advantages of small-group tactics in offensive operations include stealth, since small groups are harder to detect by reconnaissance UAVs due to their limited size and the use of underground routes, natural shelters (ravines, forest belts) and smoke screens.

High mobility allows them to bypass enemy positions, avoid engagement zones, and quickly change directions of action. In urban environments, this enables the encirclement of strongpoints through underground passages or ruins.

The integration of UAVs (FPV drones and drones equipped with drop mechanisms) allows for precision strikes against equipment, infantry, or fortifications with minimal losses.

The use of drones for reconnaissance and strike missions reduces the need for direct fire contact, thereby lowering the risk of casualties among personnel.

Despite its advantages, small-unit tactics have significant drawbacks that complicate their use. Difficulty in navigation and coordination: in underground communications (tunnels, sewer systems) or dense urban environments, small groups face orientation challenges due to limited visibility and obstacles to communication. For example, GPS signals may be jammed by the enemy's electronic warfare systems.

Coordination between groups is also complicated by the vulnerability of radio communications to electronic warfare, which requires the use of mesh networks or alternative communication channels.

There is also a threat of poisoning, collapses, and fire traps: underground communications may be mined, blocked by debris or used by the enemy to set up ambushes. Poor ventilation in underground passages increases the risk of gas poisoning. Moreover, small groups carry limited amounts of ammunition, equipment, and electronic warfare systems due to the requirement for mobility and lightness, which reduces their autonomy during prolonged combat operations.

In defensive operations, UAVs are used for reconnaissance and strike missions: FPV drones and drones with drop mechanisms enable reconnaissance and targeted strikes without direct contact with the enemy, thereby reducing casualties. Portable jamming systems are used to protect groups from enemy drones.

Engineering support (blockages, barriers, and mining) is used by units to prevent enemy movement through underground routes. Underground communications can also be integrated into the defense system, providing concealed movement, evacuation routes, or the delivery of supplies.

Small groups operate autonomously using digital situational awareness systems for coordination. Infantry actions are combined with UAVs and artillery, where drones conduct reconnaissance and strikes while infantry units perform containment tasks. Smoke screens, camouflage nets, and electronic warfare systems are used to protect against aerial reconnaissance. The advantages and disadvantages of this tactic can be presented in the form of a table.

Table 3 – Advantages and Disadvantages of Employing of Small-Unit Combat Tactics

Evaluation Criterion	Advantages	Disadvantages
Mobility and dispersion	Reduces vulnerability to artillery and UAVs; enables rapid repositioning	Limited ability to hold a long front line
Command flexibility	Rapid tactical-level decision-making; significant role of junior leaders	Requires highly trained sergeant-level commanders
Integration with UAVs	Real-time fire adjustment; increased strike accuracy	Dependent on communication channels and electronic warfare systems
Urban operations	Effective in building assaults and clearing neighborhoods, well-suited for dense urban combat	High casualties without support from armored combat vehicles
Psychological impact	Continuous pressure on the enemy; raids and sabotage operations Advantage of suddenness	High psychological and moral strain on personnel
Logistics	Lower supply needs; easier covert movement	Limited ammunition, medical supplies, and support equipment
Survivability in a “Transparent Battlefield”	Harder to detect massed targets; dispersion prevents destruction of large numbers of forces in a single strike	Vulnerable if communication or coordination between groups is lost

Small-group tactics have become an integral part of modern combat operations in the Russian-Ukrainian war, particularly under conditions where the transparency of the battlefield and the high density of firepower make traditional tactical methods impractical. It should be noted that the use of small infantry group tactics, combined with advanced technologies and innovative command-and-control algorithms, enables units of the National Guard of Ukraine not only to successfully accomplish combat missions but also to shape new standards of modern military art, demonstrating to the international community a paradigm of adaptive tactics under conditions of technological transformation in armed warfare.

Conclusions and prospects for further research. Thus, based on the presented material and the conducted analysis, a substantiated assessment has been provided regarding the effective use of small infantry group tactics by units of the National Guard of Ukraine under the conditions of the modern “transparent battlefield.”

It has been proven that the units of the National Guard of Ukraine demonstrate a high level of tactical flexibility. Practical combat experience has made it possible to develop effective tactical

techniques that integrate the use of optoelectronic devices (including thermal imaging equipment), reconnaissance and signaling systems (such as motion sensors), unmanned aerial systems, as well as the systematic establishment of engineering obstacles and the implementation of counterintelligence (security) measures.

It has been established that the key advantages of small-group tactics are concealed maneuver, suddenness of the fire engagement, high mobility, precision strikes, and the minimization of personnel losses serve as an effective asymmetric tool that makes it possible to offset the enemy’s strength and firepower superiority.

At the same time, identified vulnerabilities such as difficulties in navigation under conditions of active enemy electronic warfare, mine and explosive hazards along movement routes, and logistical limitations related to the amount of carried ammunition and medical supplies require a comprehensive approach to their mitigation.

The materials of this article may be used in the educational process of higher military educational institutions.

Prospects for further research may include studying the methodology for preparing personnel

for autonomous operations, developing algorithms for interaction between small groups and ground robotic systems, and formalizing the acquired experience in updated doctrinal documents and methodological manuals of the National Guard of Ukraine.

References

1. Komanduvannia Sukhoputnykh viisk Zbroinykh Syl Ukrainy (2016). *Boiovyi statut mekhanizovanykh i tankovykh viisk Sykhoputnykh viisk Zbroinykh Syl Ukrainy. Chastyna III (vzvod, viddilennia, tank)* [Combat status of mechanized and tank units of the Land Forces of the Armed Forces of Ukraine. Part III (platoon, divisions, tank)]. Kyiv [in Ukrainian].
2. Komanduvannia Sukhoputnykh viisk Zbroinykh Syl Ukrainy (2016). *Boiovyi statut mekhanizovanykh i tankovykh viisk Sykhoputnykh viisk Zbroinykh Syl Ukrainy. Chastyna II (batalon, rota)* [Combat status of mechanized and tank forces of the Land Forces of the Armed Forces of Ukraine. Part II (battalion, company)]. Kyiv [in Ukrainian].
3. Kalloniatis, A., Hoek, K., Poladian, L., Bowden, F. (2021). Optimising structure in a networked Lanchester Model for Fires and Manoeuvres in Warfare. *Journal of the Operational Research Society*, no. 3, pp. 45–52. DOI: <https://doi.org/10.48550/arXiv.2105.06104> [in English].
4. Anderson, M. G. (2022). How Ukraine's Roving Teams of Light Infantry Helped Win the Battle of Sumy. *Modern War Institute at West Point*, August. Retrieved from: <https://surl.lt/lfxcii> (accessed 27 February 2026) [in English].
5. Phocas, B., Geroux, J. (2022). The School of Street Fighting: Tactical Urban Lessons from Ukraine. *Modern War Institute*. Retrieved from: <https://surl.li/shxkya> (accessed 7 February 2026) [in English].
6. Romanenko I. V., Kliuiev O. P., Ovcharenko A. S. (2023). *Taktyka strymuvannia: ukrainska adaptatsiia* [Deterrence Tactics: Ukrainian Adaptation]. *Natsionalna bezpeka ta oborona*, no 2, pp. 22–29 [in Ukrainian].
7. Ahern, R., Zuparic, M., Van Damme, W. (2023). Unifying Warfighting Functions in Mathematical Modelling: Combat, Manoeuvre, and C2. *arXiv*. Retrieved from: <https://arxiv.org/abs/2301.09949> (accessed 7 February 2026) [in Ukrainian].
8. Kryvoruchko I. (2023). *Metodyka otsiniuvannia variantiv manevru (perehrupuvannia) pidrozdiliv dlia pererozpodilu syl u khodi oboronnoi operatsii* [Methodology for evaluating maneuver (regrouping) options for units for the distribution of forces during a defensive operation]. *Zbirnyk naukovykh prats Tsentru voienno-stratehichnykh doslidzhen*, no. 2 (78), pp. 133–139 [in Ukrainian].
9. Pavlunko M., Posmitiukh O., Tyshchuk S., Salii O., Smolkov O. (2023). *"Hibrydna viina" – suchasna stratehiia rosiiskoi federatsii v zbroinii ahresii proty Ukrainy* ["Hybrid war" is the modern strategy of the Russian Federation in armed aggression against Ukraine]. *Zbirnyk naukovykh prats Tsentru voienno-stratehichnykh doslidzhen NUOU*, no. 3 (76), pp. 18–23 [in Ukrainian].
10. Borsari, F. (2025). Adaptation Under Fire: Mass, Speed, and Accuracy Transform Russia's Kill Chain in Ukraine. *CEPA Comprehensive Reports*. Retrieved from: <https://surl.cc/zzwivk> (accessed 7 February 2026) [in English].
11. Darwish, A. (2025). Ukrainian Military Tech Timeline and Analysis (2022–2025). *Bloomsbury Intelligence and Security Institute*. Retrieved from: <https://bisi.org.uk/reports/ukrainian-military-tech-timeline-and-analysis-20222025> (accessed 7 February 2026) [in English].
12. International Institute for Strategic Studies (2023). *The Military Balance 2023*. London : Routledge [in English].
13. Salnikova O. F., Korendovych V. S., Antonenko S. I., Minieiev P. A. (2018). *Analiz voiennykh aspektiv hibrydnoi viiny: yikh zmist ta uroky protydii* [Analysis of the military aspects of hybrid warfare: the content and lessons for counteraction]. *Suchasni informatsiini tekhnolohii u sferi bezpeky ta oborony*, no. 32 (2), pp. 11–118 [in Ukrainian].
14. Sehed S. P., Shevchuk V. P. (2019). *Hibrydna viina Rosii proty Ukrainy: istorychnyi vymir* [Russia's Hybrid War Against Ukraine: Historical Dimension]. *Nauka i oborona*, no. 6 (1), pp. 31–35. DOI: <https://doi.org/10.33099/2618-1614-2019-6-1-31-35> [in Ukrainian].

15. Lazorenko O. (2024). *Hibrydna viina: napriamky i vyznachennia* [Hybrid warfare: directions and definitions]. *Visnyk Cherkaskoho universytetu. Seriya: istorychni nauky*, no. 1, pp. 38–45 [in Ukrainian].
16. Grant, G. (2023). *Modernising Ukraine's Defence: Lessons from 2022*. London : LSE Defence Studies [in English].
17. Karber, P. (2023). *Battlefield Insights: Ukraine's Light Infantry under Fire*. London : LSE Defence Studies [in English].
18. Rid, T. (2017). *The Future of War*. New York : Penguin Press [in English].
19. Tsentr oboronnykh stratehii (2022). *Lehka pikhotna v novii viini: uroky 2022 roku* [Light pikhotna in new wine: the charms of 2022]. Kyiv. Retrieved from: <https://surl.li/xxvvia> (accessed 7 February 2026) [in Ukrainian].
20. Bilenko M. Yu., Kondratenko Yu. S. (2023). *Efektivnist zastosuvannia lehkyykh pikhotnykh pidrozdiliv u kontrdyversii diialnosti* [The effectiveness of using light infantry units in counter-sabotage activities]. *Viiskova sprava ta bezpeka*, no. 3 (9), pp. 48–57 [in Ukrainian].
21. Voronkov K. V. (2024). *Taktyka zastosuvannia malykh mobilnykh hrup na kvadrotsyklakh ta mototsyklakh u boiovykh diiakh* [Tactics of using small mobile groups on ATV and motorcycles in combat operations]. *Viiskova dumka*, no. 3, pp. 33–41 [in Ukrainian].
22. Butusova Ya. I. (2023). *Osoblyvosti zastosuvannia shтурmovykh hrup u miskykh umovakh: dosvid Ukrainy* [Peculiarities of using assault groups in urban conditions: the experience of Ukraine]. *Naukovyi visnyk Natsionalnoho universytetu oborony Ukrainy*, no. 1 (69), pp. 77–86 [in Ukrainian].
23. Holts A. (2023). *Motopikhota XXI stolittia: mobilnist ta zahroza* [Motorized infantry XXI century: mobility is a threat]. Retrieved from: <https://novayagazeta.eu/articles/2023/10/14> (accessed 7 February 2026) [in Ukrainian].
24. Ministerstvo oborony Ukrainy. *Taktyka vedennia boiovykh dii v urbanizovanii mistsevosti* [Tactics of conducting combat operations in urban areas]. Kyiv [in Ukrainian].
25. Tykhonov V. O. (2023). *Analiz zastosuvannia droniv i moto-manevrenykh hrup rosiiskyykh viisk na Donechchyni* [Analysis of the use of drones and motorized maneuver groups of Russian troops in the Donetsk region]. *Zbirnyk naukovykh prats Tsentru naukovykh doslidzhen Natsionalnoho universytetu oborony Ukrainy*, no. 2, pp. 59–65 [in Ukrainian].
26. Tkachuk A. M. (2022). *Osoblyvosti pidgotovky i vedennia oboronnoho boiu v umovakh miskoi zabudovy* [Features of preparing and conducting defensive combat in urban environments]. *Nauka i oborona*, no. 1, pp. 19–25 [in Ukrainian].
27. Bondarenko S. M. (2021). *Inzhenerne zabezpechennia boiovykh dii u mistakh* [Engineering support for combat operations in cities]. *Viiskovo-naukovyi visnyk*, no. 38, pp. 72–80 [in Ukrainian].
28. Honcharenko Yu. R. (2022). *Udoskonalennia taktyky pidrozdiliv v urbanizovanomu seredovyshchi* [Improving unit tactics in an urban environment]. *Zbirnyk naukovykh prats Tsentru voienno-stratehichnykh doslidzhen*, no. 3, pp. 45–50 [in Ukrainian].

Received / Стаття надійшла до редакції: 10.02.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 27.02.2026

Published / Опубліковано: 30.06.2026

ВАСИЛЬСВ МИКОЛА ВОЛОДИМИРОВИЧ

*старший викладач кафедри професійної військової підготовки
Центру післядипломної освіти,
Київський інститут Національної гвардії України
<https://orcid.org/0009-0001-2795-1717>*

РЕПЕНКО ОЛЕКСАНДР МИКОЛАЙОВИЧ

*старший викладач кафедри тактики,
Київський інститут Національної гвардії України
<https://orcid.org/0009-0009-6888-6083>*

ЗАСТОСУВАННЯ ТАКТИКИ МАЛИХ ГРУП ПІДРОЗДІЛАМИ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ: ДОСВІД РОСІЙСЬКО-УКРАЇНСЬКОЇ ВІЙНИ

Проаналізовано застосування тактики малих груп підрозділами Національної гвардії України під час виконання бойових завдань в умовах широкомасштабної російсько-української війни. Дослідження ґрунтується на емпіричних даних бойового досвіду, здобутого силами оборони України на різних ділянках фронту.

Особливу увагу приділено використанню способів (засобів) ведення бою в особливих умовах (у місті, лісі, горах, на відкритій місцевості). Оцінено ефективність засобів індивідуального захисту, зокрема у відповідь на використання противником газових гранат К-51. Запропоновано практичні рекомендації щодо покращення бойової підготовки, логістики та інженерного забезпечення.

Наведено приклади ефективних тактичних прийомів під час застосування маневрів. Акцентовано увагу на деяких способах протидії тактиці ворожих штурмових груп, особливостях протидії застосуванню бронетехніки, різних видів безпілотних літальних апаратів та засобів радіоелектронної боротьби.

Вперше наведено системне обґрунтування потенціалу адаптивної тактики для підрозділів територіальної оборони, що діють у міських умовах.

Майбутні дослідження будуть спрямовані на розробку бойової підготовки, адаптованих до операцій у районах з високою щільністю населення, загроз від безпілотників, радіологічної та хімічної небезпеки, а також використання нетрадиційних тактичних підходів з боку супротивників. Враховуючи інтенсивність сучасних міських бойових дій, вплив стресу на прийняття рішень та ефективність команд вимагає міждисциплінарних досліджень, спрямованих на підвищення психофізичної готовності військовослужбовців. Буде розглянуто інтеграцію сучасних засобів візуалізації, автономних систем вогневої підтримки, модульних захисних конструкцій, сенсорних систем спостереження та автоматизованих рішень управління вогнем у систему професійної підготовки досліджуваної категорії особового складу.

Ключові слова: *Національна гвардія України; тактика малих груп; прозоре поле бою; безпілотні авіаційні комплекси; наземні роботизовані комплекси.*



VLASIUK VALERII
*Candidate of Military Science, Associate Professor
Deputy Head of Department of Tactics,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0000-0002-2140-3250>*



NAHORNYI ROMAN
*Cadet, Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0009-0004-2269-6018>*

IMPROVEMENT OF THE PROCESS OF BUILDING THE COMBAT ORDER FOR CONDUCTING OFFENSIVE COMBAT BY THE FORCES OF THE NATIONAL GUARD OF UKRAINE

The article states that an offensive battle is one of the main types of combined arms combat, which can be organized and conducted both by the forces and means of a separate unit and by the joint efforts of different branches, types of troops and in interaction with other law enforcement agencies.

Planning and organizing an offensive battle is one of the most complex processes of the work of commanders of all levels and requires taking into account a large number of various factors, including the construction and formation of elements of the combat order.

In domestic guiding documents and scientific achievements on a specific topic, as well as NATO doctrines available for use, the available options for organizing and planning an offensive battle do not contain a clear approach to the distribution of available forces and means according to the most characteristic combat tasks and the construction of the combat order.

In order to improve and increase the efficiency of the process of organizing an offensive battle by management bodies, an idea has been proposed that takes into account the distribution of available forces and means according to the most characteristic combat tasks for the construction of the combat order. An example of a distribution option and a constructed battle order is presented in the form of a table.

The use of the idea will allow to increase the efficiency of the work of the control bodies during the planning and organization of an offensive battle due to greater clarity of information display and reduction of time for proving the commander's plan to subordinate units.

Each element of the formed battle order is assigned its corresponding most characteristic combat task. According to the authors, such an approach to distribution is visual, convenient and covers the main tasks of the troops in an offensive battle.

Keywords: *offensive combat; distribution of forces and means; combat missions; combat formation.*

Statement of the problem. As of February 2026, the full-scale invasion of Ukraine by the forces of the Russian Federation (RF) continues. The enemy continues to conduct air-land offensive operations across a wide front. Currently, the most active methods of warfare involve launching mass missile, artillery, and air strikes against military training grounds, units, their command organs, the state's critical infrastructure, and civilian objects. Various combined strikes are utilized, employing ballistic and cruise missiles in combination with kamikaze drones of various modifications.

In order to increase the effectiveness of repelling numerically superior enemy forces in terms of manpower and mechanized units – including infantry fighting vehicles (IFVs), armored personnel carriers (APCs), and armored fighting vehicles (AFVs), as well as tanks, artillery, and aviation – offensive brigades were formed within the system of the Ministry of Internal Affairs (MIA). These include the National Guard of Ukraine (NSU) brigades: "Azov", "Spartan", "Rubizh", "Chervona Kalyna", "Kara-Dag", "Bureviy", and "Khartia"; the State Border Guard



Service of Ukraine (SBGS) brigades: "Pomsta", "Hart", "Forpost", and "Stalevyi Kordon"; and the National Police of Ukraine (NPU) brigade: "Liut".

The forces of Ukraine's security and defense sector continue to perform defensive tasks, searches, raids, ambushes, as well as step-by-step offensive actions, which comprise combined strikes by troops and fire assets. The primary method of destroying the enemy on the territory of the state is offensive combat. Therefore, there is a need to find ways and approaches to improve the processes of its planning and organization by the command organs of units and sub-units, taking into account the distribution of available forces and assets according to the combat missions most characteristic of them to build a combat order.

Analysis of recent research and publications.

At present, the primary governing documents regulating the planning, organization, and conduct of offensive combat by sub-units and units are Combat Manuals [1–4] and Guidelines [5, 6].

In the specified list [1–4], each of the main sections titled "Offensive Combat" and their corresponding annexes provide information on the procedure for organizing and conducting offensive combat, as well as main definitions and military terms. The Guidelines disclose the operational procedures of a tactical-level staff [5] and the individual [6] decision-making process for organizing, planning combat, and commanding subordinate sub-units during the execution of designated combat missions.

However, all information in [1–6] is presented textually in the form of general articles of manuals and guidelines, which do not contain examples or variants of distributing available forces and assets by corresponding characteristic combat missions for sub-units in offensive combat.

In the scientific works of domestic scholars [7–15] in the field of military sciences, fundamental provisions regarding the improvement of combat conduct, including offensive combat, are highlighted. Important questions of military science and military art are covered. However, examples and variants of planning offensive combat with the distribution of forces and assets to sub-units according to their most characteristic combat missions are not disclosed.

Current and publicly accessible NATO doctrines and military publications [16–19] reveal approaches to planning offensive operations. Nevertheless, examples of the distribution of forces and assets according to their most characteristic missions are presented fragmentedly, and

recommendations regarding the procedure for building a combat order for the most effective destruction of enemy forces are lacking. Thus, it can be concluded that in domestic governing documents and scientific achievements on this topic, as well as in accessible NATO doctrines, the existing options for organizing and planning offensive combat do not contain a visual approach to distributing available forces and assets by their most characteristic combat missions and building a combat order.

Purpose of the article is to improve the process of building a combat order for conducting offensive combat by applying an approach to distribute available forces and assets according to their most characteristic combat missions. The developed approach will increase the efficiency of the work of NSU command organs during the planning and organization of offensive combat due to a more visual representation of information and a reduction in the time required to convey the commander's intent to subordinate sub-units.

Presentation of the main material. In accordance with the requirements of Combat Manuals, offensive combat is one of the main types of combined arms combat and aims to achieve two primary tasks:

- The defeat of the enemy;
- The capture of terrain areas, lines, or objectives.

The main requirements for offensive actions are:

- Surprise of offensive actions;
- Concentration of efforts toward defeating the enemy;
- High tempo of advance;
- Decisiveness of actions and maneuvers.

Offensive actions can be conducted against an enemy who is:

- Advancing – by conducting a meeting engagement;
- Retreating – by conducting a pursuit;
- Defending – from a position of direct contact with the enemy or by deploying from the depth of the formation (from the march).

For the organized conduct of offensive combat, a combat mission is assigned to:

- A brigade (regiment) – an offensive zone, a main direction, and a task to defeat the enemy;
- A battalion – an immediate mission, a subsequent mission, and the direction of continuation of the offensive;

- A company – an immediate mission and the direction of continuation of the offensive;
- A platoon – an objective of attack and the direction of continuation of the offensive.

The objective of an attack can be designated as:

- An object, such as an enemy bunker/dugout, an enemy squad position, a building, a structure, or a hill/height;
- A terrain section, such as enemy company and/or platoon strongpoints, with an approximate area of up to 500 square meters;
- An area, with an approximate area of 1000 square meters or larger;
- A line/boundary, such as a street, a road, a riverbed, or a tree line.

Thus, the platoon's objective of attack and its direction of continuation of the offensive must ensure the execution of the company's combat mission, and the company's direction of continuation of the offensive ensures the execution of the battalion's immediate mission. In turn, the battalion's direction of further offensive must ensure the execution of the brigade's (regiment's) combat mission.

The structure of offensive combat includes:

- The combat order;
- Systems of: positions, areas, and lines; fire engagement (VHV); air defense (PVO); countering enemy diversionary-reconnaissance forces (DRS) and airborne landings; command and control; support and sustainment.

The combat order in offensive combat is formed:

- For a brigade (regiment) – in a single echelon with the allocation of a combined arms reserve (ZVRez) or in two echelons;
- For a battalion – in a single echelon with a ZVRez or in two echelons, as well as a mortar battery, attached sub-units, and fire assets;
- For a company – in one or two echelons with attached artillery sub-units, reinforcement assets, an allocated ZVRez, and a created mine-clearing group;
- For a platoon – a command and fire support group led by the platoon commander, mechanized squads, and reinforcement assets.

Depending on the nature of the enemy's actions, terrain, the manning level of sub-units, and other factors and conditions, additional elements of the

combat order may be formed.

Command and control of brigade (regiment) sub-units is the process of organizing, coordinating, directing, monitoring, and analyzing the activities of subordinate sub-units to effectively execute combat missions. To command a brigade (regiment), a command and control system is established, which includes a set of functionally and structurally interconnected sub-systems (elements): command organs, command posts (PU), control assets, and concealed troop command and control.

To command the sub-units of a brigade (regiment), a main command post (OKP) is established, which is designed to command sub-units during the preparation and in the course of combat (actions) and is deployed at a distance that ensures reliable command of subordinates. At the battalion, company, and platoon levels, command and observation posts (KSP) are deployed and equipped.

To grant greater independence for executing a combat mission regarding the organization of offensive actions, other sub-units may be attached to the main forces or allocated for support.

Attached sub-units (forces) and fire assets are transferred to the temporary subordination of the commander of the main sub-unit and execute the tasks assigned by them. Their release from subordination is carried out upon the instructions of the higher command.

Supporting sub-units remain under the subordination of their direct commanders and execute the tasks defined by them, as well as tasks requested by the commander of the supported forces within the resource (allotment) allocated to them.

The actions of the main forces may be attached or supported by sub-units of: infantry; mechanized; tank; artillery; air defense (PVO); army aviation (helicopters and/or aircraft); anti-tank weapons (PTZ); military intelligence; radio-electronic reconnaissance (RER/SIGINT); communications; electronic warfare (EW); application of unmanned aerial vehicles (UAVs) and unmanned aerial complexes (UAS/BAK); engineer-sapper; radiation, chemical, and biological protection (CBRN/RKhBz); medical; repair and recovery; material and technical support (logistics/MTZ).

The organizational and staff structure

(OSHS/TO&E) at the brigade level, a variant of which is presented in Figure 1, encompasses a command organ (staff), a brigade artillery group, combat sub-units (three mechanized battalions on APCs, a mechanized battalion on IFVs, an infantry battalion, a tank battalion, a self-propelled artillery battalion/divizion, a rocket artillery battalion/divizion, an air defense missile battalion/divizion, an unmanned systems application battalion, an anti-tank company, a sniper platoon), material and technical support sub-units (a repair and recovery battalion, a material and technical support/logistics battalion, a signal company, a medical company), and combat support sub-units (a reconnaissance company, a sub-unit CBRN company, an engineer-sapper company, an EW company).

Thus, relying on the conducted analysis of the requirements and provisions of the main governing documents [1–6], it can be concluded that during the building of a combat order for conducting offensive combat, every commander faces the following problematic issues:

- The material is presented concisely and without additional explanations;
- There is a large amount of textual information, which complicates general spatial visualization and prevents simultaneously grasping the entire process of building a combat order for conducting offensive combat;
- Relying solely on the articles of the manuals, it is difficult for a commander to cover all possible tasks for each element of the combat order that can be formed to conduct offensive combat.

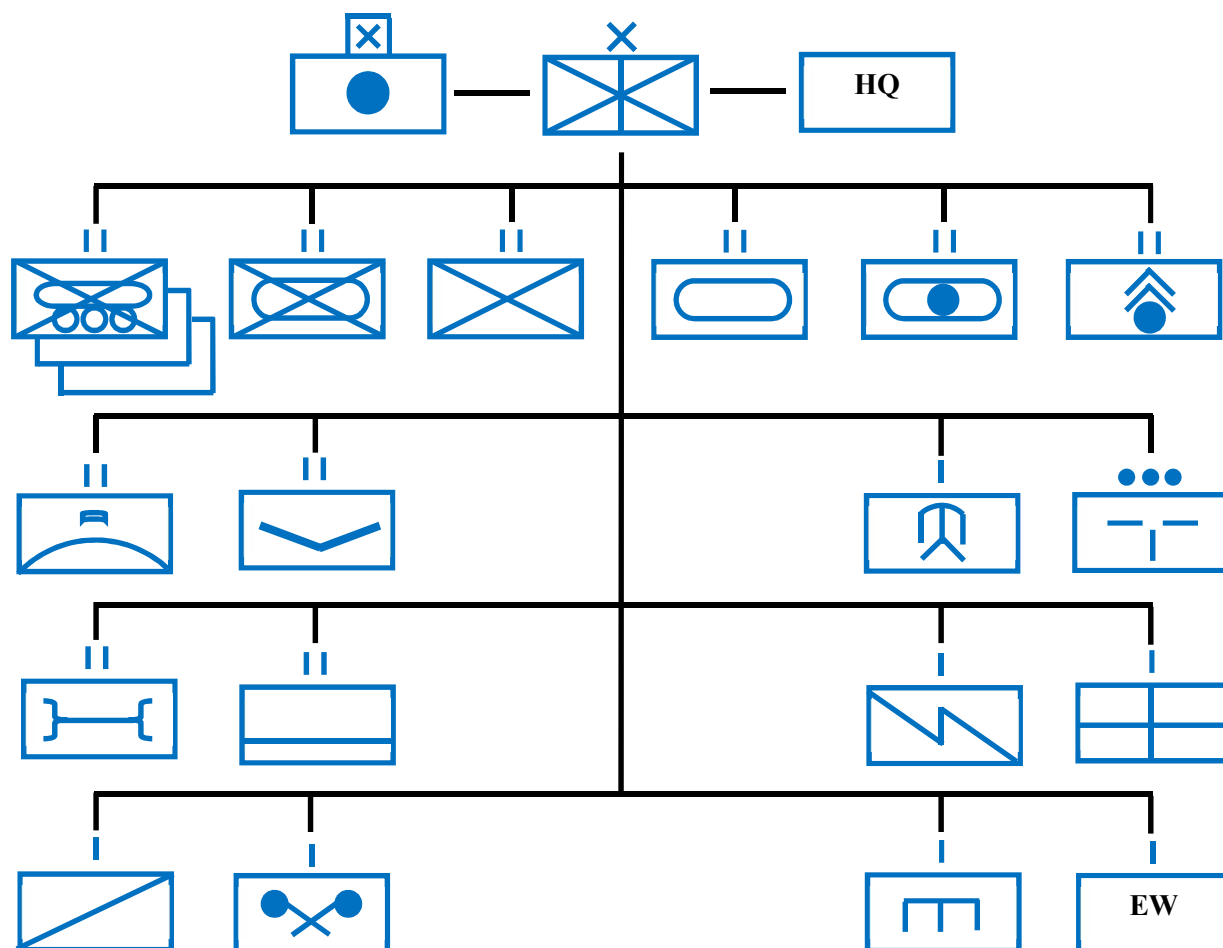


Figure 1 – A variant of the organizational and staff structure of a brigade

Source: developed by the authors based on data from [1]

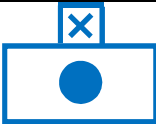
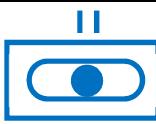
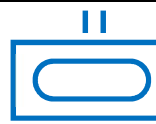
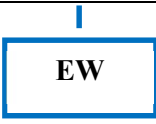
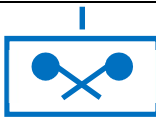
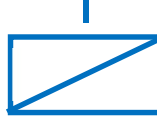
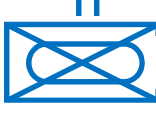
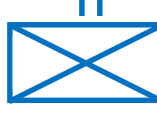
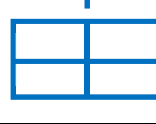
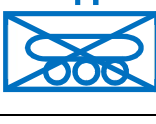
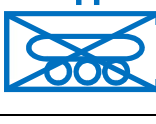
Taking into account the described problematic issues, an idea is proposed to combine the requirements of domestic governing documents [1–5] and NATO doctrines [16–19] for organizing offensive combat.

Given the number of possible elements of a combat order during offensive combat that can be formed, and the presence of attached and supporting forces and assets, it is quite difficult to quickly and visually present the commander's

intent to all subordinate personnel. To resolve this issue and improve the work of command organs, it is proposed to implement an approach for distributing available forces and assets according to their designated missions.

A variant of such an approach involving the distribution of available forces and assets for building a combat order to conduct offensive combat is presented in Table 1.

Table 1 – A variant of the distribution of available forces and assets for building a combat order to conduct offensive combat

№ з/п	Завдання		1	2	3	4
1	SUPPRESS	Сили подавлення (придушення)				
2	OBSCURE	Сили засліплення (задимлення)				
3	SECURE	Сили безпеки (прикриття)				
4	REDUCE	Сили подолання інженерних загороджень				
5	ASSAULT	Сили прориву				
6	SUPPORT	Сили забезпечення				
7	RESERVE	Резерв				

Developed by the authors based on data from [1–5; 16–19]

In Table 1, the distribution of available forces and assets (Fig. 1) for building a combat order to conduct offensive combat is systematically, visually, and conveniently presented, taking into account the main combat missions:

- The "SUPPRESS" mission (suppression forces) is represented by sub-units: row 1, columns: 1 brigade artillery group; 2 self-propelled artillery battalion/divizion; 3 rocket artillery battalion/divizion; 4 tank battalion.

- The "OBSCURE" mission (blinding/smoke forces) is represented by sub-units: row 2, columns: 1 EW company; 2 sub-unit CBRN company.

- The "SECURE" mission (security/screening forces) is represented by sub-units: row 3, columns: 1 unmanned systems application battalion; 2 air defense missile battalion/divizion; 3 reconnaissance company.

- The "REDUCE" mission (obstacle-breaching forces) is represented by sub-units: row 4, columns: 1 engineer-sapper company; 2 sniper platoon.

- The "ASSAULT" mission (breach/assault forces) is represented by sub-units: row 5, columns: 1 mechanized battalion on APCs; 2 mechanized battalion on IFVs; 3 infantry battalion; 4 anti-tank company.

- The "SUPPORT" mission (sustainment/support forces) is represented by sub-units: row 6, columns: 1 repair and recovery battalion; 2 material and technical support/logistics battalion; 3 signal company; 4 medical company.

- The "RESERVE" mission (reserve) is represented by sub-units: row 7, columns 1 and 2: two mechanized battalions on APCs. The basis for forming reserve forces is a two-fold requirement – power and mobility.

Thus, seven steps of the "SOSRASR" cycle are formed for the process of building a combat order to conduct offensive combat with the distribution of available forces and assets according to their most characteristic combat missions. All available forces and assets of the brigade are engaged to organize offensive actions. The presented distribution is not a dogma, but merely a convenient and visual example. The variant of distributing forces and assets by their most characteristic combat missions is a matter of discussion and can be changed by the commander, taking into account known additional baseline information. The developed acronym "SOSRASR" can be supplemented and improved by the commander's decision. The example of the provided table can be used as a formalized document, as it contains the main combat missions

assigned to the formed elements of the combat order.

Conclusions and prospects for further research. Consequently, the presented approach to distributing forces and assets according to their corresponding most characteristic combat missions in Table 1 for building a combat order enables the commander to more conveniently visualize the procedure for employing available sub-units upon completing the decision-making process.

The scientific novelty of the article's materials, unlike known ones, lies in combining approaches to building a combat order for conducting offensive combat in accordance with the requirements of domestic governing documents and NATO doctrines. Each element of the formed combat order is assigned its corresponding most characteristic combat mission. According to the authors, such an approach to distribution is visual, convenient, and covers the main tasks of troops in offensive combat.

This idea can be implemented into the activities of NSU command organs and other security agencies directly participating in conducting offensive combat, both independently and in cooperation, in the form of a formalized document – a table.

These materials are a logical continuation of [20], which examined defensive combat; therefore, the analysis and formulation of recommendations for NSU command organs regarding the improvement of planning and organizing a march and quartering on-site, based on domestic approaches and the experience of leading NATO countries, have been chosen as prospects for further research.

References

1. Komanduvannia Sukhoputnykh viisk Zbroinykh Syl Ukrainy (2026). *Boiovyi statut mekhanizovanykh i tankovykh viisk Sykhoputnykh viisk Zbroinykh Syl Ukrainy. Chastyna I (bryhada, polk) : SBP 3-(01,02,04).55* [Combat regulations of the mechanized and tank troops of the Land Forces of the Armed Forces of Ukraine. Part I (brigade, regiment)]. Kyiv [in Ukrainian].
2. Komanduvannia Sukhoputnykh viisk Zbroinykh Syl Ukrainy (2026). *Boiovyi statut Sukhoputnykh viisk Zbroinykh Syl Ukrainy. Chastyna II (mekhanizovanyi batalion): SBP 3-(01).56* [Combat regulations of the Ground Forces of the Armed Forces of Ukraine. Part II (mechanized battalion)]. Kyiv [in Ukrainian].

3. Komanduvannia Sukhoputnykh viisk Zbroinykh Syl Ukrainy (2026). *Boyovyi statut Sukhoputnykh viisk Zbroinykh Syl Ukrainy. Chastyna II (tankovyi batalion) : SBP 3-(02).56* [Combat regulations of the Ground Forces of the Armed Forces of Ukraine. Part II (tank battalion)]. Kyiv [in Ukrainian].

4. Komanduvannia Sukhoputnykh viisk Zbroinykh Syl Ukrainy (2016). *Boiivyi statut mekhanizovanykh i tankovykh viisk Sukhoputnykh viisk Zbroinykh Syl Ukrainy. Chastyna III (vzvod, viddilennia, ekipazh)* [Combat regulations of the mechanized and tank troops of the Land Forces of the Armed Forces of Ukraine. Part III (platoon, detachment, crew)]. Kyiv [in Ukrainian].

5. Nastanova "Poriadok roboty shtabiv taktychnoho rivnia z orhanizatsii (planuvannia) boiu ta upravlinnia pidporiadkovanyymi pidrozdilamy v boiu": SDDP 3-(01,02,04)402.55(56) (nakaz № 8/nahd) [Instruction "Procedure of work of tactical-level headquarters for organizing (planning) combat and managing subordinate units in combat" activity no. 8/nahd]. (2026, January 6). Kyiv [in Ukrainian].

6. Nastanova "Robota komandira pid chas pidhotovky boiu ta upravlinnia pidrozdilamy (TLP)": SDDP 3-(01,02,04)403.57-59 (nakaz № 12/nahd) [Instruction "The work of a commander during combat preparation and command of units (TLP)" activity no. 12/nahd]. (2026, January 6). Kyiv [in Ukrainian].

7. Vasyliiev M. V., Khatsaiuk O. V., Repenko O. M. (2025). *Intehratsiia suchasnykh tekhnolohii u protses planuvannia boiovykh operatsii* [Integration of modern technologies into the process of planning combat operations]. *Naukovyi visnyk Kyivskoho instytutu Natsionalnoi hvardii Ukrainy*, no. 1, pp. 61–71. DOI: <https://doi.org/10.59226/2786-6920.1.2025.61-71> [in Ukrainian].

8. Vasyliiev M. V., Hodlevskiy S. O., Shcherbachuk O. M. (2025). *Suchasnyi stan i vyklyky sektoru bezpeky i oborony Ukrainy v umovakh rosiisko-ukrainskoi viiny: na osnovi porivniannia polozhen chynnykh boiovykh statutiv iz realiiamy suchasnoho polia boiu* [Current state and challenges of the Ukrainian security and defense sector in the conditions of the russian-Ukrainian war: based on a comparison of the provisions of the current combat statutes with the realities of the modern battlefield]. *Chest i zakon*, no. 2 (93), pp. 36–41. DOI: <https://doi.org/10.33405/2078-7480/2025/2/93/339305> [in Ukrainian].

9. Kurbatov A., Plaksin A., Zinchenko S. (2024). *Analitichni metody v systemi ISTAR: vid*

sposterezhennia do prohnouzuvannia boiu [Analytical methods in the ISTAR system: from observation to combat forecasting]. *Naukovyi visnyk Kyivskoho instytutu Natsionalnoi hvardii Ukrainy*, no. 1, pp. 30–35. DOI: <https://doi.org/10.59226/2786-6920.1.2024.30-35> [in Ukrainian].

10. Repilo Yu., Holovchenko O. (2021). *Model vedennia boiovykh dii artyleriiskymy pidrozdilamy pid chas vohnevoi pidtrymky u khodi vedennia nastupalnykh dii* [Model of combat operations by artillery units during fire support during offensive operations]. *Suchasni informatsiini tekhnolohii u sferi bezpeky ta oborony*, no. 40 (1), pp. 153–162. DOI: <https://doi.org/10.33099/2311-7249/2021-40-1-153-162> [in Ukrainian].

11. Repilo Yu. Ye., Rossiitsev V. V., Shkoliarenko V. V. (2022). *Analiz osnovnykh metodiv planuvannia voiennykh dii, pryiniatykh u NATO* [Analysis of the main methods of planning military actions adopted by NATO]. *Suchasni informatsiini tekhnolohii u sferi bezpeky ta oborony*, no. 3, pp. 55–62. DOI: <https://doi.org/10.33099/2311-7249/2022-45-3-55-62> [in Ukrainian].

12. Semenenko O., Mytchenko S., Dobrovolskyi Yu., Remez A., Yarmolchuk M., Tverdokhlib Ye. (2024). *Evoliutsiia form ta metodiv vykorystannia uhrupovan viisk (syl): tendentsii zbroinoi borotby* [Evolution of forms and methods of using groups of troops (forces): trends in armed struggle]. *Sotsialnyi rozvytok i bezpeka*, no. 14 (3), pp. 33–52. DOI: <https://doi.org/10.33445/sds.2024.14.3.3> [in Ukrainian].

13. Lykholot O. V., Holovchenko O. V., Demianiuk A. V. (2025). *Metodyka planuvannia zoseredzhenoho vohnevoho udaru pid chas planuvannia obiednanoi vohnevoi pidtrymky u suchasnykh zbroinykh konfliktakh* [Methodology for planning a concentrated fire strike during the planning of joint fire support in modern armed conflicts]. *Naukovyi visnyk Kyivskoho instytutu Natsionalnoi hvardii Ukrainy*, no. 2, pp. 105–124. DOI: <https://doi.org/10.59226/2786-6920.2.2025.105-124> [in Ukrainian].

14. Vlasiiuk V. V., Hridina V. V., Poliakov V. Yu. (2022). *Pokaznyky i kryterii efektyvnosti dlia otsiniuvannia mozhlyvosti vykonaty boiove zavdannia storozhovoii okhoronoii shchodo nedopushchennia raptovoho napadu protyvyntsa na pidrozdil Natsionalnoi hvardii Ukrainy pid chas roztashuvannia na misti v raioni zoseredzhennia abo bazovomu tabori* [Indicators and efficiency criteria for assessing the ability to perform a combat mission by guarding the unit to prevent a sudden enemy attack

on a unit of the National Guard of Ukraine while stationed in a concentration area or base camp]. *Chest i zakon*, no. 4 (83), pp. 21–26. DOI: <https://doi.org/10.33405/2078-7480/2022/4/83/272277> [in Ukrainian].

15. Vlasjuk V., Poliakov V. (2022). *Pokaznyky ta kryterii efektyvnosti dlia otsiniuvannia mozhlyvosti vykonaty boiove zavdannia pokhidnoiu okhoronoiu shchodo nedopushchennia raptovoho napadu protyvyka na pidrozdil Natsionalnoi hvardii Ukrainy pid chas zdiisnennia marshu* [Indicators and efficiency criteria for assessing the ability to perform a combat mission by a marching guard to prevent a sudden enemy attack on a unit of the National Guard of Ukraine during a march]. *Naukovyy visnyk Kyivskoho instytutu Natsionalnoi hvardii Ukrainy*, no. 1, pp. 55–62. DOI: <https://doi.org/10.59226/2786-6920.1.2022.55-62> [in Ukrainian].

16. FM 6.0. Headquarters Department of the Army (2015). *Commander and Staff Organization and Operations* [in English].

17. ATP 3-06. MCTP 12-10B. Department of the Army Headquarters, United States Marine Corps. (2017). *Urban operations*, Headquarters [in English].

18. ATP 3-90.1 (FM 3-90.1). Headquarters, Department of the Army (2016). *Armor and Mechanized Infantry Company Team* [in English].

19. FM 34-2-1. Headquarters, Department of the Army (2019). *Tactics, Techniques, and Procedures for Reconnaissance and Surveillance and Intelligence Support to Counter reconnaissance* [in English].

20. Vlasjuk V. V., Nahorny R. O. (2025). *Rekomendatsii shchodo vprovadzhennia pidkhodu do planuvannia oboronnoho boiu sylamy Natsionalnoi hvardii Ukrainy* [Recommendations for the implementation of an approach to planning a defensive battle by the forces of the National Guard of Ukraine]. *Naukovyy visnyk Kyivskoho instytutu Natsionalnoi hvardii Ukrainy*, no. 1, pp. 21–28. DOI: <https://doi.org/10.59226/2786-6920.1.2025.21-28> [in Ukrainian].

Received / Стаття надійшла до редакції: 20.03.2026

Reviewed and accepted for publication / Проце́нзовано та прийнято до друку: 15.04.2026

Published / Опубліковано: 30.06.2026

ВЛАСЮК ВАЛЕРІЙ ВАСИЛЬОВИЧ

кандидат військових наук, доцент,
заступник начальника кафедри тактики,
Київський інститут Національної гвардії України
<https://orcid.org/0000-0002-2140-3250>

НАГОРНИЙ РОМАН ОЛЕКСАНДРОВИЧ

курсант,
Київський інститут Національної гвардії України
<https://orcid.org/0009-0004-2269-6018>

УДОСКОНАЛЕННЯ ПРОЦЕСУ ПОБУДОВИ БОЙОВОГО ПОРЯДКУ ДЛЯ ВЕДЕННЯ НАСТУПАЛЬНОГО БОЮ СИЛАМИ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ

Наступальний бій є одним із основних видів загальновійськового бою. Він може організовуватись і проводитись як силами й засобами окремого підрозділу, так і об'єднаними зусиллями різних родів, видів військ, а також у взаємодії з іншими силовими відомствами.

Планування та організація наступального бою являє собою один із найскладніших процесів роботи командирів усіх ланок і потребує врахування великої кількості різноманітних чинників, зокрема побудову і створення елементів бойового порядку.

З метою вдосконалення та підвищення ефективності процесу організації наступального бою органами управління запропоновано підхід до побудови бойового порядку, що бере до уваги розподіл наявних сил і засобів за найбільш характерними для них бойовими завданнями. Подано варіант розподілу й побудови бойового порядку. Упровадження запропонованого підходу сприятиме підвищенню ефективності роботи органів управління під час планування та організації наступального бою завдяки більшій наочності відображення інформації та скороченню часу на доведення задуму командира підпорядкованим підрозділам.

Ключові слова: наступальний бій; розподіл сил і засобів; бойові завдання; бойовий порядок.



HALAI VIKTORIIA

*Doctor of of Legal Sciences, Professor,
Professor of the Department of State Security,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0000-0003-1568-5068>*



KOREN DENYS

*Cadet,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0009-0007-4993-4380>*

TRANSFORMATION OF THE NATIONAL GUARD OF UKRAINE IN THE CONTEXT OF EURO-ATLANTIC INTEGRATION: IMPLEMENTATION OF NATO STANDARDS AND ACHIEVING INTEROPERABILITY

The article examines the complex process of transformation of the National Guard of Ukraine in the context of modern security challenges and Euro-Atlantic integration. The legal framework of reforms is analyzed, specifically the implementation of the Military Standardization Program for 2024–2026 and the Government's Priority Action Plan. Particular attention is paid to the evolution of the National Guard of Ukraine to a modern military formation with law enforcement functions that meets the best practices of the Alliance member states.

The practical aspects of implementing NATO standards (STANAG) in the operational, material, and administrative spheres of the National Guard of Ukraine's activities are considered. The transition to a new management system based on J, G, S-structures is highlighted in detail, which allows optimizing decision-making and ensuring unity of approaches with the Armed Forces of Ukraine and international partners. The role of international programs (DEEP, PDP) and joint exercises in increasing the professional level of personnel and certifying educational programs according to NATO standards is studied.

It is substantiated that achieving full interoperability is a critical condition for the integration of the National Guard of Ukraine into the collective security system. Promising directions for further development are identified, including the digitalization of management, modernization of logistics, and implementation of the principles of institutional integrity.

Keywords: *National Guard of Ukraine; NATO standards; interoperability; J-structure; L-courses; gender integration; Euro-Atlantic integration.*

Statement of the problem. The current geopolitical situation and the ongoing armed aggression against Ukraine have necessitated a fundamental reform of the security and defense sector in order to achieve maximum interoperability with NATO member states. The National Guard of Ukraine (NGU), as an important component of this sector, is undergoing an intensive transformation. Despite significant progress, the process of transitioning to Alliance standards faces a number of challenges: the incomplete re-equipment with modern equipment, the need to optimize logistics and medical support

systems, as well as the necessity for full adaptation of command and control structures to Western models (in particular, the implementation of the J-structure).

The core problem lies in overcoming the gap between limited resource capabilities and the growing needs of the NGU under conditions of active hostilities. This requires a systematic scholarly analysis of the mechanisms for implementing NATO standards and an assessment of their effectiveness in ensuring national security.

Analysis of recent research and publications. Issues related to the transformation of Ukraine's



© V. Halai, D. Koren, 2026

© Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine, 2026

security and defense sector and the implementation of NATO standards are at the center of attention of many domestic researchers and sectoral experts.

In particular, O. Pyskun thoroughly examines the stages of cooperation with the Alliance and the implementation of Partnership Goals within the framework of the Partnership for Peace Programme.

Researchers V. Hrydchyna, I. Saienko, A. Yefimenko, and T. Pryzhbylo analyze the pathways of Ukraine's military reform through the lens of achievements and priority tasks in the process of implementing NATO standards.

A significant contribution to the study of the transition to military standards and the reform of the NGU command and control structure has been made by F. Fluri and V. Badrak, who emphasize strengthening the military component and the use of the model of volunteer formations.

The issue of the mismatch between resource capabilities and the growing needs of the National Guard has been addressed in the works of A. Kalyayev, who analyzes the shortcomings of logistics, medical support, communications systems, and the transition to a contract-based service model.

Purpose of the article is to provide a comprehensive analysis of the transformation process of the National Guard of Ukraine in the context of Euro-Atlantic integration, to examine the practical aspects of implementing NATO standards in managerial, educational, and combat activities of the troops, as well as to identify promising pathways for achieving full operational interoperability with the military structures of NATO member states.

Presentation of the main material. The implementation of NATO standards – as a comprehensive set of measures for studying them and making decisions regarding their application in the security and defense sector – was carried out within the framework of the Military Standardization Work Program for 2024 – 2026 (with amendments), which is planned for implementation by the Government Priority Action Plan for 2025. Significant achievements within the security and defense sector (including the National Guard of Ukraine) include the implementation of NATO standards. In particular, 91 U.S. military material standards have been adopted, including 6 operational standards (communications and information systems, ammunition and explosives), 83 material standards (military cable and wiring

products), and 2 administrative standards (organization of testing) [1, pp. 1–2].

According to O. Pyskun [2, pp. 185–186], the process of cooperation between the command of Ukraine's military law enforcement bodies and NATO has gone through several important stages, including accession to the NATO Partnership for Peace Programme (1994), the signing of the Charter on a Distinctive Partnership between Ukraine and NATO (1997), and the Ukraine-NATO Action Plan.

With regard to the direct participation of the National Guard of Ukraine (hereinafter – NGU) in Ukraine-NATO cooperation based on international standards and joint programs in the security and defense sector, according to the Law of Ukraine “On National Security” [3], the NGU is a component of the security and defense sector, which implies its direct involvement in such interaction.

A significant contribution to the transition to NATO military standards has been made by Alliance experts, who applied a three-stage systemic approach to NGU reform: reform of the NGU command and control structure; development of a new system of training and education for personnel, taking into account foreign experience as well as the NGU's participation in combat operations in the eastern regions of the country; and the establishment of a mechanism to ensure interoperability between the NGU and all security agencies of Ukraine, as well as NATO forces [2, p. 187].

Since 2014, the NGU has been closely cooperating with the NATO Representation in Ukraine, implementing Annual National Programs under the aegis of the Ukraine-NATO Commission [4]. From the outset of this cooperation, one of the key tasks for the National Guard has been the implementation of international experience, principles, and standards in its activities.

Analyzing the restoration of the National Guard of Ukraine in 2014, researchers F. Fluri and V. Badrak [5, p. 7] note that it could have marked the beginning of the development of a system of volunteer paramilitary formations similar to the U.S. National Guard or the Baltic model of territorial defense. However, the development of the National Guard of Ukraine proceeded along the path of gradual reform of the former post-Soviet internal troops, increasing their effectiveness through strengthening the military component and transitioning to NATO standards in organization, structure, and armament.

Thus, in 2016, according to a representative of the International Project “PATRIOT Training Center” [5, pp. 12-13], the reform of the National Guard of Ukraine was focused on two main areas: transformation of the combat training system for personnel and restructuring of the command and control system in accordance with NATO standards.

Measures of NGU cooperation within the framework of the Partnership Goals package for Ukraine since 2018 [2, p. 187] include:

1) with the Ministry of Internal Affairs of Ukraine and the Armed Forces of Ukraine on interoperability requirements, operational planning and preparation, strategic communications, and cyber defense;

2) with Ukraine-NATO Trust Funds in the areas of medical rehabilitation, logistics and standardization, as well as command, control, communications, and computerization, which operate under the NATO Liaison Office in Ukraine (in particular, financial assistance to the National Guard Medical Center “Novi Sanzhary,” where, with the support of the Trust Fund, modern medical equipment was procured).

As noted at that time in the study by A. O. Kalyayev [6], the reasons for the mismatch between limited capabilities and the growing needs of the NGU included: the incomplete process of re-equipment with specialized equipment, modern weapons, special means, and communication systems necessary for effective task performance; shortcomings in the logistics system, medical support, and rehabilitation; the unfinished transition to a contract-based personnel system in accordance with NATO principles of human resource policy; an insufficient level of combat and specialized training of personnel for operating under significantly changing combat and operational conditions; and the incomplete development of an effective system of operational (combat) command and control, communications, intelligence and surveillance according to the standards adopted by EU and NATO member states, among others.

A new package of Ukraine-NATO Partnership Goals was developed within the Armed Forces of Ukraine as a practical mechanism for implementing security and defense sector reform tasks up to 2020, which identified two Partnership Goals for the National Guard of Ukraine [7, p. 89]. Among the areas and tasks of cooperation with NATO, the following were defined:

1) conducting training to develop subject-matter expertise and English language proficiency, as well as understanding NATO standardization policy;

2) implementing NATO standards in combat training of troops, as well as in the training of officers and non-commissioned officers;

3) carrying out a comprehensive assessment of the actual operational capabilities of the Ukrainian Armed Forces in the context of their ability to operate jointly with units, formations and groupings of the armed forces of NATO member states during combat operations.

Since 2018 the North Atlantic Council has adopted a new package of Partnership Goals for Ukraine, under which the NGU received a number of Goals to be implemented jointly with the Ministry of Internal Affairs of Ukraine and the Armed Forces of Ukraine, as well as independently [4], including: “Language Requirements,” “Operational Planning and Preparation,” “Strategic Communications,” and “Cyber Defence.”

During 2020-2021 the National Guard of Ukraine continued to actively cooperate with partner countries and international organizations, particularly NATO, which was reflected in the active involvement of units of the National Guard of Ukraine in international programs: the Ukraine-NATO Professional Development Programme (PDP), the Defence Education Enhancement Programme (DEEP), and the Ukraine-NATO Building Integrity Programme (BI) [2, p. 69].

In particular, to ensure interoperability with NATO, the National Guard of Ukraine (NGU) has been involved through participation in the following activities [4]:

1) international exercises held on the territory of Ukraine together with analogous formations of NATO member states (a rapid response company of military unit 3017 of the Eastern Operational-Territorial Command of the NGU participated in the international exercise Rapid Trident 2020);

2) activities within the Ukraine-NATO Professional Development Programme (PDP) (modular training courses on current issues of Ukraine’s Euro-Atlantic integration policy; a joint project with the National Academy of the National Guard of Ukraine on conducting training courses on Euro-Atlantic integration for NGU personnel; strategic online sessions on the development of the Annual National Programme under the auspices of the Ukraine-NATO Commission);

3) activities within the Defence Education Enhancement Programme (a multinational workshop for non-commissioned officers titled

“Orientation toward Professional Military Education for NCOs as a Tool for Developing the NCO Corps in the 21st Century” (Serbia); online sessions for academic staff of higher military educational institutions of the Ministry of Defence and the National Guard of Ukraine aimed at familiarizing them with the decision-making processes of tactical-level military command bodies of NATO member states during combat operations;

4) activities of the Ukraine-NATO Building Integrity Programme (within the framework of the Ukraine-NATO programme on building integrity, transparency, accountability, and reducing corruption risks in the work of defense and security institutions);

5) in NATO Trust Fund projects (the course “Organization of the Search for Improvised Explosive Devices” for National Guard of Ukraine personnel within the framework of the Ukraine-NATO Trust Fund on Countering Improvised Explosive Devices and Explosive Ordnance Disposal, conducted at the NGU Training Center; medical rehabilitation with the support of the NATO Support and Procurement Agency Office within the framework of the Ukraine-NATO Trust Fund on Medical Rehabilitation, Bulgaria).

In addition, in 2021, an analysis of NATO standards was conducted in accordance with the List of NATO Standards approved by the Commander of the National Guard of Ukraine [8]. The feasibility of applying the provisions (norms and requirements) of the identified NATO standards within the National Guard of Ukraine was implemented through the adoption and introduction of: one NATO standard document (AAP-03 “Production, Maintenance and Management of NATO Standardization Documents”); 29 NATO standard documents with reservations; and 69 NATO standard documents with reservations for future implementation.

The further development of the National Guard of Ukraine should be based on a sustainable strengthening of its military component with a transition to NATO standards, where the key areas in the standardization process should include: the organization of command and communications systems, the combat training system of units of the National Guard of Ukraine, and the unification of weapon systems [5, p. 41].

The mechanism for national implementation of NATO standards in NGU activities primarily involves the execution of the objectives of the

Annual National Programs of Ukraine-NATO cooperation.

We agree with the opinion of O.V. Pyskun [2, p. 186] that significant progress in achieving the Partnership Goals within the framework of the Planning and Review Process of the NATO Partnership for Peace Programme is ensured through the Ukraine-NATO Individual Partnership Programme and through the implementation, since 2014, of the Annual National Programmes under the auspices of the Ukraine-NATO Commission. These programmes constitute a key systemic document for the development of cooperation with NATO and an important instrument for carrying out reforms with the support of the Alliance.

In order to bring the National Guard of Ukraine closer to NATO standards, the 2021 Annual National Programme defined Strategic Objective 2.7, “The National Guard of Ukraine is combat-capable and able to perform its assigned tasks.” In accordance with this objective, the primary goal of the NGU’s development is to build it into a mobile, combat-capable military formation with law enforcement functions, capable, through interaction with other components of Ukraine’s security and defense sector, performing designated law enforcement and defense tasks aimed at countering threats to national security, as well as joint tasks in international peace and security operations [8].

Using the example of the implementation of one of the Ukraine-NATO Annual National Programmes, it is possible to trace a trend in defining measures related to the NGU [9] across the following areas:

1. Information activities (pp. 7, 119, 122, 123):

1) continuous posting of up-to-date information on NATO cooperation on official websites (departmental printed publications, Facebook, YouTube, Instagram, Twitter pages);

2) posting information on the official NGU website regarding the formation and implementation of state policy in matters of national security and defense;

3) publication and presentation of annual White Paper editions and other analytical documents by security and defense sector bodies;

4) conducting informational events for NGU personnel about NATO’s structure, operating principles, security and defense sector reforms involving the implementation of NATO standards and principles, the history and prospects of Ukraine-NATO interaction;

5) dissemination among NGU personnel of informational posters on NATO activities (in particular, the distribution of the booklet “NATO’s Assistance to Ukraine. A Brief Overview,” prepared by the Foundation “Eastern European Security Research Initiative” with the support and financial assistance of the NATO Information and Documentation Centre in Ukraine).

2. Organizational activities (pp. 118, 190, 192, 195):

1) preparation of analytical reports on the results and status of the NGU’s operational and service activities with subsequent reporting to the Office of the President of Ukraine and the National Security and Defense Council Secretariat;

2) Transition of units of the military command bodies of the National Guard of Ukraine to an organizational and staffing structure compatible with the structural units of the Main Headquarters and aligned with the management principles of NATO member states;

3) reviewing artillery unit staffing to optimize fire control resources, enhance firepower, combat readiness, survivability, continuous reconnaissance, and communications;

4) staffing reconnaissance units with the required number of unmanned aerial vehicles (UAVs);

5) staffing of the strategic communications structural unit within the Main Headquarters of the National Guard of Ukraine;

6) developing guiding documents on the combat employment of NGU air defense units;

7) developing guiding documents on engineering support for the NGU.

3. Logistical support measures (pp. 197, 198): involvement of civilian enterprises in providing material and technical support to the troops (introduction of outsourced catering services for personnel in military units responsible for protecting critical state facilities).

4. Measures for professional training of specialists and education (pp. 120, 125, 126):

1) development of standards for the provision of psychological services and standards for evaluating the effectiveness of psychologists’ work; equipping psychological testing facilities with a hardware and software complex for psychophysiological assessment; establishment of a mobile psychological support center; establishment of a psychotraining complex – a psychological rehabilitation center; provision of certified training for psychologists in cognitive behavioral therapy; implementation of NATO standards AMedP-8.6

[STANAG 2564] and AMedP-8.12 [STANAG 2544] into the psychological support system;

2) ensuring the enhancement of the professional competence of instructors and teaching staff of higher military educational institutions through participation in exercises, training sessions, and seminars on Euro-Atlantic integration and NATO standards, conducted at specialized research institutions and training centers of NATO member states.

The NGU has reformed its personnel training system based on the experience of NATO member states. The new system is founded on the principle of sequential and phased training, beginning with individual preparation of servicemen and continuing with training at the unit level. NGU personnel and units actively participate in the Ukrainian-U.S. exercises Rapid Trident and Sea Breeze to enhance the operational capabilities of NGU units in performing diverse tasks, improve the level of combat and service training, facilitate experience exchange, and increase interoperability between NGU units, the Armed Forces of Ukraine, and NATO member states and partner forces [10].

5. Measures for gender integration (pp. 26, 27, 127, 128):

1) approval of the NGU Gender Integration Action Plan until 2021 and the NGU Action Plan for implementing the National Action Plan on United Nations Security Council Resolution 1325 “Women, Peace and Security” for the period up to 2025;

2) development of the necessary organizational and administrative documents to ensure compliance with the principle of gender equality in NGU activities (the NGU Commander’s Order “Gender Integration Action Plan in the NGU until 2025”);

3) implementation of the results of the Ministry of Internal Affairs analysis of infrastructure and material-technical conditions for women serving in the security sector or holding public service positions and the creation of conditions based on monitoring results to enable men and women to balance professional and family responsibilities;

4) establishment of gender competencies for leaders (commanders, chiefs) of the National Guard of Ukraine in accordance with international requirements for the implementation of the principle of gender equality in the security and defense sector, in particular those adopted in the armed forces of NATO member states, as well as the fundamentals of national policy on ensuring gender equality and the specifics of implementing

the principle of gender equality in conditions of armed conflict and post-conflict situations, etc.

Today, among the innovative steps aimed at ensuring interoperability between the National Guard of Ukraine and NATO, the following can be identified [10]: the establishment within the Main Headquarters of the NGU of an inspectorate (troops activity control unit); an anti-corruption prevention and detection service; an advisors unit; a psychological support unit; a gender integration service; a department for strategic and mid-term planning and interoperability with NATO military structures; the transition of the NGU to NATO standard symbols (a standardized and structured set of graphic symbols has been approved, taking into account the specific tasks assigned to the NGU); modernization of the NGU communications system (an information and telecommunications network has been deployed using modern technologies to ensure secure communications with military command bodies and mobile command posts), etc.

To this list, it is also worth adding the exchange of experience through the deployment of servicemen of the Armed Forces of Ukraine and the National Guard of Ukraine to the NATO–Ukraine Joint Analysis, Training and Education Centre (JATEC) in Poland, where specific projects on defense planning, conduct of operations, and the application of technologies are being developed [11], as well as the introduction by the Main Headquarters of the NGU of a J-structure at the strategic level of command, which provides for a clear delineation of responsibilities across functional areas and ensures alignment with the approaches of the Armed Forces of Ukraine, other security agencies, and NATO partners (a similar system is already in place at the brigade level (S-structure) and corps level (G-structure)) [12].

It is believed that the implementation of the J-structure makes it possible to carry out the following measures [13]: optimize the command and control system by reducing the workload on the central apparatus; accelerate decision-making through the delegation of authority to the corps and brigade levels; unify command structures with those of partner nations' armed forces, thereby enhancing interoperability within future joint operations; increase transparency and accountability in the performance of leadership, control and support functions; avoid duplication and focus greater efforts on combat training, maintaining combat readiness and logistics; grant

greater autonomy to leaders at all levels in managerial decision-making.

Conclusions and prospects for further research. Achieving full interoperability is a necessary condition for integrating the National Guard of Ukraine into the collective security system. The NGU's transformation process is an integral component of the national policy for NATO integration, based on the Military Standardization Program and the Government's Priority Actions Plan.

As of 2026, the NGU continues active development and adoption of dozens of NATO standards (material, operational and administrative), including amendments to the Military Standardization Program, which has added new standards. The NGU has implemented a phased and sequential training system, actively participates in international exercises (e.g., Rapid Trident, Sea Breeze), and leverages the DEEP and PDP programs to enhance the professional development of its officer corps.

Although the J-structure is already being implemented at the strategic level, current legislation (the Law of Ukraine "On the National Guard of Ukraine" and relevant Statutes) requires precise terminological alignment. To avoid duplication of functions and ensure legal unity of command between the NGU, the Armed Forces of Ukraine and NATO partners, it is advisable to formally codify the terminology and functional responsibilities of headquarters according to NATO standards (J, G, S structures) within the normative legal acts regulating military command.

To create a mobile formation capable of rapid adaptation for specific operations (from maintaining public order to participating in combat operations as part of multinational forces), amendments should be made to the Law of Ukraine "On National Security of Ukraine" and the Law of Ukraine "On the National Guard of Ukraine" to clearly delineate and complement law enforcement functions with defense tasks under hybrid threat conditions.

Since the NGU has already established a vertical of L-courses (professional military education), automatic recognition of Ukrainian certificates must be ensured. This requires introducing a legal requirement that educational programs comply with NATO standards for the conferral of subsequent officer and non-commissioned officer ranks.

Based on experience in implementing UN Security Council Resolution 1325 and safeguarding gender mechanisms, it is

recommended to codify the requirements for “gender competencies” for leadership positions in the security sector, formally incorporating them into job descriptions and evaluation criteria, thereby fully aligning personnel policies with the standards of NATO member states’ armed forces.

A key direction for further research is digital interoperability and integration into NATO systems, including the technical study of NGU information system integration (e.g., combat management and intelligence systems) into the Alliance’s unified information space. Additionally, the adaptation of NATO experience in countering hybrid threats is relevant, since the National Guard of Ukraine has law enforcement functions; studying NATO’s resilience concept is also considered promising.

References

1. Ministerstvo oborony Ukrainy (2025). *Informatsiyni material shchodo zaprovadzhennia standartiv ta kerivnykh dokumentiv NATO* [Information material on the implementation of NATO standards and guidelines]. Retrieved from: <https://surl.li/amnzof> (accessed 4 December 2025) [in Ukrainian].
2. Pyskun O. V. (2023). *Administrativno-pravovyi status komplektuvannia Natsionalnoi hvardii Ukrainy* [Administrative and legal status of recruitment of the National Guard of Ukraine]. Doctor's thesis. Kropyvnytskyi : DonDUVS. Retrieved from: <https://surl.li/nqchbx> (accessed 4 December 2025) [in Ukrainian].
3. *Zakon Ukrainy "Pro natsionalnu bezpeku" № 2469-VIII* [Law of Ukraine about National Security activity no. 2469-VIII]. (2018, 21 June). Retrieved from: <https://surl.li/uytnzi> (accessed 12 December 2025) [in Ukrainian].
4. Ministerstvo vnutrishnikh sprav (2021). *72-ha richnytsia NATO: napriamy i dosiahnennia spivpratsi NHU z Pivnichnoatlantychnym Aliansom* [72nd anniversary of NATO: directions and achievements of cooperation between NGU and the North Atlantic Alliance]. Retrieved from: <https://surl.li/gtlqyt> (accessed 4 December 2025) [in Ukrainian].
5. Fluri P., Badrak V. (2017). *Natsionalna hvardiia Ukrainy: shliakhy rozvytku* [National Guard of Ukraine: ways of development]. Geneva – Kyiv. Retrieved from: <https://surl.li/gvuzvb> (accessed 4 September 2025) [in Ukrainian].
6. Kaliev A. O. (2020). *Syly bezpeky i oborony u systemi voiennoi bezpeky derzhavy* [Security and defense forces in the system of military security of the state]. *Demokratychnе vriaduvannia*. Retrieved from: <https://surl.li/uvqhr> (accessed 4 December 2025) [in Ukrainian].
7. Saenko L. B., Yefimenko A. Ye., Pryzhbylo T. V. (2017). *Voienna reforma Ukrainy: dosiahnennia ta priorityty zavdan ukrainskoho viiska na shliakhu vprovadzhennia standartiv NATO* [Military reform of Ukraine: achievements and priorities of the Ukrainian army on the way to NATO standards]. *Zbirnyk naukovykh prats Viiskovoi akademii. Seriya: tekhnichni nauky*. Odesa : Viiskova akademiia. Retrieved from: <https://surl.li/xvvctc> (accessed 4 December 2025) [in Ukrainian].
8. Ukraina do NATO (2021). *Perekhid na standarty NATO Natsionalnoi hvardii Ukrainy* [Transition of the National Guard of Ukraine to NATO standards]. Retrieved from: <https://surl.li/hixsqg> (accessed 4 December 2026) [in Ukrainian].
9. Ministerstvo vnutrishnikh sprav (2021). *Informatsiia pro vykonannia zakhodiv Richnoi natsionalnoi prohramy pid ehiidoiu Komisii Ukraina – NATO* [Information on the implementation of the Annual National Program under the auspices of the Ukraine-NATO Commission]. Retrieved from: <https://surl.li/kljywm> (accessed 4 December 2026) [in Ukrainian].
10. Natsionalna hvardiia Ukrainy (2019). *Natsionalna hvardiia Ukrainy: 5 rokiv* [National Guard of Ukraine: 5 years]. Retrieved from: <https://surl.li/niivfs> (accessed 4 December 2026) [in Ukrainian].
11. Armiia Inform (2025). *Uriad vyznachyv poriadok napravlennia voyniv ZSU ta NHU do Spilnogo tsentru NATO-Ukraina JATEC* [The government defined the procedure for sending soldiers of the AFU and NGU to the Joint NATO-Ukraine Center JATEC]. Retrieved from: <https://surl.li/ccqhiy> (accessed 4 December 2026) [in Ukrainian].
12. Shulhynska hromada (2025). *Natshvardiia perekhodyt na standarty NATO: J-struktura upravlinnia – teper i na naivysshchomu rivni* [The National Guard moves to NATO standards and the management structure is now at the highest level]. Retrieved from: <https://surl.li/nmtpdt> (accessed 4 December 2026) [in Ukrainian].
- Ukrinform (2025). *Struktura Natshvardii perekhodyt na systemu upravlinnia za standartamy NATO* [The structure of the National Guard moves to a management system according to NATO standards]. Retrieved from: <https://surl.li/ffxzzh> (accessed 4 December 2026) [in Ukrainian].

Received / Стаття надійшла до редакції: 04.03.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 31.03.2026

Published / Опубліковано: 30.06.2026

ГАЛАЙ ВІКТОРІЯ ОЛЕКСАНДРІВНА

*доктор юридичних наук, професор,
професор кафедри забезпечення державної безпеки,
Київський інститут Національної гвардії України
<https://orcid.org/0000-0003-1568-5068>*

КОРЕНЬ ДЕНИС ОЛЕКСАНДРОВИЧ

*курсант,
Київський інститут Національної гвардії України
<https://orcid.org/0009-0007-4993-4380>*

ТРАНСФОРМАЦІЯ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ В КОНТЕКСТІ ЄВРОАТЛАНТИЧНОЇ ІНТЕГРАЦІЇ: УПРОВАДЖЕННЯ СТАНДАРТІВ НАТО Й ДОСЯГНЕННЯ ВЗАЄМОСУМІСНОСТІ

Досліджено комплексний процес трансформації Національної гвардії України в умовах сучасних безпекових викликів та євроатлантичної інтеграції. Проаналізовано нормативно-правове підґрунтя реформ, зокрема виконання Програми військової стандартизації на 2024–2026 роки та Плану пріоритетних дій Уряду. Особливу увагу приділено еволюції Національної гвардії України до сучасного військового формування з правоохоронними функціями, що відповідає кращим практикам країн-членів Альянсу.

Розглянуто практичні аспекти впровадження стандартів НАТО (STANAG) в оперативну, матеріальну та адміністративну сфери діяльності Національної гвардії України. Детально висвітлено перехід на нову систему управління за стандартами J, G, S-структур, що дає змогу оптимізувати прийняття рішень і забезпечити єдність підходів зі Збройними Силами України та партнерами.

Вивчено роль міжнародних програм (DEEP, PDP) і спільних навчань у підвищенні професійного рівня особового складу та сертифікації освітніх програм за стандартами НАТО.

Обґрунтовано, що досягнення повної взаємосумісності є необхідною умовою для інтеграції Національної гвардії України до колективної системи безпеки. Визначено перспективні напрями подальшого розвитку, зокрема цифровізація управління, модернізація логістики та впровадження принципів інституційної доброчесності.

Ключові слова: *Національна гвардія України; стандарти НАТО; взаємосумісність; J-структура; L-курси; гендерна інтеграція; євроатлантична інтеграція.*

UDC 614.876:351.86(477)

DOI 10.59226/2786-6920.1.2026.55-72



GONCHARENKO OLEKSANDR

*Ph.D in Biology, Associate Professor,
Department of Combat and Logistical Support,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0000-0002-4950-4387>*



KIZIAN RUSLAN

*Candidate of Science in Public Administration,
Head of the Faculty of Service and Combat Activities of the National Guard of Ukraine,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0009-0005-8980-4391>*



MANZHOS OLEKSII

*Senior Lecturer, Department of Combat and Logistical Support,
Head of the Radiation, Chemical, and Biological Protection Service –
Head of the Environmental Safety Service,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0000-0003-0832-4483>*

**IDENTIFICATION OF SOURCES OF IONIZING RADIATION, RADIOACTIVE MATERIALS,
AND OTHER OBJECTS WITH SIGNS OF RADIATION HAZARD OUTSIDE REGULATORY
CONTROL IN UKRAINE IN 2015–2025**

This article examines the issue of detecting sources of ionizing radiation, radioactive materials, and other objects exhibiting signs of radiation hazard outside regulatory control in Ukraine during the period 2015–2025. The relevance of the topic stems from the widespread use of sources of ionizing radiation in medicine, industry, science, metrology, and security systems, which increases the risk of losing control over individual objects. In the context of armed aggression against Ukraine, this issue is of significance to the security and defense sectors.

The purpose of this article is to systematically summarize and analyze cases of detection of ionizing radiation sources and radioactive materials outside regulatory control in Ukraine in 2015–2025, identify patterns in these cases, and establish guidelines for the initial identification of such objects. To achieve this goal, the dynamics of the number of incidents involving ionizing radiation in Ukraine and cases of radioactive materials in illegal circulation were analyzed; 112 documented cases were systematized; and groups of indicators for initial identification were determined.

The methodological framework of the study consisted of documentary, comparative, and content analysis, as well as statistical generalization. The source base comprised annual reports and official communications from the State Nuclear Regulatory Inspectorate of Ukraine for the years 2015–2025.



© O. Goncharenko, R.Kizian, O. Manzhos, 2026

© Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine, 2026

It was found that the total number of ionizing radiation sources in Ukraine increased from 24,582 units in 2015 to 27,970 in 2025. This growth was driven primarily by the non-radionuclide source segment, while the number of radionuclide sources showed a downward trend. At the same time, the trend in the detection of radioactive materials in illicit circulation was not synchronized with the overall trend in the number of ionizing radiation sources. Content analysis allowed us to identify typical detection scenarios: in scrap metal flows, at metallurgical enterprises, at border crossing points, in postal and cargo shipments, during chance finds, under conditions of prolonged uncontrolled storage, as well as in military and post-occupation contexts. Four groups of primary recognition features were identified: contextual, external danger markers, object-functional, and situational.

The scientific novelty lies in the systematic generalization of 112 recorded cases and the identification of guidelines for the initial recognition of such objects. The practical significance of the results lies in the possibility of using them during the training of National Guard personnel, the development of training and reference materials, and the improvement of initial response algorithms.

Keywords: *sources of ionizing radiation; radioactive materials; regulatory control; initial identification; radiation safety; National Guard of Ukraine; security and defense sector.*

Statement of the problem. Official data from the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU) indicate that ionising radiation sources (IRS) are widely used in medicine, industry, scientific research, metrology, security systems, and other fields, thereby accounting for their significant presence in civilian and special circulation [1]. According to SNRIU data, in 2025, there were 27,970 registered IRS units in Ukraine [2]. Only in 2025 were 1,764 IRS units registered, and 672 units deregistered, indicating the significant and dynamic nature of their circulation. Under such conditions, there is an objective risk of loss of control over individual sources and their detection outside regulatory control.

Analysis of open official SNRIU reports shows that cases of detection of IRS, radioactive materials (RM), and other objects with indications of radiation hazard outside regulatory control in Ukraine are recorded annually [3]. Such incidents are associated with the illegal circulation of sources, their detection among scrap metal, abandoned technical devices, discarded instruments, postal shipments, and other objects of unknown origin. A significant part of the risk is also formed by outdated Soviet-era sources, which, under conditions of lost documentation, improper decommissioning, or termination of enterprise activity, may have remained outside the current state accounting and regulatory control system. This necessitates a systematic study of the problem

not only from the perspective of radiation safety but also in the context of ensuring public, state, and military security.

In the context of the unprovoked armed aggression of the Russian Federation against Ukraine, the problem of loss of regulatory control over IRS acquires an additional security and defence dimension. As of early 2024, 70 enterprises, institutions, and organisations using IRS remained in the temporarily occupied territories of Ukraine, with a total of 1,014 such sources [4]. The inability to exercise full state supervision over these objects increases the risks of their damage, theft, unauthorised relocation, and use for illicit purposes.

For the National Guard of Ukraine (NGU), this issue has not only general security but also direct service-applied significance. In accordance with the Law of Ukraine “On the National Guard of Ukraine” [5], the main functions of the NGU include the protection of nuclear facilities, nuclear materials, radioactive waste and other ionizing radiation sources of state ownership, protection of special cargoes, protection of critical infrastructure facilities, as well as participation in restoring public order and eliminating consequences of emergency or crises at protected facilities. Under such conditions, timely initial recognition of IRS, RM, and other objects with radiation hazard indicators outside regulatory control should be considered a practical prerequisite for a proper response by

NGU forces and other components of the security and defence sector.

The addressed problem is directly related to the implementation of the research project “Methodology for the Recognition of Ionising Radiation Sources” (state registration number 0126U001698), within which the need to systematise cases of IRS detection outside regulatory control, identify typical circumstances of their detection, and substantiate approaches to the initial recognition of potentially hazardous radiation objects is emphasised.

Despite the existence of official reports, annual SNRIU publications, and separate studies, the problem of detecting IRS, RM, and other objects with radiation hazard indicators outside regulatory control in Ukraine remains insufficiently addressed in the scientific literature. Patterns of such incidents and the possibilities of using their analysis results for the development of capabilities of the security and defence sector of Ukraine, improving NGU personnel training for the initial recognition of such objects, and enhancing the effectiveness of interagency response require further generalisation.

Thus, the study of cases of detection of IRS, RM, and other objects with indications of radiation hazard outside regulatory control is relevant for science, as it allows for a deeper understanding of modern radiation threats, substantiates directions for developing the capabilities of the security and defence sector of Ukraine, and improves approaches to initial recognition and response.

Analysis of recent studies and publications.

At the international level, the issue of ionising radiation sources (IRS) and radioactive materials (RM) after loss of regulatory control is primarily addressed in analytical materials of the International Atomic Energy Agency (IAEA). The Incident and Trafficking Database (ITDB) covers incidents of illicit trafficking, unauthorised possession, loss, improper movement, and accidental discovery of such materials [6]. ITDB data for 2024 confirm that a significant proportion of events is associated not only with malicious activities but also with unauthorised disposal,

accidental discovery of radioactive material, and radioactive-contaminated items [7]. At the same time, these sources provide only a general international framework and do not reveal the national specificity of incidents, typical objects of detection, and their significance for the training of security and defence sector forces.

In foreign studies, the issue of radioactive materials outside regulatory control is also considered through the prism of institutional and regulatory frameworks. In particular, Khoirul Huda et al. [8] demonstrated that an effective nuclear security system requires clearly defined competent authorities, coordination between them, detection and response mechanisms, and specific procedures for handling materials discovered by first responders or the public. However, this work is of a normative-analytical nature and does not contain empirical analysis of specific cases of the detection of such materials.

In domestic literature, the problem of IRS is mainly considered in security, technological, and applied aspects. Thus, O. L. Sitnikova and A. I. Melnyk [9] proposed an algorithm for assessing IRS vulnerability that accounts for the risk of theft and use in radiological sabotage scenarios. O. V. Tokarevskyi et al. [10] emphasised risks associated with spent and historical sources, which, in the absence of proper control, may become new threats. However, these studies focus, respectively, on the vulnerability assessment of licensed sources and on the handling of spent IRS, rather than on a systematic analysis of real cases of their detection outside regulatory control.

The applied security dimension of the problem is reflected in studies devoted to the illicit movement of RM and response to their detection. V. S. Nikiforenko [11] examined legal and organisational principles for countering the illicit movement of RM across the state border of Ukraine. M. V. Chala et al. [12] highlighted practices of emergency preparedness and response involving a mobile radiation reconnaissance laboratory. In a 2024 study, M. V. Chala et al. [4] analysed the experience of unscheduled inspection checks and physical inventory of the IRS in combat

zones and temporarily occupied territories. These works are important for understanding the border, operational, and military contexts of the problem; however, they are either limited to separate response directions or concern the return of already known sources under regulatory control.

A separate research direction concerns the normative-legal support of nuclear security. In particular, D. O. Dimitrieva et al. [13] showed that the current regulatory framework in Ukraine in this field requires further improvement, especially regarding coordination among stakeholders and the integrity of response approaches to RM-related events. At the same time, such works do not provide empirical generalisation of real cases of IRS and RM detection and do not form a system of indicators important for their initial recognition.

Thus, the analysis of current research and publications shows that the scientific field has already formed international-analytical [6, 7], regulatory-legal [8, 13], security [9], technological [10], border-operational [11], emergency-response [12], and military [4] approaches to the issue of IRS and RM after loss of regulatory control. At the same time, previous studies do not provide a systematic empirical generalization of real cases of detection of IRS, RM, and other objects with indications of radiation hazard in Ukraine based on open official sources and do not provide a holistic understanding of the dynamics of such cases during 2015–2025, typical circumstances, locations and scenarios of their detection, types of objects, as well as indicators significant for their initial recognition. The practical dimension of this problem also remains insufficiently explored, namely the possibility of using the results of such analyses for training NGU personnel, improving initial response, and developing the capabilities of other components of Ukraine's security and defence sector. This unresolved part of the problem constitutes the research gap of the present study.

The purpose of this article is to be based on open official sources, to systematically summarize and analyze cases of detection of ionizing radiation sources, radioactive materials, and other objects with indications of radiation hazard outside

regulatory control in Ukraine during 2015–2025, to identify their main dynamic, situational, and substantive patterns, and to determine practically significant guidelines for the initial recognition of such objects and response to them by security and defense sector forces.

To achieve the purpose, the following tasks were set:

1. To study the dynamics of the number of ionising radiation sources in Ukraine and the dynamics of officially recorded cases of radioactive materials in illicit trafficking during 2015–2025;

2. To systematise cases of detection of ionising radiation sources, radioactive materials, and other objects with indications of radiation hazard outside regulatory control according to main situational, environmental, and substantive characteristics;

3. To identify indicators significant for the initial recognition of such objects and practical response to them by security and defence sector forces, primarily the National Guard of Ukraine (NGU).

Presentation of the main material. The methodological basis of the study consisted of general scientific and specialised methods for analysing open official sources. To study the dynamics of the number of IRS in Ukraine and cases of RM detection in illicit trafficking, document analysis, comparative analysis, and statistical generalisation of data from annual reports and official SNRIU publications for 2015–2025 were used [2, 14–65].

To study typical scenarios for the detection of IRS, RM, and other objects with radiation hazard indications, content analysis was applied to a dataset of 112 documented cases compiled from open official SNRIU reports and annual regulatory publications for 2015–2025 [2, 14–65]. The inclusion criterion for a case was its official recording in open SNRIU sources. Comparison of news reports and annual SNRIU reports showed that these sources are not identical in completeness or level of detail; therefore, the dataset was formed through mutual comparison and supplementation. The unit of analysis was an individual case of

detection of an IRS, RM, or other object with indications of radiation hazard outside regulatory control. For each case, the date or time period, location or environment of detection, type and brief description of the object, and, where available, data on the identified source or radionuclide, dose rate, and circumstances of detection were recorded. Further analytical coding and generalisation were carried out by grouping cases according to recurring situational, environmental, and substantive characteristics, which enabled the identification of typical detection scenarios and the systematisation of indicators significant for the initial recognition of potentially hazardous radiation objects by security and defence sector forces. It should be noted that the study is based on publicly available sources and therefore does not cover cases not included in the public information space.

First, it is appropriate to consider the dynamics of statistical indicators characterising the overall circulation of IRS in Ukraine and officially recorded cases of RM detection in illicit trafficking during 2015–2025.

Analysis of statistical indicators for 2015–2025 demonstrated a trend of growth in the total number of IRS in Ukraine. If in 2015 there were 24,582 IRS units in the state register, then in 2025 there were 27,970 units (Fig. 1) [2, 16, 20, 23, 29, 37, 39, 53, 63–65]. This trend can be attributed, on the one hand, to the increase in the number of non-radionuclide (generating) sources widely introduced primarily in medical practice and used in industry, and on the other hand, to improvements in the state accounting and regulatory control system. In particular, official SNRIU reports for this period indicate the development of the State Register of IRS, the refinement of state registration procedures, the elimination of duplicate records, and the additional inclusion of sources already in operation or in storage. Thus, the observed increase reflects not only the expansion of IRS usage but also the improved completeness of their state registration. This indicates that during the studied period, a significant scale of IRS circulation was maintained in Ukraine, and consequently, the potential relevance of risks associated with loss of control over individual sources remained high.

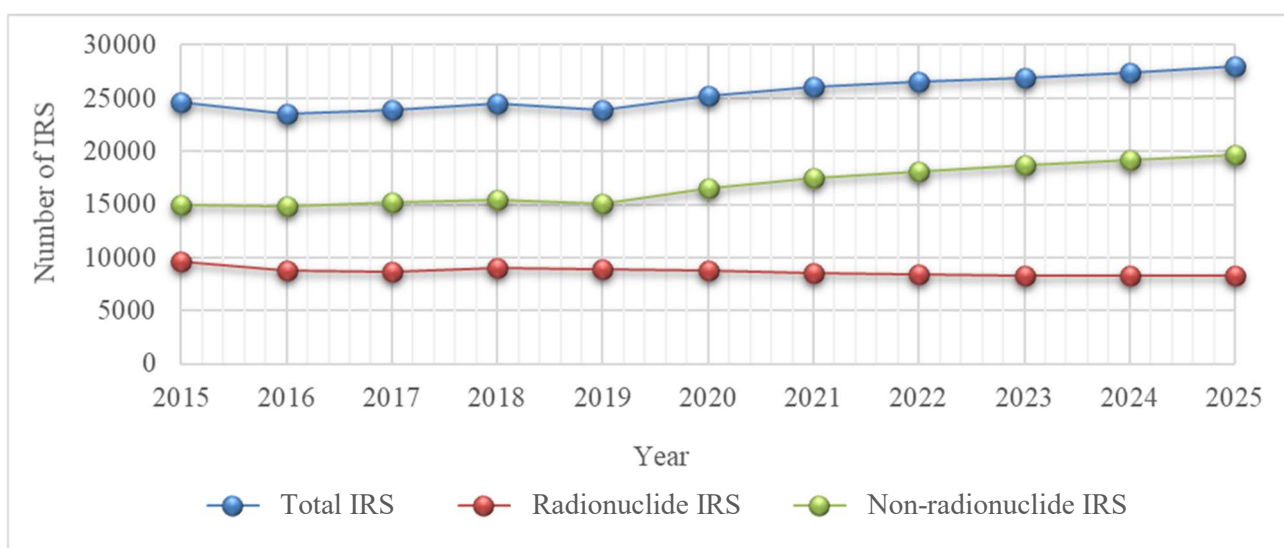


Figure 1 – Dynamics of the total number of ionising radiation sources in Ukraine and their distribution into radionuclide and non-radionuclide sources in 2015–2025

Source: developed by the authors based on data [2, 16, 20, 23, 29, 37, 39, 53, 63–65]

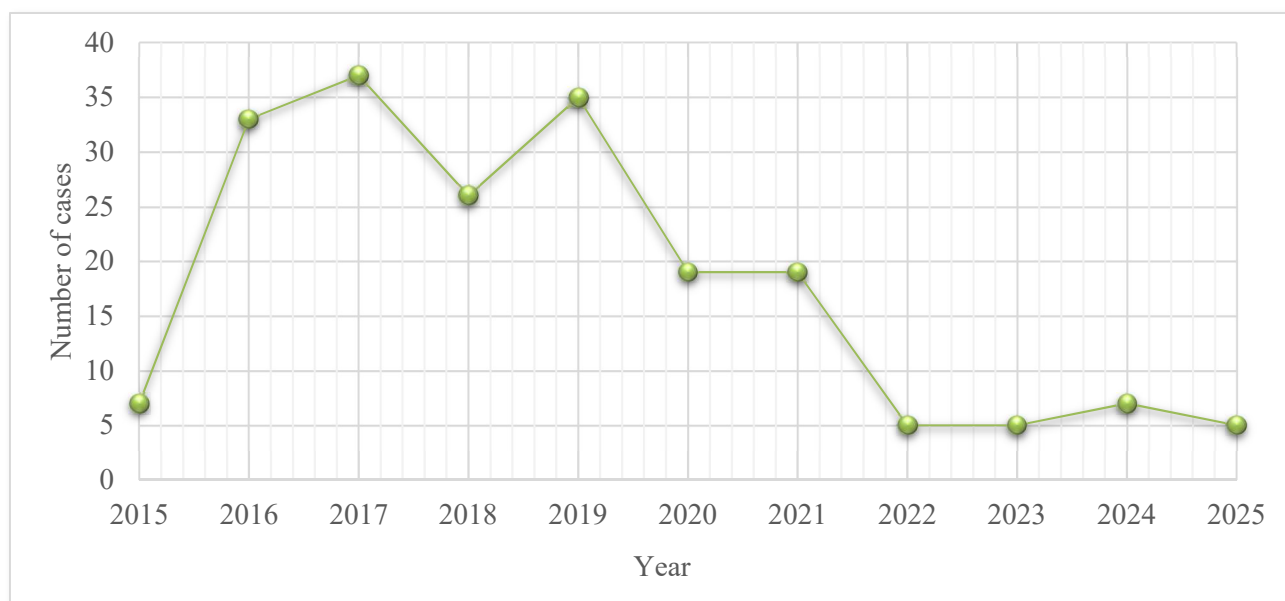


Figure 2 – Dynamics of cases of detection of radioactive materials in illicit trafficking in Ukraine in 2015–2025

Source: developed by the authors based on data [2, 14–65]

At the same time, the internal structure of this dataset changed unevenly. The number of radionuclide IRS gradually decreased over the study period, whereas the number of non-radionuclide IRS, on the contrary, increased. Thus, the increase in the total number of IRS in Ukraine was mainly driven by the expansion of the non-radionuclide source segment. In contrast, the radionuclide IRS segment remained relatively stable, with a slight decline. Such a structural change should be taken into account when assessing risks associated with the possible loss of regulatory control over individual sources.

A different dynamic is demonstrated by cases of detection of RM in illicit trafficking (Fig. 2). In contrast to the relatively smooth change in the total number of IRS, this indicator is characterised by pronounced fluctuations: after growth in 2016–2017 and a repeated increase in 2019, a significant decrease in the number of officially recorded cases is subsequently observed. In 2022–2025, this indicator remained low compared to previous years

and fluctuated between 5 and 7 cases per year [2, 14–65].

The results obtained allow several generalisations. First, the dynamics of the total number of IRS in state circulation and the dynamics of RM detection cases in illicit trafficking are not synchronous. Second, despite the gradual decrease in the number of radionuclide IRS, this category of objects remains of the highest security significance in the context of illicit trafficking and potential radiation hazards. Third, the decrease in the number of officially recorded cases in 2022–2025 should not be unambiguously interpreted as a reduction in the threat level. The armed aggression of the Russian Federation against Ukraine, ongoing since 2014, and especially its full-scale phase since 2022, has significantly affected the conditions of regulatory control over IRS in combat zones and temporarily occupied territories, limiting the possibility of conducting inspection checks and physical inventory of individual sources [4]. Under such conditions, the

reduction in officially reported indicators may have been driven not only by the actual dynamics of events but also by changes in control conditions, logistical constraints, and the specifics of open reporting. At the same time, this created additional prerequisites for the loss of information about the location of individual sources, their damage, unauthorised relocation, and subsequent accidental detection, particularly in scrap metal streams.

Thus, the presented statistical indicators provide an important empirical background for the study; however, they do not, in themselves, reveal the nature of specific threats, typical detection scenarios, or indicators by which potentially hazardous radiation objects can be initially recognised by security and defence sector forces. Therefore, further analysis focused on the generalisation of 112 documented cases, enabling a shift from general statistics to the identification of typical detection scenarios and indicators significant for initial recognition of such objects.

For each case, the event date, detection location, type of object, identified source or radionuclide, and, where available, dose rate data were considered. This enabled a transition from general statistics to the typologization of recurring situational models, detection environments, and substantive characteristics relevant to the initial recognition of such objects.

The analysis of the collected material showed that the detection of IRS, RM, and other objects indicating radiation hazard outside regulatory control is not accidental or purely episodic. On the contrary, such cases recur in relatively stable environments and according to similar situational patterns, which makes it possible to identify several typical scenarios of their occurrence in industrial, transport, postal-logistical, domestic, institutional, and military contexts.

The first typical scenario involves inbound radiation control systems at metallurgical enterprises and scrap metal streams. In this environment, both radioactively contaminated scrap metal shipments were repeatedly detected at

PJSC “ArcelorMittal Kryvyi Rih” [16, 31, 36, 37, 43, 45, 61], PJSC “Azovstal” [25–29, 35, 42, 44, 50, 52, 53, 61], PJSC “Zaporizhstal” [41], PJSC “Yenakiieve Metallurgical Plant” [55, 59], as well as individual sources or their fragments, including metal pipes [36, 41, 43, 45, 61], a measuring instrument scale [42], a gamma radiation block type BGI-75 [55], elements of radioisotope devices VPHR-1 and PPHR-1 [44], and a radioisotope icing detector type RIO-3 [53]. A characteristic feature of this scenario is that the hazardous object is often not visually perceived as a specific radiation source but is disguised as ordinary scrap metal or its component.

The second scenario covers border crossing points, airports, and other transport hubs. In this environment, repeated cases include detection of potentially radiation-hazardous watches at “Boryspil” Airport [25, 35, 38, 43, 51, 53, 54, 61], “Kyiv” Airport [35, 55], and “Lviv” Airport [34, 51, 53], compasses, including KI-11 aviation compasses [23, 34, 46, 56], artificial horizons AGI-1S [34], artillery stereoscopic rangefinders [42], sextants [34], altimeters and other technical devices [51, 53, 54]. A separate case includes radioactive contamination of a passenger vehicle at the “Ustyluh” checkpoint [17], as well as detection of contaminated metal pipes and scrap fragments at the “Kherson” checkpoint and the State Enterprise “Kherson Sea Commercial Port” [29, 31]. A common feature of these episodes is that the radiation-hazardous item often appears as an ordinary technical product, equipment component, instrument, or luggage item, which complicates its initial recognition without specialised training and dosimetric control.

The third stable scenario involves postal and cargo shipments. This group includes cases of detection of DP-63A dosimeters [17, 20, 23], compasses [23, 56], watches and other technical items [58] in postal shipments, as well as concealed objects disguised in books or among other items [53]. A separate example is an international postal shipment containing two KI-11 aviation

compasses, which were detected at the “Shehyni–Medika” checkpoint [23]. This indicates that the postal-logistics channel is an independent risk environment in which covert movement of radiation-hazardous items is possible without direct contact between sender and recipient.

The fourth scenario is associated with accidental findings in open areas, forest belts, abandoned buildings, basements, former industrial site territories, educational institutions, and other locations where IRS were historically used [2, 14–65].

This group includes detection of objects with radiation hazard symbols [2, 33], containers, cylindrical metal objects [2, 15, 18], smoke detectors [20, 21], transparent containers with radioactive substances [2], and other objects of unspecified purpose [19–21]. This scenario is characterised by the fact that the object may remain unnoticed for a long time, and its detection occurs during repair works, cleaning, patrolling, site inspections, or accidental discovery by civilians.

The fifth scenario involves long-term, uncontrolled storage of radiation-hazardous items on the premises of research institutions, enterprises, warehouses, or other storage facilities. This group includes cases of IRS detection in basement premises of scientific institutions [32, 47], in safes of educational institutions [43], and at production sites [23], where radioisotope devices were stored without proper accounting and control. Such episodes confirm that loss of regulatory control may be associated not only with illicit movement but also with long-forgotten or ownerless storage of sources in enclosed premises.

The sixth scenario has a pronounced military, post-occupation, or law-enforcement operational context. It includes cases of detection of a DP-63A dosimeter following a violation of radiation safety regulations in the Chernobyl Exclusion Zone, discovery of a Cs-137 bio-shield block [23], detention of individuals with a “Gammarid” gamma radiographic device [50, 52] and a metal sphere with characteristics of radioactive material

[60], as well as recording of unauthorized earthworks at burial sites of contaminated soil and materials following a radiation accident [52]. This scenario is of particular importance for the security and defence sector, as it directly relates to the risk of access to hazardous radiation sources under crisis, unstable, or wartime conditions.

Thus, typologization of detection scenarios shows that for security and defence sector forces, it is practically significant not only to know the types of sources themselves, but primarily to understand the environments in which they are most likely to occur, their characteristic masking patterns, and recurring situations in which such objects may be initially detected. This provides the analytical basis for further systematisation of the material composition of detected objects and for identifying indicators significant for their initial recognition.

A systematic analysis of the material composition of detected objects reveals that several characteristic groups of items repeatedly appear in the dataset. First, contaminated scrap metal, railcars, pipes, and other fragments of metal products [16, 25–29, 31, 35–39, 41–45, 48, 50–57, 59, 61]. Second, old technical and measuring devices, including DP-63A dosimeters [16, 17, 20, 23], various types of watches [29, 30, 34, 38, 43, 49, 51, 58, 61], compasses [23, 34, 46, 56], aviation and industrial instruments [17, 23, 34, 42–44, 51, 53, 57], smoke detectors RID-1, RID-6M, KI-1 [20, 21, 35, 41, 54], RIO-3 icing detectors [14, 53, 57], “Gammarid” gamma radiography devices [50, 56, 57, 62], bio-shield blocks and gamma relay blocks [23, 29, 41, 55]. Third, objects of unspecified or non-obvious purpose – glass ampoules [46], stones, ceramic tiles [38], rock samples [53], crystallised substances [39], metal boxes, metal spheres [60], and cylindrical objects [2, 18, 49].

This structure of material composition has important practical significance. It shows that potentially hazardous radiation objects outside regulatory control do not always appear as specific radiation sources. In a significant number of cases,

they are visually perceived as ordinary scrap metal, old technical products, household-technical items, or objects of unclear purpose. This diversity significantly complicates their initial recognition and requires reliance not only on direct hazard markers but also on typical risk object groups.

It is noteworthy that, among the identified sources in the studied dataset, Ra-226 appears most frequently [2, 17, 23, 29, 31, 36, 37, 41–43, 48, 51, 53]. This radionuclide was detected in watches [29, 30, 43, 49, 51], compasses [23, 42, 46], technical and aviation instruments [17, 34, 42, 51, 53], scrap metal and pipes [31, 36, 37, 41, 43, 61], as well as in unidentified objects [2, 48]. This allows us to consider old instruments, technical products, and equipment fragments associated with the historical use of radium as one of the most indicative risk groups in cases of detection of objects outside regulatory control.

In addition to Ra-226, the studied cases include Cs-137 [23, 39, 41, 42, 54], U-238 [2, 18, 21, 22], Pu-239 [20, 21, 35, 41, 54], Sr-90 and Y-90 [14, 53, 57], Kr-85 [33], Am-241 [38], Co-60 [54], as well as combined radionuclide compositions [30, 46, 54]. At the same time, in a significant number of officially described episodes, the source was not specified. This once again emphasises that, for an initial response, decisive importance lies not in precise on-site nuclide identification, but in timely recognition of a potential hazard based on a combination of external, material, and situational indicators.

The conducted analysis enables the identification of four interrelated groups of indicators significant for the initial recognition of IRS, RM, and other objects with radiation hazard indications.

First, contextual indicators, i.e., typical detection environments. These include scrap metal sites and metallurgical enterprises [16, 31, 41], border crossing points, airports, and other transport hubs [17, 23, 34], postal infrastructure facilities [20, 23, 56], abandoned premises, basements, scientific and industrial sites [19, 32, 43], as well as open areas, forests, forest belts, and territories of

former military or industrial sites [2, 33, 62]. These environments represent the highest probability of detecting objects outside regulatory control.

Second, external hazard markers that may directly indicate the possible radiation nature of an object. These include radiation hazard symbols [2, 33, 43], warning labels, radionuclide indices or technical markings [14, 29, 57], as well as structural features that may indicate the presence of a source: protective containers, metal housings, shielding elements, or unusually high object mass [21, 23, 62].

Third, object-functional indicators, i.e., the object's belonging to high-risk technical product groups. These primarily include old dosimetric, aviation, military, industrial, and fire-signalling devices, among which dosimeters, compasses, watches, smoke detectors, gamma radiography devices, and other radioisotope instruments require special attention [17, 20, 23, 42, 53]. The practical significance of this group lies in the fact that, even in the absence of direct labelling, the device type itself may already warrant increased caution.

Fourth, situational indicators, i.e., circumstances under which a suspicious object is detected or manifests itself as potentially hazardous. These include activation of stationary radiation monitoring systems [16, 25, 41], detection during baggage, postal, or cargo inspections [20, 23, 34], as well as discovery during repair works, cleaning, site inspections, dismantling of equipment, or earthworks [19, 47, 52]. Such circumstances often serve as the initial signal of danger even before the specific source or radionuclide is identified.

Thus, the initial recognition of IRS, RM, and other objects with indications of radiation hazard cannot be based solely on the presence of an obvious radiation warning symbol. A significant proportion of recorded objects either lack clear external markers or appear as ordinary technical items, household objects, or scrap metal components. Therefore, for security and defence sector forces, it is essential to combine four components: knowledge of typical environments of

occurrence, ability to recognise external hazard markers, identification of risk object groups by functional characteristics, and consideration of situational indicators of detection.

Conclusions and prospects for further research.

As a result of the study, it was established that during 2015–2025, the total number of ionising radiation sources (IRS) in the state of Ukraine increased from 24,582 to 27,970 units, which indicates the maintenance of a significant volume of their circulation and the continued relevance of risks associated with the loss of control over individual objects. At the same time, the dynamics of cases of radioactive materials (RM) detection in illicit trafficking were not synchronous with the overall dynamics of IRS numbers: after peak values in 2016–2019, significantly lower indicators were recorded in 2022–2025; however, such a decrease cannot be unambiguously interpreted as a reduction in the threat level.

Systematisation of 112 documented cases showed that the detection of IRS, RM, and other objects with indications of radiation hazard outside regulatory control is of a recurrent nature and occurs predominantly in typical environments: scrap metal streams, metallurgical enterprises, border crossing points, transport hubs, postal shipments, abandoned premises, and during accidental discoveries. It was established that a significant proportion of such objects do not have obvious external markers and may visually appear as ordinary technical products, household items, or scrap metal, which necessitates that initial recognition should rely not only on radiation hazard symbols but also on typical occurrence scenarios, risk object types, and detection context.

The scientific novelty of the obtained results lies in the systematic generalization and content analysis of 112 officially recorded cases of detection of IRS, RM, and other objects with indications of radiation hazard outside regulatory control in Ukraine during 2015–2025, the identification of their main dynamic and situational

patterns, and the substantiation of indicators significant for the initial recognition of such objects by security and defense sector forces. The theoretical significance of the study lies in refining the understanding of the nature of modern radiation threats outside regulatory control. In contrast, its practical significance lies in the possibility of using the results to train National Guard of Ukraine (NGU) personnel and other components of the security and defence sector, develop training materials, and improve initial response algorithms.

Prospects for further research should include expanding the database of documented cases, in-depth typologization of specific types of IRS, RM, and other objects with radiation hazard indicators, and the development of training and reference materials for their initial recognition by security and defence sector forces.

References

1. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2026). *Perelik pidpriumstv, ustanov ta orhanizatsii, shcho maiut litsenzii z vykorystannia DIV v chastyini vykonannia robot z tekhnichnoho obsluhovuvannia DIV* [List of enterprises, institutions and organizations licensed to use sources of ionizing radiation in the part of maintenance works for sources of ionizing radiation]. Retrieved from: <https://surl.li/oslwpz> (accessed 12 February 2026) [in Ukrainian].
2. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2026). *Zvit pro diialnist Derzhavnoi inspektsii yadernoho rehuliuвання Ukrainy za 2025 rik* [Report on the activities of the State Nuclear Regulatory Inspectorate of Ukraine for 2025]. Retrieved from: <https://surl.li/mgsxnf> (accessed 12 February 2026) [in Ukrainian].
3. Goncharenko O., Manzhos O., Yanchuk M., Naumkin M. (2025). *Radiatsiina bezpeka yak skladova Natsionalnoi bezpeky Ukrainy: analiz intsydentiv iz dzherelamy ionizuiuchoho vyprominiuvannia (2020–2025 rr.)* [Radiation

safety as a component of the national security of Ukraine: analysis of incidents involving sources of ionizing radiation (2020–2025)]. *Natsionalni interesy*, no. 11, pp. 123–140. DOI: [https://doi.org/10.52058/3041-1793-2025-11\(16\)-123-140](https://doi.org/10.52058/3041-1793-2025-11(16)-123-140) [in Ukrainian].

4. Chala M., Kudriashova Ye., Ivanov Z., Rubliuk M., Bachynskii V. (2024). *Provedennia pozaplanovykh inspektsiinykh perevirok na pidpriemstvakh (ustanovakh, orhanizatsiakh), shcho vykorystovuiut dzherela ionizuiuchoho vyprominiuvannia, u zonakh vedennia boiovykh dii abo tymchasovo okupovanykh rf* [Conducting unscheduled inspection audits at enterprises (institutions, organizations) using sources of ionizing radiation in combat zones or in territories temporarily occupied by the russian federation]. *Yaderna ta radiatsiina bezpeka*, no. 3 (103), pp. 4–14. DOI: [https://doi.org/10.32918/nrs.2024.3\(103\).01](https://doi.org/10.32918/nrs.2024.3(103).01) [in Ukrainian].

5. *Zakon Ukrainy "Pro Natsionalnu hvardiiu Ukrainy" № 876-VII* [Law of Ukraine about the National Guard of Ukraine activity no. 876-VII]. (2014, March 13). *Vidomosti Verkhovnoi Rady Ukrainy*. Retrieved from: <https://lnk.ua/32aeGoyxp> (accessed 12 February 2026) [in Ukrainian].

6. International Atomic Energy Agency (2025). Incident and Trafficking Database (ITDB). *IAEA Incident and Trafficking Database (ITDB) 2025 factsheet*. Retrieved from: <https://lnk.ua/wRJGX8ZDG> (accessed 12 February 2026) [in English].

7. International Atomic Energy Agency (2025). *More than 145 reports added to IAEA Incident and Trafficking Database in 2024*. Press releases. Retrieved from: <https://lnk.ua/4aQBuZDAL> (accessed 12 February 2026) [in English].

8. Huda, K., Pramono, Y., & Nugraheni, M. W. (2023). Review of regulations for security of radioactive materials out of regulatory control (MORC). *AIP Conference Proceedings*, vol. 2893, iss. 1: Proceedings of the 18th Annual Nuclear Safety Seminar (ANSS) 2022. DOI: <https://doi.org/10.1063/5.0173379> [in English].

9. Sitnikova O. L., Melnyk A. I. (2022). *Rozrobka alhorytmu otsinky vrazlyvosti dzherel ionizuiuchoho vyprominiuvannia* [Development of an algorithm for assessing the vulnerability of ionizing radiation sources]. *Yaderna ta radiatsiina bezpeka*, no. 1 (93), pp. 71–76. DOI: [https://doi.org/10.32918/nrs.2021.1\(93\).08](https://doi.org/10.32918/nrs.2021.1(93).08) [in Ukrainian].

10. Tokarevskyi O. V., Fuzik K. V., Kondratiev S. M., Aleksieieva Z. M. (2020). *Analiz aspektiv bezpeky zakhoronennia vidpratsovanykh dzherel ionizuiuchoho vyprominiuvannia* [Analysis of safety aspects of disposal of disused sources of ionizing radiation]. *Yaderna ta radiatsiina bezpeka*, no. 2 (86), pp. 72–82. DOI: [https://doi.org/10.32918/nrs.2020.2\(86\).09](https://doi.org/10.32918/nrs.2020.2(86).09) [in Ukrainian].

11. Nikiforenko V. (2021). *Protydiia nezakonnomu peremishchenniu cherez derzhavnyi kordon Ukrainy radioaktyvnykh materialiv ta predmetiv* [Counteracting the illegal movement of radioactive materials and items across the state border of Ukraine]. *Yaderna ta radiatsiina bezpeka*, no. 1 (89), pp. 30–35. DOI: [https://doi.org/10.32918/nrs.2021.1\(89\).04](https://doi.org/10.32918/nrs.2021.1(89).04) [in Ukrainian].

12. Chala M., Kudriashova Ye., Ivanov Z., Nikolaiev Ye. (2022). *Diialnist z avariinoi hotovnosti i reahuvannia iz zaluchenniam mobilnoi laboratorii radiatsiinoi rozvidky* [Emergency preparedness and response activities involving a mobile radiation reconnaissance laboratory]. *Yaderna ta radiatsiina bezpeka. Spetsvypusk*, pp. 62–70. Retrieved from: <https://lnk.ua/4z4qyZXN6> (accessed 13 March 2026) [in Ukrainian].

13. Dimitriieva D., Pashchenko V., Melnyk A., Kuzmiak I., Turanskyi O., Valihun N. (2025). *Ohliad normatyvno-pravovoi bazy Ukrainy v chastyni rehuliuvannia skladovykh yadernoi zakhyshchenosti* [Review of the regulatory and legal framework of Ukraine in terms of regulation of nuclear security components]. *Yaderna ta radiatsiina bezpeka*, no. 3 (107), pp. 30–45. DOI: [https://doi.org/10.32918/nrs.2025.3\(107\).03](https://doi.org/10.32918/nrs.2025.3(107).03) (accessed 13 March 2026) [in Ukrainian].

14. Derzhavna inspektsiia yadernoho rehuliuвання України (2025). *Informatsiia shchodo vyivlennia u nezakonnomu obihu radioaktyvnoho materialu (zvit za II kvartal 2025 roku)* [Information on the detection of radioactive material in illicit trafficking (report for the second quarter of 2025)]. Retrieved from: <https://snriu.gov.ua/news/informatsiia-shchodo-vyivlennia-u-nezakonnomu-obihu-radioaktyvnoho-materialu-zvit-za-ii-kvartal-2025-roku> (accessed 4 March 2026) [in Ukrainian].

15. Derzhavna inspektsiia yadernoho rehuliuвання України (2025). *Informatsiia shchodo vyivlennia u nezakonnomu obihu radioaktyvnoho materialu (zvit za I kvartal 2025 roku)*

[Information on the detection of radioactive material in illicit trafficking (report for the first quarter of 2025)]. Retrieved from: <https://lnk.ua/fDWEWUmrO> (accessed 4 March 2026) [in Ukrainian].

16. Derzhavna inspektsiia yadernoho rehuliuвання України (2025). *Dopovid pro stan yadernoi ta radiatsiinoi bezpeky v Ukraini u 2024 rotsi* [Report on the state of nuclear and radiation safety in Ukraine in 2024]. Retrieved from: <https://surl.li/tdxgcd> (accessed 4 March 2026) [in Ukrainian].

17. Derzhavna inspektsiia yadernoho rehuliuвання України (2024). *Informatsiia shchodo vyivlennia radioaktyvnoho materialu v nezakonnomu obihu* [Information on the detection of radioactive material in illicit trafficking]. Retrieved from: <https://lnk.ua/8nbL5AFGN> (accessed 4 March 2026) [in Ukrainian].

18. Derzhavna inspektsiia yadernoho rehuliuвання України (2024). *Informatsiia pro vyivlennia u nezakonnomu obihu radioaktyvnoho materialu v Zaporizhzhzi* [Information on the detection of radioactive material in illicit trafficking in Zaporizhzhia]. Retrieved from: <https://surl.li/qcirra> (accessed 4 March 2026) [in Ukrainian].

19. Derzhavna inspektsiia yadernoho rehuliuвання України (2024). *Informatsiia pro vyivlennia radioaktyvnoho materialu v nezakonnomu obihu* [Information on the detection of radioactive material in illicit trafficking]. Retrieved from: <https://lnk.ua/wvU9sRi1t> (accessed 4 March 2026) [in Ukrainian].

20. Derzhavna inspektsiia yadernoho rehuliuвання України (2024). *Dopovid pro stan yadernoi ta radiatsiinoi bezpeky v Ukraini u 2023 rotsi* [Report on the state of nuclear and radiation safety in Ukraine in 2023]. Retrieved from: <https://lnk.ua/RUm8AniKf> (accessed 4 March 2026) [in Ukrainian].

21. Derzhavna inspektsiia yadernoho rehuliuвання України (2023). *Informatsiia pro vyivlennia u nezakonnomu obihu radioaktyvnoho materialu* [Information on the detection of radioactive material in illicit trafficking]. Retrieved from: <https://surl.li/hmapjt> (accessed 4 March 2026) [in Ukrainian].

22. Derzhavna inspektsiia yadernoho rehuliuвання України (2023). *Informatsiia shchodo vyivlennia u nezakonnomu obihu radioaktyvnoho materialu* [Information regarding the detection of radioactive material in illicit trafficking]. Retrieved from: <https://lnk.ua/TKU9jgg27> (accessed 4 March 2026) [in Ukrainian].

23. Derzhavna inspektsiia yadernoho rehuliuвання України (2023). *Dopovid pro stan yadernoi ta radiatsiinoi bezpeky v Ukraini u 2022 rotsi* [Report on the state of nuclear and radiation safety in Ukraine in 2022]. Retrieved from: <https://lnk.ua/bGANJ4idP> (accessed 4 March 2026) [in Ukrainian].

24. Derzhavna inspektsiia yadernoho rehuliuвання України (2022). *Pro vyivlennia radioaktyvnoho materialu* [On the detection of radioactive material]. Retrieved from: <https://lnk.ua/35PEyVyj8> (accessed 4 March 2026) [in Ukrainian].

25. Derzhavna inspektsiia yadernoho rehuliuвання України (2021). *Pro vyivlennia u nezakonnomu obihu radioaktyvnoho materialu* [On

the detection of radioactive material in illicit trafficking]. Retrieved from: <https://lnk.ua/LwLGzZ6fJ> (accessed 4 March 2026) [in Ukrainian].

26. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2021). *Informatsiia shchodo vyivlennia u nezakonnomu obihu radioaktyvnoho materialu 09.12.2021* [Information regarding the detection of radioactive material in illicit trafficking on 09.12.2021]. Retrieved from: <https://lnk.ua/FY3oMrHvc> (accessed 4 March 2026) [in Ukrainian].

27. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2021). *Vyivleno vahon z metalobrukhtom z pidvyshchenym rivnem vyprominiuvannia* [A railcar with scrap metal containing an elevated radiation level was detected]. Retrieved from: <https://lnk.ua/Pahsriklg> (accessed 4 March 2026) [in Ukrainian].

28. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2021). *Vyivleno vahon z metalobrukhtom z pidvyshchenym rivnem hamma vyprominiuvannia* [A railcar with scrap metal containing an elevated gamma-radiation level was detected]. Retrieved from: <https://lnk.ua/mNWUMwSfh> (accessed 4 March 2026) [in Ukrainian].

29. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2022). *Dopovid pro stan yadernoi ta radiatsiinoi bezpeky v Ukraini u 2021 rotsi* [Report on the state of nuclear and radiation safety in Ukraine in 2021]. Retrieved from: <https://lnk.ua/2LS26hmtm> (accessed 4 March 2026) [in Ukrainian].

30. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2021). *Informatsiia shchodo vyivlennia u nezakonnomu obihu radioaktyvnoho materialu* [Information regarding the detection of radioactive material in illicit trafficking]. Retrieved from: <https://lnk.ua/cBtolotTZ> (accessed 4 March 2026) [in Ukrainian].

31. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2021). *Pro vyluchennia iz nezakonnoho obihu radioaktyvnykh materialiv za II ta III kvartaly 2021 roku* [On the seizure of

radioactive materials from illicit trafficking for the second and third quarters of 2021]. Retrieved from: <https://surl.li/twsxuw> (accessed 4 March 2026) [in Ukrainian].

32. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2021). *Vyluchennia, perevezennia ta peredacha na podalshe zberihannia dzherela shvydkykh neitroniv* [Seizure, transportation and transfer for further storage of a fast neutron source]. Retrieved from: <https://surl.li/ftrewo> (accessed 4 March 2026) [in Ukrainian].

33. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2021). *Pro vyluchennia iz nezakonnoho obihu radioaktyvnykh materialiv* [On the seizure of radioactive materials from illicit trafficking]. Retrieved from: <https://lnk.ua/fpPonvaEO> (accessed 4 March 2026) [in Ukrainian].

34. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2021). *Pro vyluchennia iz nezakonnoho obihu radioaktyvnykh materialiv za IV kvartal 2020 roku* [On the seizure of radioactive materials from illicit trafficking for the fourth quarter of 2020]. Retrieved from: <https://lnk.ua/rKPJDtbXS> (accessed 4 March 2026) [in Ukrainian].

35. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2020). *Pro vyluchennia iz nezakonnoho obihu radioaktyvnykh materialiv za 3 kvartal 2020 roku* [On the seizure of radioactive materials from illicit trafficking for the third quarter of 2020]. Retrieved from: <https://lnk.ua/UvORuizKZ> (accessed 4 March 2026) [in Ukrainian].

36. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2020). *Vyluchennia iz nezakonnoho obihu radioaktyvnykh materialiv za I kvartal 2020 roku* [Seizure of radioactive materials from illicit trafficking for the first quarter of 2020]. Retrieved from: <https://lnk.ua/r7dvgoSOH> (accessed 4 March 2026) [in Ukrainian].

37. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2021). *Dopovid pro stan yadernoi ta radiatsiinoi bezpeky v Ukraini u 2020*

rotsi [Report on the state of nuclear and radiation safety in Ukraine in 2020]. Retrieved from: <https://surl.li/igugst> (accessed 4 March 2026) [in Ukrainian].

38. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2020). *Shchodo vyiavlennia u nezakonnomu obihu radioaktyvnykh materialiv u 4 kvartali 2019 roku* [Regarding the detection of radioactive materials in illicit trafficking in the fourth quarter of 2019]. Retrieved from: <https://lnk.ua/ZzygFWPYP> (accessed 4 March 2026) [in Ukrainian].

39. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2020). *Dopovid pro stan yadernoi ta radiatsiinoi bezpeky v Ukraini u 2019 rotsi* [Report on the state of nuclear and radiation safety in Ukraine in 2019]. Retrieved from: <https://surl.li/nwggba> (accessed 4 March 2026) [in Ukrainian].

40. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2019). *Informatsiia shchodo vyiavlennia u nezakonnomu obihu radioaktyvnoho materialu v III kvartali 2019 roku* [Information on the detection of radioactive material in illicit trafficking in the third quarter of 2019]. Retrieved from: <https://lnk.ua/obNKsZ3aa> (accessed 4 March 2026) [in Ukrainian].

41. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2019). *Shchodo vyiavlennia u nezakonnomu obihu radioaktyvnoho materialu protiahom II kvartalu 2019 roku* [Regarding the detection of radioactive material in illicit trafficking during the second quarter of 2019]. Retrieved from: <https://lnk.ua/2dFDHUn9l> (accessed 4 March 2026) [in Ukrainian].

42. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2019). *Zvit za I kvartal 2019 roku shchodo vyiavlennia ta vyluchennia radioaktyvnykh materialiv, shcho perebuvaly u nezakonnomu obihu* [Report for the first quarter of 2019 on the detection and seizure of radioactive materials that were in illicit trafficking]. Retrieved from: <https://lnk.ua/en5AVvcQR> (accessed 4 March 2026) [in Ukrainian].

43. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2019). *Protiahom chetvertoho kvartalu 2018 roku Derzhatomrehuliuвання spilno z vidpovidnymi strukturnymy pidrozdilamy tsentralnykh orhaniv vykonavchoi vlady Ukrainy zabezpechyly vyiavlennia ta vyluchennia radioaktyvnykh materialiv, shcho perebuvaly u nezakonnomu obihu, ta povernennia yikh pid rehuliuвання kontrol* [During the fourth quarter of 2018, the State Nuclear Regulatory Inspectorate, jointly with the relevant structural units of the central executive authorities of Ukraine, ensured the detection and seizure of radioactive materials that were in illicit trafficking and their return under regulatory control]. Retrieved from: <https://surl.li/tpophw> (accessed 4 March 2026) [in Ukrainian].

44. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2018). *Protiahom III kvartalu 2018 roku Derzhatomrehuliuвання spilno z vidpovidnymi strukturnymy pidrozdilamy tsentralnykh orhaniv vykonavchoi vlady Ukrainy zabezpechyly vyiavlennia ta vyluchennia radioaktyvnykh materialiv* [During the third quarter of 2018, the State Nuclear Regulatory Inspectorate, jointly with the relevant structural units of the central executive authorities of Ukraine, ensured the detection and seizure of radioactive materials]. Retrieved from: <https://surl.li/kejopl> (accessed 4 March 2026) [in Ukrainian].

45. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2018). *Shchodo nezakonnoho obihu radioaktyvnykh materialiv* [Regarding illicit trafficking of radioactive materials]. Retrieved from: <https://lnk.ua/0Xm6djxE0> (accessed 4 March 2026) [in Ukrainian].

46. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2018). *Nebezpechni radioaktyvni materialy vylucheni z nezakonnoho obihu* [Dangerous radioactive materials seized from illicit trafficking]. Retrieved from: <https://lnk.ua/KM2bvIn80> (accessed 4 March 2026) [in Ukrainian].

47. Derzhavna inspektsiia yadernoho rehuliuвання України (2018). *Pro vyivlennia dzherela ionizuiuchoho vyprominiuvannia u pidvalnomu prymishchenni IHMR NANU* [On the detection of a source of ionizing radiation in the basement premises of the IHMR of the NAS of Ukraine]. Retrieved from: <https://surl.li/etdril> (accessed 4 March 2026) [in Ukrainian].

48. Derzhavna inspektsiia yadernoho rehuliuвання України (2017). *Pro vyivlennia u nezakonnomu obihu radioaktyvnoho materialu* [On the detection of radioactive material in illicit trafficking]. Retrieved from: <https://lnk.ua/MCpMasdS> (accessed 4 March 2026) [in Ukrainian].

49. Derzhavna inspektsiia yadernoho rehuliuвання України (2017). *Na ukrainsko-moldovskomu kordoni z nezakonnoho obihu vylucheno radionuklidne dzherelo* [A radionuclide source was seized from illicit trafficking at the Ukrainian-Moldovan border]. Retrieved from: <https://lnk.ua/ldf0X5Xfy> (accessed 4 March 2026) [in Ukrainian].

50. Derzhavna inspektsiia yadernoho rehuliuвання України (2017). *Pro vyivlennia radioaktyvnykh materialiv u nezakonnomu obihu* [On the detection of radioactive materials in illicit trafficking]. Retrieved from: <https://lnk.ua/VJdeEfYbD> (accessed 4 March 2026) [in Ukrainian].

51. Derzhavna inspektsiia yadernoho rehuliuвання України (2017). *Z nezakonnoho obihu vylucheni radioaktyvni materialy* [Radioactive materials seized from illicit trafficking]. Retrieved from: <https://lnk.ua/Mg5p1M1rA> (accessed 4 March 2026) [in Ukrainian].

52. Derzhavna inspektsiia yadernoho rehuliuвання України (2017). *Informatsiine povidomlennia pro vyivlennia zaboronenykh nebezpechnykh vidkhodiv na terytorii Kirovohradskoi oblasti* [Information notice on the detection of prohibited hazardous waste in the territory of Kirovohrad region]. Retrieved from: <https://lnk.ua/yCkeqGTOT> (accessed 4 March 2026) [in Ukrainian].

53. Derzhavna inspektsiia yadernoho rehuliuвання України (2018). *Dopovid pro stan yadernoi ta radiatsiinoi bezpeky v Ukraini u 2017 rotsi* [Report on the state of nuclear and radiation safety in Ukraine in 2017]. Retrieved from: <https://surl.li/tychvp> (accessed 4 March 2026) [in Ukrainian].

54. Derzhavna inspektsiia yadernoho rehuliuвання України (2017). *Shchodo vyivlennia u nezakonnomu obihu radioaktyvnoho materialu* [Regarding the detection of radioactive material in illicit trafficking]. Retrieved from: <https://lnk.ua/4RzR6KVAY> (accessed 4 March 2026) [in Ukrainian].

55. Derzhavna inspektsiia yadernoho rehuliuвання України (2017). *Pro vyivlennia u nezakonnomu obihu radioaktyvnoho materialu* [On the detection of radioactive material in illicit trafficking]. Retrieved from: <https://lnk.ua/bmc5URyFj> (accessed 4 March 2026) [in Ukrainian].

56. Derzhavna inspektsiia yadernoho rehuliuвання України (2016). *Shchodo vyivlennia u nezakonnomu obihu radioaktyvnykh materialiv* [Regarding the detection of radioactive materials in illicit trafficking]. Retrieved from: <https://lnk.ua/k2T9fyK5A> (accessed 4 March 2026) [in Ukrainian].

57. Derzhavna inspektsiia yadernoho rehuliuвання України (2016). *Pro vyivlennia u nezakonnomu obihu radioaktyvnykh materialiv* [On the detection of radioactive materials in illicit trafficking]. Retrieved from: <https://lnk.ua/Zdi8CR3N3> (accessed 4 March 2026) [in Ukrainian].

58. Derzhavna inspektsiia yadernoho rehuliuвання України (2016). *Shchodo vyivlennia u nezakonnomu obihu radioaktyvnoho materialu* [Regarding the detection of radioactive material in illicit trafficking]. Retrieved from: <https://lnk.ua/fJvHATh6t> (accessed 4 March 2026) [in Ukrainian].

59. Derzhavna inspektsiia yadernoho rehuliuвання України (2015). *Shchodo vyivlennia u nezakonnomu obihu radioaktyvnoho*

materialu [Regarding the detection of radioactive material in illicit trafficking]. Retrieved from: <https://lnk.ua/cRsdj2wCd> (accessed 4 March 2026) [in Ukrainian].

60. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2015). *V Ivano-Frankivskii oblasti v nezakonnomu obihu vyjavleno radioaktyvnyi material* [Radioactive material was detected in illicit trafficking in Ivano-Frankivsk region]. Retrieved from: <https://lnk.ua/91NRQefoQ> (accessed 4 March 2026) [in Ukrainian].

61. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2015). *Shchodo vyjavlennia u nezakonnomu obihu yadernykh ta inshykh radioaktyvnykh materialiv* [Regarding the detection of nuclear and other radioactive materials in illicit trafficking]. Retrieved from: <https://lnk.ua/Auvl5Bf4Z> (accessed 4 March 2026) [in Ukrainian].

62. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2015). *Shchodo vyjavlennia u nezakonnomu obihu radioaktyvnoho materialu* [Regarding the detection of radioactive material in illicit trafficking]. Retrieved from:

<https://lnk.ua/bboLCJGTG> (accessed 4 March 2026) [in Ukrainian].

63. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2016). *Dopovid pro stan yadernoi ta radiatsiinoi bezpeky v Ukraini u 2015 rotsi* [Report on the state of nuclear and radiation safety in Ukraine in 2015]. Retrieved from: <https://surl.li/tcatfa> (accessed 4 March 2026) [in Ukrainian].

64. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2017). *Dopovid pro stan yadernoi ta radiatsiinoi bezpeky v Ukraini u 2016 rotsi* [Report on the state of nuclear and radiation safety in Ukraine in 2016]. Retrieved from: <https://surl.li/vyqxbj> (accessed 4 March 2026) [in Ukrainian].

65. Derzhavna inspektsiia yadernoho rehuliuвання Ukrainy (2019). *Dopovid pro stan yadernoi ta radiatsiinoi bezpeky v Ukraini u 2018 rotsi* [Report on the state of nuclear and radiation safety in Ukraine in 2018]. Retrieved from: <https://surl.li/gjwezs> (accessed 4 March 2026) [in Ukrainian].

Received / Стаття надійшла до редакції: 06.03.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 31.03.2026

Publishe d/ Опубліковано: 30.06.2026

ГОНЧАРЕНКО ОЛЕКСАНДР ЮРІЙОВИЧ

доктор філософії з біології,
доцент кафедри бойового та логістичного забезпечення,
Київський інститут Національної гвардії України
<https://orcid.org/0000-0002-4950-4387>

КІЗЯН РУСЛАН ВОЛОДИМИРОВИЧ

кандидат наук з державного управління, начальник факультету
службово-бойової діяльності Національної гвардії України,
Київський інститут Національної гвардії України
<https://orcid.org/0009-0005-8980-4391>

МАНЖОС ОЛЕКСІЙ ОЛЕКСАНДРОВИЧ

старший викладач кафедри бойового та логістичного забезпечення –
начальник служби радіаційного, хімічного, біологічного захисту –
начальник служби екологічної безпеки,
Київський інститут Національної гвардії України
<https://orcid.org/0000-0003-0832-4483>

ВИЯВЛЕННЯ ДЖЕРЕЛ ІОНІЗУЮЧОГО ВИПРОМІНЮВАННЯ, РАДІОАКТИВНИХ МАТЕРІАЛІВ ТА ІНШИХ ОБ'ЄКТІВ З ОЗНАКАМИ РАДІАЦІЙНОЇ НЕБЕЗПЕКИ ПОЗА РЕГУЛЯТОРНИМ КОНТРОЛЕМ В УКРАЇНІ ВПРОДОВЖ 2015–2025 РОКІВ

Розглянуто питання виявлення джерел іонізуючого випромінювання, радіоактивних матеріалів та інших об'єктів, що мають ознаки радіаційної небезпеки, що перебувають поза регулюючим контролем в Україні протягом періоду 2015–2025 років. Актуальність теми зумовлена широким використанням джерел іонізуючого випромінювання в медицині, промисловості, науці, метрології та системах безпеки, що збільшує ризик втрати контролю над окремими об'єктами. В умовах збройної агресії проти України це питання має значення для секторів безпеки та оборони.

Встановлено, що загальна кількість джерел іонізуючого випромінювання в Україні зросла з 24 582 одиниць у 2015 році до 27 970 у 2025 році. Це зростання було зумовлене переважно сегментом нерадіонуклідних джерел, тоді як кількість радіонуклідних джерел демонструвала тенденцію до зниження. Водночас тенденція виявлення радіоактивних матеріалів у незаконному обігу не була синхронізована із загальною тенденцією кількості джерел іонізуючого випромінювання. Контент-аналіз дозволив визначити типові сценарії виявлення: у потоках металобрухту, на металургійних підприємствах, у пунктах пропуску через кордон, у поштових та вантажних відправленнях, під час випадкових знахідок, в умовах тривалого неконтрольованого зберігання, а також у військових та пост-окупаційних контекстах.

Визначено чотири групи первинних ознак розпізнавання: контекстуальні, зовнішні маркери небезпеки, об'єктно-функціональні та ситуаційні.

Практичне значення результатів полягає в можливості їх використання під час навчання особового складу Національної гвардії, розробці навчально-довідкових матеріалів та вдосконаленні алгоритмів первинного реагування.

Ключові слова: *джерела іонізуючого випромінювання; радіоактивні матеріали; регуляторний контроль; первинне розпізнавання; радіаційна безпека; Національна гвардія України; сектор безпеки і оборони.*



HONCHAR ANDRII

*PhD student at the Institute of Lawmaking for Scientific and Legal Expertise,
National Academy of Sciences of Ukraine
<https://orcid.org/0009-0000-1367-4512>*

ON THE ISSUE OF THE CIVIL-LEGAL MECHANISM FOR RECOGNITION OF PROPERTY RIGHTS TO INTELLECTUAL PROPERTY OBJECTS CREATED BY MILITARY SERVICEMEN DURING THEIR SERVICE

*This article presents a comprehensive doctrinal and practical analysis of the civil-law mechanism for recognizing property rights to intellectual property objects created by military personnel during their service in Ukraine. In modern armed conflicts, the intellectual potential of the Armed Forces is a crucial defense factor, with military personnel constantly generating innovative solutions like AI algorithms and unmanned systems. However, the specific nature of military service, based on imperative orders and public interest, objectively excludes the application of classical dispositive presumptions of joint ownership typical for labor relations. Previously, this conceptual gap left unique defense developments unprotected and the state without *de jure* rights to critical inventions.*

*To address this, the article analyzes the recent legislative novelties, primarily Law No. 4585-IX, which introduced an imperative *ipso jure* model. Under this mechanism, property rights to official IP objects automatically transfer to the state upon creation. The law maintains a balance of interests by preserving the authors' personal non-property rights and introducing a "four-month rule": if the state fails to file for registration within this period, the right reverts to the service member. The practical viability of this mechanism is confirmed by Ministry of Defense Order No. 343 and the precedent of the "Vitriak M" FPV drone detection system, the first successful patenting of a military development by a military unit.*

Furthermore, the study highlights the most acute remaining problem: the realization of the military inventors' right to fair remuneration, which currently lacks a specific compensation mechanism. Based on a comparative analysis of NATO states, the author proposes implementing the best European practices. These include Germany's model of "reasonable compensation" calculated via governmental guidelines, France's guaranteed additional remuneration for "mission inventions," and the UK's "secrecy orders" for protecting national security. The article concludes that establishing a transparent reward system and implementing NATO standards (STANAG), particularly the 1960 Paris Agreement on mutual safeguarding of secrecy of defense inventions, are vital for future international patenting and the secure transfer of dual-use technologies.

Keywords: *intellectual property; property rights; military personnel; service invention; civil law mechanism; Law No. 4585-IX; inventions; technology transfer.*

Statement of the problem. In the context of modern armed conflicts, characterized by the transition to the concept of network-centric warfare and an unprecedented level of technological intensity, the intellectual potential of the Armed Forces is transforming into one of the crucial defense factors of the state. Military personnel of scientific institutions and specialized centers of the Defense Forces daily generate innovative solutions—ranging from artificial intelligence algorithms and electronic warfare tools to the latest unmanned systems. According to Article 418 of the

Civil Code of Ukraine (hereinafter referred to as the CC of Ukraine), the right to intellectual property is the right of a person to the result of intellectual, including creative, activity.

At the same time, the specific nature of military service, based on imperative orders and the priority of public interest, requires a special legal regime for such objects. Until recently, civil legislation did not take these specific features into account, leading to a situation where unique defense developments remained unprotected, and the state *de jure* did not possess rights to critical inventions created at the



© A. Honchar, 2026

© Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine, 2026

expense of budget resources. Resolving this problem required the creation of an effective civil-law mechanism for recognizing and securing property rights for the state while simultaneously maintaining a balance of interests of the military personnel-creators.

Therefore, the formation and subsequent doctrinal substantiation of a civil-law mechanism for recognizing property rights to intellectual property objects created by military personnel is critically important for eliminating conceptual gaps in domestic civil law. The scientific comprehension of this specific intersectoral institution, where the dispositive norms of private law and the imperative requirements of public security intersect, opens a new direction of research in the theory of intellectual property law, which is of strategic importance for preserving and developing the innovative defense potential of the state.

Analysis of recent research and publications.

The issue of legal protection of intellectual property in the defense sector has recently attracted increasing attention from domestic and foreign scholars. General aspects of the civil-law mechanism and contractual disposal of property rights were thoroughly studied by O. Yavorska, as well as by specialists of the National Academy of Legal Sciences of Ukraine in the field of security and defense (O. Zaikivskyi et al., 2020). A significant contribution to the study of intellectual property rights in research and development contracts for defense needs was made by Yu. Kapitsa (2024).

In foreign doctrine, the issue of the balance between innovation and regulation (IPR frameworks) in the military sphere is analyzed in detail in modern articles, particularly by A. Anand (2025), who explores the challenges of identifying rights holders for dual-use technologies and creating balanced legal frameworks in the defense industry. Foreign models of compensation and the legal regime of official inventions in the US, the UK, and Germany are highlighted in comparative studies of recent years that consider the "hire to invent" doctrines and special compensation laws.

Despite the existence of scientific works in this field, a previously unresolved part of the general problem is the implementation of the civil-law mechanism for recognizing property rights to intellectual property objects created by military

personnel during their military service, adopted by the Law of Ukraine No. 4585-IX of August 21, 2025 (which entered into force in December 2025), and department-level acts of the Ministry of Defense of 2025. This is because most previous studies relied on an outdated regulatory framework that did not distinguish between labor and military-service relations, and also lacked mechanisms for the imperative transfer of rights and guaranteeing the payment of special remuneration to military personnel. Therefore, at the present stage, such a mechanism and the development of approaches to the implementation of a transparent reward system for military personnel regarding the intellectual property objects they created, given the existing European experience, require proper coverage and substantiation.

The purpose of the article is to conduct a comprehensive theoretical and legal analysis of the essence and structure of the civil-law mechanism for recognizing property rights to intellectual property objects created by military personnel during their service. Within the scope of this article, to achieve the set purpose, the following tasks have been formulated:

- To investigate the dichotomy of labor and military-service relations as a theoretical prerequisite for forming a special legal regime for military innovations;
- To analyze the regulatory novelties of the legislation of Ukraine (Law No. 4585-IX and department-level regulatory acts), evaluating their effectiveness;
- Based on foreign experience (Germany, France, the United Kingdom), to propose directions for solving the problem of fair remuneration for military inventors.

Presentation of the main material. The civil-law mechanism in the field of intellectual property represents a complex structured system of legal means. According to modern doctrinal studies, the structure of such a mechanism encompasses three basic elements: legal norms (forming a complex intersectoral system), legal relations (arising regarding the use and protection of objects), as well as acts of implementation of legal norms (the use of rights by participants and their application within the exercise of public power). Additional elements include the legal consciousness of military

personnel and the regime of legality in the field of defense innovations.

The foundation of this mechanism in Ukraine is the Civil Code (CC of Ukraine), which establishes the dualistic nature of intellectual property rights. Thus, Article 423 of the CC of Ukraine establishes personal non-property rights (in particular, the inalienable right to be recognized as the creator), which always remain with the military inventor. On the other hand, the key legal interest of the state is focused on property rights. According to Article 424 of the CC of Ukraine, they include the right to use the object, the exclusive right to authorize its use, and the exclusive right to prevent unauthorized use.

For a long time, the effective functioning of the mechanism was hindered by the erroneous identification of military-service relations with labor relations. In classical labor law, the creation of an official object is based on voluntary expression of will within the framework of an employment contract. However, as emphasized in special literature, the key difference lies in the volitional aspect: the performance of a service task by a serviceman is the execution of an imperative order of a commander under the threat of criminal liability for insubordination. This fundamental feature, multiplied by the use of military resources for creating innovations, objectively excludes the possibility of applying classical dispositive presumptions of joint ownership to military intellectual property objects.

Until 2024, this problem led to institutional stagnation. A study conducted in the units of the Armed Forces of Ukraine (AFU) and the Ministry of Defense in February 2024 revealed a critical problem: the defense agency *de jure* did not own a single intellectual property object, and the system for their protection was entirely absent. The realization of this threat prompted the creation in September 2024 of a specialized department for intellectual property issues within the Main Directorate of Military Justice.

The culmination of the reform was the adoption by the Verkhovna Rada of the Law of Ukraine No. 4585-IX (dated August 21, 2025), which officially regulated this institutional vacuum. The law fundamentally changed Article 429 of the CC of Ukraine, introducing an imperative *ipso jure* model. From now on, property rights to an official object created in connection with the performance of

official duties during military service automatically transfer to the state in the person of authorized security and defense agencies (Ministry of Defense of Ukraine, Security Service of Ukraine, National Guard of Ukraine, etc.) at the moment of their creation. Simultaneously, the law extended the legal regime of property to such property rights, simplifying the procedure for their accounting. To prevent the loss of innovations due to bureaucratic delay, a "four-month rule" was implemented: if the state fails to file an application for registration of the object within this period, the right to registration reverts directly to the serviceman, but the state retains a preferential right to acquire a license.

The practical implementation of this mechanism is secured in department-level acts. In particular, Ministry of Defense Order No. 343 dated May 29, 2025, approved the foundational "Instruction on the Acquisition, Exercise, and Protection of Intellectual Property Rights in the System of the Ministry of Defense of Ukraine," the scope of which extends to all military units, higher military educational institutions, and scientific institutions of the AFU. The Instruction obliges the author-serviceman to immediately notify the commander of the creation of an innovation, attaching a detailed technical description. In parallel, Ministry of Defense Order No. 342 dated May 29, 2025, determined that the managers of research and development (R&D) and design-and-experimental works bear direct responsibility for respecting intellectual property rights and ensuring the patent purity of their developments.

The effectiveness of the new system has already been proven in practice: in November 2024, the Ministry of Defense of Ukraine announced the receipt of the first patent for the domestic FPV drone detection system "Vitriak M". This innovative device, developed by military engineers of the Technological Solutions Scaling Center (TSSC) of the General Staff of the AFU, became the first precedent in the history of Ukraine when a military unit acted as the developer of a weapon model and successfully codified it as a supply item according to all rules of intellectual property protection.

The accumulation of property rights by the state opens up wide opportunities for their contractual distribution, which is of key importance for technology transfer. In accordance with Part 2 of

Article 1107 of the CC of Ukraine, agreements on the disposal of intellectual property rights are concluded exclusively in writing; failure to comply with this requirement makes the agreement null and void. This is particularly important for the integration of dual-use technologies used for both civilian and military needs.

In the process of involving the private sector in mass production, the state enters into license agreements. In international practice, when joint defense enterprises are established on the territory of Ukraine (for example, cooperation with the American company AeroVironment for the production of Switchblade 600 drones or with the Czech Czechoslovak Group for the manufacturing of 155-mm shells), the transfer of property rights to dual-use technologies is carried out by concluding license agreements with the payment of royalties or through contributing property rights to intellectual property objects to the authorized capital.

The most acute remaining problem in the updated mechanism is the realization of the military personnel's right to remuneration. Law No. 4585-IX declaratively secured the inventors' right to "fair remuneration," but delegated the determination of specific amounts and the payment procedure to the Cabinet of Ministers of Ukraine. As researchers note, the complete alienation of rights without a clearly established specific compensation mechanism creates a risk of demotivating the personnel of the AFU.

To solve this problem, it is advisable to implement the leading European experience. For example, Germany has a specialized Employees' Inventions Act (ArbEG), Article 41 of which explicitly states that its provisions apply *mutatis mutandis* to civil servants and military personnel of the armed forces (Bundeswehr). The German model provides for a strict obligation of the employee to report the invention (Section 5 ArbEG), after which the employer-state has the right to unilaterally claim property rights to it. In return, the serviceman receives the right to "reasonable compensation," the amount of which is calculated using complex mathematical formulas based on the governmental "Remuneration Guidelines" of 1959.

In France, according to Article L. 611-7 of the Intellectual Property Code, three categories of inventions are distinguished. Official developments of military personnel qualify as "mission

inventions" (*inventions de mission*), the property rights to which transfer to the state, but the author acquires a guaranteed right to receive additional remuneration, which is paid in the form of a lump-sum payment or as a percentage (royalties).

The British system, based on the "hire to invent" doctrine, is more conservative. According to Section 39 of the Patents Act 1977, official inventions automatically belong to the employer. However, the right to compensation arises only if it is proven that the invention brought "outstanding benefit" to the organization, which is extremely difficult to realize in practice. Indicative is the decision of the Supreme Court of the United Kingdom in the case *Shanks v Unilever*, where the inventor managed to win £2 million in remuneration only after proving that his patent brought the company over £24 million in licensing income. Furthermore, an effective mechanism of "secrecy orders" from the UK Intellectual Property Office (UKIPO) functions in Britain, allowing the withholding of patents on military inventions that may harm national security from publication.

Finally, the development of the domestic civil-law mechanism must comply with NATO standards (STANAG). The foundational document in this area is the "NATO Agreement for the Mutual Safeguarding of Secrecy of Inventions Relating to Defence and for Which Applications for Patents Have Been Made" (Paris, 1960). This document obliges all participating states (USA, UK, Germany, France, etc.) to mutually protect the secret military patents of their allies, which is critically important for Ukraine given its future accession to the Alliance and the needs for secure international patenting of jointly created weapons.

Conclusions and prospects for further research.

The conducted research allows us to conclude that the adoption of the Law of Ukraine No. 4585-IX and the corresponding departmental regulatory framework of 2024–2025 fundamentally transformed the civil-law mechanism for recognizing property rights to official intellectual property objects of military personnel. The transition from an ineffective dispositive presumption to an imperative model of automatic securing of property rights for the state (*ipso jure*), taking into account the specifics of military-service relations, is an adequate step to protect national

security under martial law. The balancing mechanism in the form of the "four-month rule" helps counteract bureaucratic inertia.

The practical significance of the study lies in determining that a key factor for the viability of the new mechanism is the development by the Government of a transparent and guaranteed system for paying fair remuneration to military personnel-authors, which can be based on the best examples of European continental law (in particular, the experience of Germany and France).

Prospects for further research lie in the plane of studying civil-law mechanisms for the transfer of defense dual-use technologies obtained by the state to the private sector (by concluding license agreements), as well as the implementation of NATO standards (in particular, the 1960 agreement) on the mutual safeguarding of secrecy of military inventions during international patenting.

References

1. Veteran.com.ua (2025). *Viiskovi vynakhidnyky ta rozrobnyky otrymaiut avtorski prava ta wynahorody* [Military inventors and developers will receive copyright and remuneration]. Retrieved from: <https://surl.li/kqodej> (accessed 16 February 2026) [in Ukrainian].
2. *Tsyvilnyi kodeks Ukrainy № 435-IV* [Civil Code of Ukraine activity no. 435-IV]. (2003, January 16). *Ofitsiyni visnyk Ukrainy*, no. 11, p. 461 [in Ukrainian].
3. YURLIHA (2026). *Prava intelektualnoi vlasnosti viiskovosluzhbovtiv* [Intellectual property rights of military personnel]. Retrieved from: <https://surl.li/ohjlet> (accessed 20 February 2026) [in Ukrainian].
4. Yavorska O. (2017). *Dohovory shchodo rozporiadzhennia mainovymy pravamy intelektualnoi vlasnosti za zakonodavstvom Ukrainy* [Contracts regarding the disposition of intellectual property rights under the legislation of Ukraine]. *Wroclawsko-Lwowskie Zeszyty Prawnicze*, no. 8, pp. 153–166. Retrieved from: <https://surl.li/aqytbj> (accessed 16 February 2026) [in Ukrainian].
5. Zaikivskiy O. B., Lotokha L. M., Onistrat O. A., Turchyn V. M. (2020). *Intelektualna vlasnist u sferi bezpeky i oborony Ukrainy* [Intellectual property in the security and defense sector of Ukraine]. Kyiv : Interservis [in Ukrainian].
6. Kapitsa Yu. M., Shakhbazian K. S., Makhnovskiy D. S. (2024). *Prava intelektualnoi vlasnosti u dohovorakh naukovykh ustanov na vykonannia doslidzhen ta rozrobok* [Intellectual property rights in agreements of scientific institutions for research and development]. Kyiv : Akademperiodyka [in Ukrainian].
7. Aanand, A., & Lavaraju, B. (2025). Intellectual property rights in the defence industry: balancing innovation and regulation. *Annual International Journal on Analysis of Contemporary Legal Affairs*, no. 5, pp. 89–94. Retrieved from: <https://surl.li/wpdmyf> (accessed 16 February 2026) [in English].
8. IPKEY (2014). Comparison on Employee Invention Laws and Regulations – Germany vs. China. Retrieved from: <https://surl.li/pqdufo> (accessed 22 February 2026) [in English].
9. Mydzhyn H. (2020). *Struktura administratyvno-pravovoho mekhanizmu zakhystu prav na obiekty intelektualnoi vlasnosti* [Structure of the administrative and legal mechanism of the protection of the intellectual property objects rights]. *Sotsialno-pravovi studii*, vol. 2 (8), pp. 72–79. Retrieved from: <https://surl.li/kwwzmm> (accessed 16 February 2026) [in Ukrainian].
10. ResearchGate (2026). *Osoblyvosti vyznannia mainovykh prav na obiekty intelektualnoi vlasnosti, stvoreni viiskovosluzhbovtiv* [Features of recognition of property rights to intellectual property objects created by military personnel]. Retrieved from: <https://surl.li/jyuaye> (accessed 23 February 2026) [in Ukrainian].
11. Zakon Ukrainy "Pro vnesennia zmin do deiakyykh zakoniv Ukrainy shchodo prav intelektualnoi vlasnosti na obiekty, stvoreni u zviazku z prokhodzheniam viiskovoi sluzhby" № 4585-IX [Law of Ukraine about the amending certain laws of Ukraine regarding intellectual property rights to objects created in connection with military service activity no. 4585-IX]. (2025, August 21). *Vidomosti Verkhovnoi Rady Ukrainy*. Retrieved from: <https://surl.li/solcrw> (accessed 16 February 2026) [in Ukrainian].
12. LIHA:ZAKON (2025). *Intelektualni prava na rozrobky viiskovykh: ukhvaleno zminy do TsK* [Intellectual rights to military developments: changes to the Civil Code adopted]. Retrieved from: <https://surl.li/evlwri> (accessed 16 February 2026) [in Ukrainian].

13. *Nakaz Ministerstva oborony Ukrainy "Deiaki pytannia orhanizatsii v systemi Ministerstva oborony Ukrainy roboty z nabuttia, zdiisnennia ta zakhystu prav intelektualnoi vlasnosti" № 343* [Order of the Ministry of Defense of Ukraine "Some issues of organizing work on the acquisition, exercise and protection of intellectual property rights in the system of the Ministry of Defense of Ukraine" activity no. 343] (2025, May 29). Retrieved from: <https://surl.lt/oimlu> (accessed 23 February 2026) [in Ukrainian].

14. *Nakaz Ministerstva oborony Ukrainy "Pro unormuvannia okremykh pytan orhanizatsii naukovo i nauково-tekhnichnoi diialnosti ta zakhystu prav intelektualnoi vlasnosti v systemi Ministerstva oborony Ukrainy" № 342* [Order of the Ministry of Defense of Ukraine "On normalization of certain issues of organization of scientific and technical activity and protection of intellectual property rights in the system of the Ministry of Defense of Ukraine" activity no. 342]. (2025, May 29). Retrieved from: <https://surl.li/dusjka> (accessed 20 February 2026) [in Ukrainian].

15. Lvivskyi portal (2024). *V ZSU ziavylas persha vitchyzniana systema vyivlennia vorozhykh FPV-droniv* [The first domestic system for detecting enemy FPV drones appeared in the Armed Forces of Ukraine]. Retrieved from: <https://surl.li/emtnwq> (accessed 16 February 2026) [in Ukrainian].

16. WikiLegalAid (2026). *Rozporiadzhennia mainovymy pravamy intelektualnoi vlasnosti* [Disposition of intellectual property rights]. Retrieved from: <https://surl.li/kvvyaa> (accessed 16 February 2026) [in Ukrainian].

17. Exporting dual-use items (2025). Trade and

Economic Security. Retrieved from: <https://surl.li/gktden> (accessed 21 February 2026) [in English].

18. Kyiv Post (2024). Transfer of Dual Application Technology to Defense Production Facilities in Ukraine. Retrieved from: <https://surl.li/nvdjfu> (accessed 21 February 2026) [in English].

19. Gesetz über Arbeitnehmererfindungen (ArbEG) [Act on Employees' Inventions] (1957, July 25). Federal Law Gazette I, 756 [in German].

20. Employee Inventions Act. (n. d.). DPMA. Retrieved from: <https://surl.li/tjwjay> (accessed 18 February 2026) [in English].

21. Code de la propriété intellectuelle [Intellectual Property Code] (n. d.). *Legifrance*. Retrieved from: <https://surl.li/xuulom> (accessed 20 February 2026) [in French].

22. Legislation.gov.uk. (n. d.). Patents Act 1977 Retrieved from: <https://surl.li/tgxguy> (accessed 21 February 2026) [in English].

23. Managing IP (2019). Employee-inventor compensation: a cross-border comparison Retrieved from: <https://surl.li/dlhipw> (accessed 25 February 2026) [in English].

24. Abel + Imray (2022). Patenting of military technology. Retrieved from: <https://surl.li/tocfyy> (accessed 25 February 2026) [in English].

25. NATO Topic (2022). Standardization. Retrieved from: <https://surl.li/fvnilp> (accessed 26 February 2026) [in English].

26. NATO Agreement for the mutual safeguarding of secrecy of inventions relating to defence and for which applications for patents have been made. (1960, September 21). Paris [in English].

Received / Стаття надійшла до редакції: 16.03.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 15.04.2026

Published / Опубліковано: 30.06.2026

ГОНЧАР АНДРІЙ АНАТОЛІЙОВИЧ

аспірант Інституту правотворчості та науково-правових експертиз,
Національна академія наук України
<https://orcid.org/0009-0000-1367-4512>

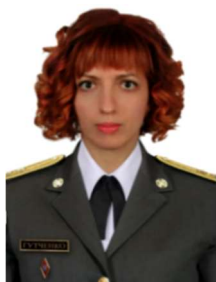
ДО ПИТАННЯ ЦИВІЛЬНО-ПРАВОВОГО МЕХАНІЗМУ ВИЗНАННЯ МАЙНОВИХ ПРАВ НА ОБ'ЄКТИ ІНТЕЛЕКТУАЛЬНОЇ ВЛАСНОСТІ, СТВОРЕНІ ВІЙСЬКОВОСЛУЖБОВЦЯМИ ПІД ЧАС ПРОХОДЖЕННЯ СЛУЖБИ

Здійснено комплексний доктринальний і практичний аналіз цивільно-правового механізму визнання майнових прав на об'єкти інтелектуальної власності, створені військовослужбовцями під час проходження служби. Досліджено концептуальну дихотомію між трудовими і військово-службовими правовідносинами, що зумовлює неможливість застосування класичних диспозитивних презумпцій спільної власності до військових інновацій.

Проаналізовано новели законодавства 2024–2025 рр., зокрема Закон України «Про внесення змін до деяких законів України щодо прав інтелектуальної власності на об'єкти, створені у зв'язку із проходженням військової служби» від 21.08.2025 р. № 4585-IX, яким запроваджено імперативну модель автоматичного переходу майнових прав на службові розробки до держави зі збереженням за авторами особистих немайнових прав і права на винагороду. Розглянуто відомче регулювання (наказ Міністерства оборони № 343) та перший успішний прецедент патентування військової розробки (пристрій «Вітряк М»).

На основі компаративістського аналізу досвіду держав НАТО (Німеччини, Великої Британії, Франції) запропоновано шляхи вдосконалювання механізму виплати справедливої винагороди військовослужбовцям-винахідникам.

Ключові слова: інтелектуальна власність; майнові права; військовослужбовці; службовий винахід; цивільно-правовий механізм; винаходи; трансфер технологій.



HUTCHENKO KATERYNA

*Candidate of Medical Sciences, Leading Researcher,
Central Research Institute of the Armed Forces of Ukraine
<https://orcid.org/0009-0008-6377-7745>*



SHUENKIN VOLODYMYR

*Doctor of Technical Sciences, Professor,
Chief Researcher of the Central Research Institute of the Armed Forces of Ukraine
<https://orcid.org/0000-0001-9893-5127>*



KOZACHUK VIACHESLAV

*Candidate of Technical Sciences, Senior Researcher, Leading Researcher,
Central Research Institute of the Armed Forces of Ukraine
<https://orcid.org/0000-0002-0207-7461>*

METHODOLOGICAL APPROACH TO JUSTIFYING THE COMPOSITION OF THE FORCES AND RESOURCES OF THE SYSTEM OF MEDICAL -PSYCHOLOGICAL REHABILITATION OF PERSONNEL IN MILITARY FORMATIONS

The article presents a developed methodological approach to justify the composition of forces and resources of the medical and psychological rehabilitation system for military personnel. The approach is based on the framework of queuing theory and consists of four stages. It enables the determination of a rational composition of forces and resources within the medical and psychological rehabilitation system. The implementation of this approach ensures a rational distribution of functions and enhances the effectiveness of rehabilitation measures.

Keywords: *queuing theory; medical and psychological rehabilitation; methodological approach; military personnel; state graph; resource optimization; planning; integral performance criterion.*

Statement of the problem. In the context of repelling the armed aggression of the Russian Federation, characterized by high-intensity combat operations and a multiplicity of psychotraumatic factors, the effectiveness of the medical and psychological rehabilitation (MPR) system acquires the status of a critically important component that directly affects the combat capability of military formations of the Armed Forces of Ukraine [1; 2]. Ensuring optimal resource management of this system is a complex task that encompasses the staffing of specialists, the availability and condition of medical

equipment, specialized material and technical assets, as well as inpatient capacity.

The need to restore psychological resilience and social adaptation of personnel after exposure to combat stress requires not only high-quality psychological assistance programs but also a quantitatively substantiated structure of forces and resources capable of promptly responding to dynamic patient flows.

Existing practices of planning and resource allocation in the field of medical and psychological rehabilitation of military personnel are often based on empirical assessments and



administrative decisions. Such an approach typically leads to a high degree of subjectivity, inefficient distribution of scarce resources, and the emergence of critical functional constraints, ultimately reducing the overall effectiveness of the MPR system.

Medical and psychological rehabilitation, as a dynamic process, follows stochastic patterns: the intensity of patient arrivals and the intensity of their successful recovery are variable quantities. Planning that does not take into account flow dynamics and the limited capacity of units overlooks a key feature of this system. This creates an urgent scientific need for the development and implementation of scientifically grounded, quantitative methods for the systemic analysis and optimization of MPR processes. The application of mathematical modeling makes it possible to move from an intuitive approach to an objective, quantitative justification of managerial decisions [3].

Analysis of recent research and publications.

Research in the field of medical and psychological rehabilitation (MPR) of military personnel is primarily focused on the theoretical and methodological substantiation of the functions, principles, and stages of psychological rehabilitation, including diagnostic, psychotherapeutic, and readaptation phases [4]. Emphasis is placed on the importance of evidence-based practices and an integrated approach to treatment that goes beyond trauma and focuses on the individual as a whole (the so-called “meta-therapy”) [5; 6]. Such an approach is critically important for the successful reintegration and recovery of military personnel who have experienced a high degree of psychological trauma [7].

However, despite significant advancements in rehabilitation measures [8–10], there remains a gap in the scientific literature regarding quantitative assessment – specifically, the direct determination of the optimal staffing composition (forces) and the required equipment (resources) necessary to ensure system capacity adequate to patient flows.

Therefore, an important and relevant task is the development of a methodological approach to substantiating the composition of forces and resources of the MPR system for military personnel, aimed at coordinated resource planning, rational distribution of functions, and improving the effectiveness of rehabilitation measures under current conditions.

The purpose of the article is to develop a methodological approach to justify the composition of forces and resources of the system of medical and

psychological rehabilitation of military personnel in military formations.

Presentation of the main material. For modeling purposes, the medical and psychological rehabilitation system is considered as a discrete closed queuing system (QS). The system consists of two main rehabilitation units:

1. Psychological unit: focused on complex psychological correction and long-term support.

2. Medical unit: provides intensive physical recovery and primary treatment.

The object of modeling includes the flows of human resources requiring assistance and the units that serve as channels providing such assistance. The following terms and definitions are used in the article:

– queuing system – the medical and psychological rehabilitation system;

– organizations – rehabilitation units (psychological unit, medical unit);

– requests – military personnel requiring medical and psychological rehabilitation;

– arrival flow (λ_1, λ_2) – the intensity of incoming military personnel for rehabilitation (e.g., after injury or combat stress);

– recovery flow (μ_1, μ_2) – the intensity of successful completion of rehabilitation (unit capacity);

– system state – the combined state of a patient within the system (e.g., waiting for assistance, receiving assistance, waiting for transfer);

– reward (Γ) – an integral performance indicator (health status, combat capability, social adaptation);

– recovery time ($1/\mu$) – the average duration of the rehabilitation cycle.

The traditional concept of “reward” in queuing theory is transformed into a multidimensional integral performance criterion Γ . This indicator reflects the strategic value of each system state in terms of achieving key objectives: restoration of combat capability, psychological resilience, social adaptation, and risk reduction. Time and operational readiness of personnel are of higher strategic importance than direct financial costs. Therefore, the integral performance criterion is defined as a weighted sum of the probabilities of system states in which the units remain operational:

$$\Gamma = \sum_{i \in \text{Прагезд.стану}} \rho_i \cdot P_i \quad (1)$$

where ρ_i – is conventional unit of effectiveness (UOE), assigned to state i by expert judgment (for example, the contribution of the medical unit is

evaluated as 10 UOE, while the psychological unit is evaluated as 5 UOE), and P_i – is the probability of the system being in this state.

The methodological approach to justify the composition of forces and resources of the MPR system for military personnel of military formations consists of four stages.

At the *first* stage, based on graph theory, a model of the MPR system is constructed, consisting of two main rehabilitation units – psychological and medical (Fig. 1).

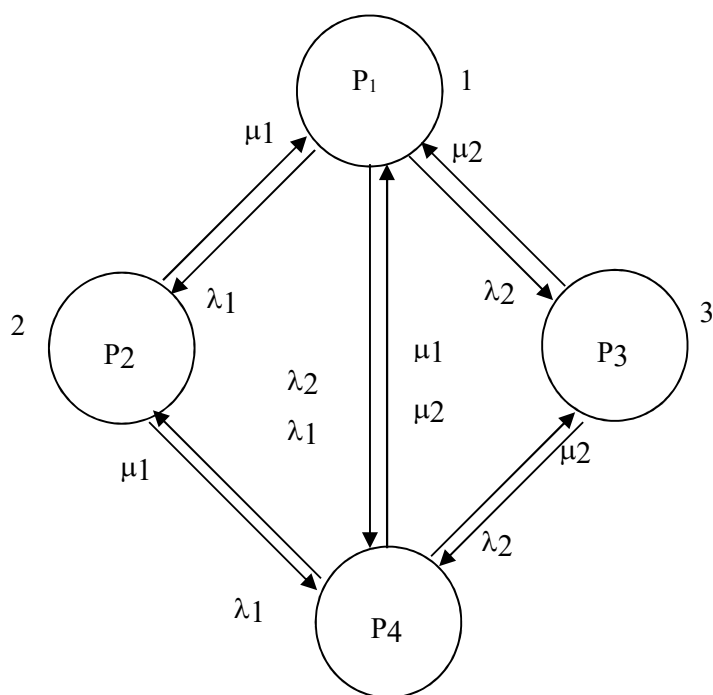


Figure 1 – State graph of the medical and psychological rehabilitation system
Source: developed by the authors

According to Fig. 1, the system may be in the following states:

- state 1 (P_1) – both units (psychological and medical) are fully occupied, providing rehabilitation services (the system is operating at maximum capacity);
- state 2 (P_2) – the psychological unit is providing assistance, while the medical unit is idle (e.g., in a waiting state or the patient is undergoing another stage of rehabilitation);
- state 3 (P_3) – the medical unit is providing assistance, while the psychological unit is idle;
- state 4 (P_4) – both units are idle (e.g., due to the absence of patients matching the unit profiles or patients being in a queue).

Transitions between these states occur with the following rates:

– λ_1 – the arrival intensity of patients to the psychological unit;

– λ_2 – the arrival intensity of patients to the medical unit;

– μ_1 – the completion intensity of rehabilitation in the psychological unit (service capacity);

– μ_2 – the completion intensity of rehabilitation in the medical unit (service capacity).

Transitions of the psychological unit from state 1 $\rightarrow$ 2 and 2 $\rightarrow$ 4 are driven by the arrival flow of requests with intensity λ_1 ; transitions of the medical unit from state 1 $\rightarrow$ 3 and 3 $\rightarrow$ 4 are driven by the arrival flow of requests with intensity λ_2 ; reverse transitions of the psychological unit from state 2 $\rightarrow$ 1 and 4 $\rightarrow$ 2 are driven by the service completion flow with intensity μ_1 ; transitions of the medical unit from state 3 $\rightarrow$ 1 and 4 $\rightarrow$ 3 are driven by the rehabilitation completion flow with intensity μ_2 .

At the *second* stage, to analyze the steady-state operation of the system, when the probabilities of being in each state do not change over time, the system of A.M. Kolmogorov differential equations is applied. In the steady-state regime, the total transition intensity into a given state is equal to the total transition intensity out of that state. This allows the formulation of a system of linear algebraic equations relating the transition intensities λ , μ to the state probabilities P_1, P_2, P_3, P_4 .

For the presented state graph, the system of equations takes the following form:

– for state 1:

$$2 \cdot (\lambda_1 + \lambda_2) \cdot P_1 = \mu_1 \cdot P_2 + \mu_2 \cdot P_3 + (\mu_1 + \mu_2) \cdot P_4 \quad (2)$$

– for state 2:

$$(\mu_1 + \lambda_2) \cdot P_2 = \lambda_1 \cdot P_1 + \mu_2 \cdot P_4 \quad (3)$$

– for state 3:

$$(\mu_2 + \lambda_1) \cdot P_3 = \lambda_2 \cdot P_1 + \mu_1 \cdot P_4 \quad (4)$$

– for state 4:

$$2 \cdot (\mu_1 + \mu_2) \cdot P_4 = \lambda_1 \cdot P_2 + \lambda_2 \cdot P_3 + (\lambda_1 + \lambda_2) \cdot P_1 \quad (5)$$

The resulting system of four equations is linearly dependent (the sum of the first three equations is equal to the fourth). To ensure a unique solution of the system, the normalization condition is applied:

$$P_1 + P_2 + P_3 + P_4 = 1 \quad (6)$$

This condition guarantees that the system is, with 100 % certainty, in one of the four possible states.

Based on probability P_1 , which represents the fraction of time during which the units operate at maximum capacity, and the ratio of the arrival intensity to the service rate, it is possible to determine the minimum required staffing level of specialists (number of service channels) in each unit in order to avoid critical queues and ensure the specified level of system throughput.

At the *third* stage, to solve the system of linear algebraic equations describing the state probabilities, the most efficient numerical method – Jordan-Gauss elimination method (complete elimination of unknowns) is used. This method is computationally less demanding compared to the matrix inversion method or Cramer's method, as it allows obtaining the solution in a finite number of steps, making it suitable for solving large-scale systems and for real-time modeling. The principle of the method consists in the successive elimination of one unknown from all other equations of the system using a pivot element.

The application of the methodology is demonstrated using a basic operational scenario of the MPR system (Scenario 1).

Assume that the medical unit has a higher patient arrival intensity and greater service capacity than the psychological unit. The following parameters are defined by expert judgment:

– Contribution to effectiveness (ρ_i): the medical unit (Γ_2) – 10 UOE; the psychological unit (Γ_1) – 5 UOE.

– Psychological unit (Γ_1): arrival intensity of patients $\lambda_1 = 1$; rehabilitation completion intensity $\mu_1 = 2$.

– Medical unit (Γ_2): arrival intensity of patients $\lambda_2 = 2$; rehabilitation completion intensity $\mu_2 = 3$.

For these intensities ($\lambda_1 + \lambda_2 = 3$, $\mu_1 = 2$, $\mu_2 = 3$), the Kolmogorov system of equations (2)–(4), together with the normalization condition (6), takes the following form:

$$\begin{aligned} 3 P_1 - 2 P_2 - 3 P_3 + 0 P_4 &= 0 \\ 1 P_1 - 3 P_2 + 0 P_3 + 2 P_4 &= 0 \quad (\text{System1}) \\ 2 P_1 + 0 P_2 - 5 P_3 + 3 P_4 &= 0 \\ P_1 + P_2 + P_3 + P_4 &= 1 \end{aligned}$$

Solution using the Jordan-Gauss elimination method:

After successive elimination of unknowns according to the Jordan-Gauss procedure (elimination of P_1 using the second equation, followed by elimination of P_4 using the fourth equation), a reduced system of two equations with unknowns P_2 and P_3 is obtained:

$$\begin{aligned} 17 P_2 + 9 P_3 &= 6 \\ 2 P_2 - 6 P_3 &= -1 \end{aligned} \quad (7)$$

Solving this system yields the state probabilities:

$$\begin{aligned} P_2 &= 0,23 \\ P_3 &= 0,24 \end{aligned}$$

Substituting these values into the original system (System 1) and using the normalization condition (6), the remaining probabilities are determined:

$$\begin{aligned} P_4 &= 0,15 \\ P_1 &= 1 - P_2 - P_3 - P_4 = 1 - 0,23 - 0,24 - 0,15 = 0,38 \end{aligned}$$

State probabilities: $P_1=0,38$, $P_2=0,23$, $P_3=0,24$, $P_4=0,15$.

Thus, on average, both units operate simultaneously for:

– 38% of the time ($P_1=0,38$),
– 23% of the time ($P_2=0,23$) only the psychological unit operates while the medical unit is idle,

– 24% of the time ($P_3=0,24$) only the medical unit operates while the psychological unit is idle,

– 15% of the time ($P_4=0,15$) both units are simultaneously idle due to patient waiting or internal processes.

Verification of the normalization condition:

$$P_1 + P_2 + P_3 + P_4 = 0,38 + 0,23 + 0,24 + 0,15 = 1.$$

At the *fourth* stage, the number of service channels n_{mp} in the medical unit is determined to substantiate the composition of forces in the MPR system.

The quantitative substantiation of the composition of forces and resources of the MPR system, i.e., determining the required number of rehabilitation channels (n_{mp}), is based on the probability of maximum system utilization P_1 and the utilization coefficient $\alpha = (\lambda/\mu)$ for each unit.

$$P_1 = 1 - \frac{\alpha^{n_{mp}}}{n_{mp}!} \left[\sum_{k=0}^{n_{mp}} \frac{\alpha^k}{k!} \right]^{-1}, \quad (8)$$

where n_{mp} – required number of service channels;

$$\alpha = (\lambda/\mu).$$

For medical unit ($\lambda_2=2, \mu_2=3$) – $n_{mp} = 1$.

For psychological unit ($\lambda_1=1, \mu_1=2$) – $n_{mp} = 1$.

Thus, for the given values of the arrival intensities λ and service intensities μ in both units, a single service channel in each unit is sufficient.

Calculation of the integral performance indicator (Γ_1):

$$\Gamma_1 = (5 + 10) P_1 + 5 P_2 + 10 P_3 \quad (9)$$

$$\Gamma_1 = 15 \cdot 0,38 + 5 \cdot 0,23 + 10 \cdot 0,24 = 5,7 + 1,15 + 2,4 = 9,25 \text{ UOE}$$

The methodology allows modeling the impact of managerial decisions aimed at system optimization by changing the intensity of rehabilitation completion (μ).

Scenario 2: Staff optimization (strengthening the psychological unit)

In this scenario, it is proposed to reduce the rehabilitation time in the psychological unit by half, which is equivalent to increasing μ_1 from 2 to 4. All other parameters remain unchanged ($\lambda_1=1, \lambda_2=2, \mu_2=3$).

The new Kolmogorov system of equations is solved using the Jordan-Gauss elimination method, yielding the following probabilities:

$$P_1 = 0,46; P_2 = 0,18; P_3 = 0,25; P_4 = 0,11$$

Verification of the normalization condition:

$$0,46 + 0,18 + 0,25 + 0,11 = 1.$$

Integral performance indicator (Γ_2):

$$\Gamma_2 = 15 \cdot 0,46 + 5 \cdot 0,18 + 10 \cdot 0,25 = 6,9 + 0,9 + 2,5 = 10,3 \text{ UOE} \quad (10)$$

Scenario 3: Technical modernization (strengthening the medical unit)

It is proposed to reduce the rehabilitation time in the medical unit by half, increasing μ_2 from 3 to 6. Other parameters remain unchanged: $\lambda_1=1, \mu_1=2, \lambda_2=2$.

Based on the new transition intensities ($\lambda_1=1, \mu_1=2, \lambda_2=2, \mu_2=6$), the Kolmogorov system of equations and the normalization condition (6) take the following form:

$$\begin{aligned} (\lambda_1 + \lambda_2) P_1 &= \mu_1 P_2 + \mu_2 P_3 \Rightarrow 3 P_1 - 2 P_2 - 6 P_3 + 0 P_4 = 0 \\ (\mu_1 + \lambda_2) P_2 &= \lambda_1 P_1 + \mu_2 P_4 \Rightarrow -P_1 + 4 P_2 + 0 P_3 - 6 P_4 = 0 \end{aligned} \quad (\text{System 2})$$

$$\begin{aligned} (\mu_2 + \lambda_1) P_3 &= \lambda_2 P_1 + \mu_1 P_4 \Rightarrow -2 P_1 + 0 P_2 + 7 P_3 - 2 P_4 = 0 \\ P_1 + P_2 + P_3 + P_4 &= 1 \end{aligned}$$

The new system of equations is solved using the Jordan-Gauss elimination method, yielding the following probabilities, rounded to two decimal places:

$$P_1 = 0,46; P_2 = 0,22; P_3 = 0,19; P_4 = 0,10$$

Verification of the normalization condition:

$$0,46 + 0,22 + 0,19 + 0,10 = 0,97.$$

Since $0,97 \sim 1$, the normalization condition is satisfied for the numerical method with rounding to two decimal places.

Integral performance indicator (Γ_3):

$$\Gamma_3 = 15 \cdot 0,46 + 5 \cdot 0,22 + 10 \cdot 0,19 = 6,9 + 1,1 + 1,9 = 9,9 \text{ UOE} \quad (11)$$

Comparison of results and selection of the optimal scenario

The comparison of the obtained results (Table 1) is a key stage in substantiating the managerial decision.

Table 1 – Comparative analysis of the effectiveness of the MPR system under rationalization scenarios

Scenario	Optimization measure	Modified parameters (λ_i, μ_i)	P_1 (simultaneous operation)	Γ (UOE)	Increase in Γ
1 (baseline)	None	$\lambda_1=1, \mu_1=2, \lambda_2=2, \mu_2=3$	0,38	9,25	–
2 (staff optimization)	Strengthening the psychological unit	$\lambda_1=1, \mu_1=4, \lambda_2=2, \mu_2=3$	0,46	10,3	+1,05
3 (technical optimization)	Strengthening the medical unit	$\lambda_1=1, \mu_1=2, \lambda_2=2, \mu_2=6$	0,46	9,9	+0,55

Comparing the integral performance indicators: $\Gamma_2(10,3) > \Gamma_3(9,9) > \Gamma_1(9,25)$, it is established that the most effective optimization strategy is the application of rationalization to the psychological unit (Scenario 2). This indicates that the lower service capacity of the psychological unit represented a critical functional bottleneck that constrained the overall system performance. Eliminating this limitation led to the maximum increase in the integral performance criterion Γ , despite the smaller contribution of this unit to the overall system effectiveness (5 UOE versus 10 UOE for the medical unit).

Conclusions and prospects for further research.

The developed methodological approach is a comprehensive tool for justification and optimizing the composition of forces and resources of the medical and psychological rehabilitation system for military personnel. Its implementation enables a transition from empirical planning to quantitative system analysis, which is critical for maintaining the combat capability of military formations.

1. Scientific novelty is achieved through the conceptual adaptation of the queuing theory framework to the specific features of military medical and psychological rehabilitation. A key element is the transformation of financial “reward” into an integral criterion of strategic effectiveness (Γ), reflecting the value of restoring combat capability, psychological resilience, and social adaptation.

2. Based on the developed discrete mathematical model (state graph) and the A.Kolmogorov system of equations, it is possible

to quantitatively determine the probabilities of functional states. These probabilities, in particular P_1 (maximum utilization), form the basis for determining the required number of service channels, which directly defines the staffing structure of rehabilitation units.

3. By modeling different rationalization scenarios and comparing them using the integral performance criterion, it was demonstrated that the most advantageous solution consists in increasing the service capacity of the unit that represents the critical functional bottleneck. In the considered illustrative example, strengthening the psychological unit (Scenario 2) provides the maximum increase in effectiveness up to $\Gamma_2 = 10.3$ UOE, which significantly exceeds the baseline level.

4. The methodology justifies the use of the Jordan-Gauss elimination method for fast and operational analysis. However, given the observed error of up to 6% for key probabilities, the use of an exact matrix analytical method is required for strategic decision-making involving substantial changes in the composition of forces and resources, in order to verify the results.

5. Further research should focus on approaches to optimizing the resulting structures of medical and psychological rehabilitation within queuing network systems, including modeling of queues and waiting time constraints, as well as the development of specialized software for implementing this methodology in the practical activities of rehabilitation institutions of the Armed Forces of Ukraine.

References

1. Hutchenko K. S., Kozachuk V. L., Hutchenko O. A., Shemchuk O. M., Tymkiv O. A., Hrom V. A. (2025). Clinical and psychological features of combined trauma in servicemen of the Armed Forces of Ukraine in the Russian-Ukrainian war. *Medychni perspektyvy*, vol. 30, no. 1, pp. 102–108. DOI: <https://doi.org/10.26641/2307-0404.2025.1.325366> [in English].
2. Hutchenko K. S., Kozachuk V. L., Hutchenko A. H. (2025). *Metodyka otsiniuvannia efektyvnosti medyko-psykholohichnoi reabilitatsii viiskovosluzhbovtziv Zbroinykh Syl Ukrainy* [Methodology for evaluating the effectiveness of medical and psychological rehabilitation of servicemen of the Armed Forces of Ukraine]. *Naukovyi visnyk Kyivskoho instytutu Natsionalnoi hvardii Ukrainy*, no. 1, pp. 55–60. DOI: <https://doi.org/10.59226/2786-6920.1.2025.55-60> [in Ukrainian].
3. Hutchenko K. S., Kozachuk V. L., Hutchenko O. A., Chaplia M. M. (2025). *Metodychnyi pidkhd do pobudovy modeli systemy reabilitatsii viiskovosluzhbovtziv na osnovi merezhi masovoho obsluhovuvannia* [Methodological approach to building a model of the rehabilitation system for servicemen based on a queuing network]. *Suchasni informatsiini tekhnologii u sferi bezpeky ta oborony*, vol. 52, no. 1, pp. 63–69. DOI: <https://doi.org/10.33099/2311-7249/2025-52-1-63-69> [in Ukrainian].
4. Bryndikov Yu. L. (2018). *Teoretychni ta praktychni osnovy orhanizatsii reabilitatsiinoi diialnosti z kombatanamy* [Theoretical and practical foundations of organizing rehabilitation activities with combatants]. Khmelnytskyi : KhNU [in Ukrainian].
5. Carson, G. D., Reubens, P., Shapiro, S. (2022). Integrative Trauma Treatment: Expanding the Psychoanalytic Frame. *Integrative Journal of Psychotherapy*, vol. 13, pp. 15–32. Retrieved from: <https://lnk.ua/W1mccRany> (accessed 25 December 2025) [in English].
6. Diepold, J. H. Jr, Schwartz, G. E. (2022). Clinical effectiveness of an integrative psychotherapy technique for the treatment of trauma: A phase I investigation of Heart Assisted Therapy. *Explore*, vol. 18, no. 6, pp. 698–705. <https://doi.org/10.1016/j.explore.2022.07.002> [in English].
7. Lavreniuk Ya. V., Kuleshova O. V. (2024). *Kompleksnyi pidkhd do medyko-psykholohichnoi reabilitatsii viiskovosluzhbovtziv: ohliad naukovo obgruntovanykh praktyk ta vtruchan* [Comprehensive approach to medical and psychological rehabilitation of servicemen: Review of evidence-based practices and interventions]. *Naukovi zapysky. Seriya: psykholohiia*, no. 2, pp. 77–81. DOI: <https://doi.org/10.32782/cusu-psy-2024-2-11> [in Ukrainian].
8. Lytvynenko L. I. (2015). *Medyko-psykholohichna reabilitatsiia viiskovosluzhbovtziv ta demobilizovanykh* [Medical and psychological rehabilitation of servicemen and demobilized persons]. *Aktualni problemy psykholohii. T. III: Konsultatyvna psykholohiia i psykhoterapiia*. Kyiv : In-t psykholohii imeni H. S. Kostiuka NAPN Ukrainy, no. 11, pp. 34–51 [in Ukrainian].
9. Romanyshyn A., Boiko O., Huzenko M. (2014). *Pervynna psykholohichna dopomoha i reabilitatsiia v boiovykh umovakh* [Primary psychological assistance and rehabilitation in combat conditions]. Lviv : ASV [in Ukrainian].
10. Kokun O. M., Ahaiev N. A., Pishko I. O., Lozinska N. S., Ostapchuk V. V. (2017). *Psykholohichna robota z viiskovosluzhbovtsiamy-uchasnykamy ATO na etapi vidnovlennia* [Psychological work with servicemen-participants of the ATO at the recovery stage]. Kyiv : NDTs HP ZSU [in Ukrainian].

Received / Стаття надійшла до редакції: 21.01.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 20.02.2026

Published / Опубліковано: 30.06.2026

ГУТЧЕНКО КАТЕРИНА СЕРГІЇВНА

кандидат медичних наук,
провідний науковий співробітник,
Центральний науково-дослідний інститут Збройних Сил України
<https://orcid.org/0009-0008-6377-7745>

ШУЄНКІН ВОЛОДИМИР ОЛЕКСАНДРОВИЧ

доктор технічних наук, професор,
головний науковий співробітник
Центрального науково-дослідного інституту Збройних Сил України
<https://orcid.org/0000-0001-9893-5127>

КОЗАЧУК В'ЯЧЕСЛАВ ЛЕОНІДОВИЧ

кандидат технічних наук, старший науковий співробітник,
провідний науковий співробітник,
Центральний науково-дослідний інститут Збройних Сил України
<https://orcid.org/0000-0002-0207-7461>

МЕТОДОЛОГІЧНИЙ ПІДХІД ДО ОБҐРУНТУВАННЯ СКЛАДУ СИЛ І ЗАСОБІВ СИСТЕМИ МЕДИКО-ПСИХОЛОГІЧНОЇ РЕАБІЛІТАЦІЇ ОСОБОВОГО СКЛАДУ ВІЙСЬКОВИХ ФОРМУВАНЬ

Одним із найактуальніших та найпроблемніших питань, що виникли під час російсько-української війни, є підвищення ефективності системи медико-психологічної реабілітації військовослужбовців Збройних Сил України. Особливість цієї системи полягає в необхідності науково обґрунтованого підходу до планування та реалізації заходів медико-психологічної реабілітації з урахуванням не лише клінічних, а й економічних аспектів. Це створює потребу в розробці комплексного методу, заснованого на математичних моделях, який дозволить оптимізувати використання ресурсів та підвищити ефективність системи медико-психологічної реабілітації.

Огляд літератури показав, що більшість існуючих моделей військової реабілітації зосереджені на медичних або психологічних аспектах без належного врахування економічної ефективності та раціонального розподілу ресурсів. Наукова новизна статті полягає в розробці методу планування заходів медико-психологічної реабілітації військовослужбовців, який передбачає використання кластерного аналізу, елементів теорії черг та програмно-цільового управління для організації порядку звернень з урахуванням клінічного стану пацієнтів та наявних ресурсів, що сприяє підвищенню ефективності системи реабілітації в умовах обмежених ресурсів.

Розроблено метод планування заходів медико-психологічної реабілітації військовослужбовців.

Сформовано раціональну чергу заявок на медико-психологічну реабілітацію з урахуванням пріоритетності та доступності ресурсів, що дозволяє максимально ефективно розподіляти медичні, людські та матеріальні ресурси. Практичне застосування запропонованого методу на прикладі військовослужбовців із зони бойових дій показало можливість суттєвого підвищення ефективності системи реабілітації шляхом оптимізації часу та трудомісткості процедур.

Подальші дослідження включатимуть визначення доцільності використання методів нечіткої кластеризації для підвищення точності формування раціональної черги військовослужбовців на медико-психологічну реабілітацію в рамках системи масового обслуговування.

Ключові слова: теорія масового обслуговування; медико-психологічна реабілітація; методологічний підхід; військовослужбовці; граф станів; оптимізація ресурсів; планування; інтегральний критерій ефективності.



DRUCHEK OLENA

*Candidate of Legal Sciences, Associate Professor,
Professor of the Department of Legal Support and Law Enforcement Activities,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0000-0002-7460-8137>*



VOLUIKO OLEKSII

*Candidate of Legal Sciences, Associate Professor,
Head of the Department of Legal Support and Law Enforcement Activities,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0000-0002-0894-5004>*

LEGAL SECURITY: CONCEPT, FEATURES, AND PRINCIPLES

The article draws upon existing results of research on the purpose and effectiveness of law and legal regulation, as well as studies addressing issues of general, national, and legal security, in order to examine the principal approaches to the contemporary concept of legal security and its constituent elements.

It is established that the conceptual foundations of legal security rest upon the recognition of the value and necessity of safeguarding law and the legal system of the state, as well as upon the understanding of the interrelationship between legal security and the systems of general (social) and national security. The study substantiates that legal security, as both a social and legal phenomenon, possesses a complex and organic nature and shares inherent characteristics with law, including social value, enforceability, and a regulatory character.

The main methodological approaches to understanding legal security are identified and analyzed. In particular, the approach according to which the category of legal security is associated with an assessment of the state of the legal system, its ability to effectively function and develop. As well as the approach according to which the category of legal security is associated with an assessment of the process and result of protecting the legal system and the effectiveness of legal regulation.

The existing definitions of legal security are critically analysed and reconsidered. The article proposes an authorial interpretation of legal security as a guaranteed state of protection of the individual, society, and the state, under which the rule of law, the stability and predictability of legal regulation, the effective exercise of rights and freedoms, and the proper functioning of mechanisms for their protection against internal and external threats are ensured.

The essential features of legal security are identified and disclosed, namely: social nature; objective and dynamic character; interconnection with national security; manifestation in the substantive requirements of the rule of law and legal certainty; the existence of an implementation mechanism; the specific status of subjects and forms (directions) of implementation; and the presence of an autonomous system of principles governing its functioning and realisation.

The principles of legal security are defined as a set of fundamental, normatively determined ideas concerning its content and orientation, as well as requirements for the activities of relevant subjects aimed at ensuring the stability of the legal system, protecting human rights and freedoms, and neutralising threats directed against the legal system.

The proposed system of principles of legal security includes: legality; the rule of law; priority of human rights and freedoms; legal certainty; effectiveness of legal protection; inevitability of legal liability; proportionality; preventiveness; systemicity and comprehensiveness; and guarantee.

Keywords: *security; legal security; national security; security assurance; legal regulation; legal certainty; principles; legal mechanism.*



© O. Druchek, O. Voluiko, 2026

© Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine, 2026

Statement of the problem. The current state of the legal landscape in Ukraine and worldwide is characterised by dynamic and multifaceted military-political, economic and informational challenges, which are unfolding against a backdrop of global, and in some respects existential, transformations. At the same time, the legitimacy of the modern state as a politically organised authority, as well as the stability of the entire world order, are objectively dependent on the institutional and functional capacity provided by the law. This dilemma leads to the strengthening of the role of law as the sole universal instrument for regulating social relations, ensuring the principles of democracy, the foundations of collective peace and security, and the rights and freedoms of the individual and the citizen.

Under such conditions, the value and universality of law are determined not only by its ideal characteristic as a measure of justice, but are linked, first and foremost, to its practical ability, through law-making, law-implementation and law-enforcement, to guarantee a specific aspect of security linked to the functioning of the state's legal system itself – that is, legal security.

There is no doubt that law, as a social phenomenon, has certain organisational, institutional and functional components that are decisive for the state's legal system and form its structure. Such essential characteristics of law as reliability, stability, predictability and foreseeability are, at the same time, features of legal security, which finds its expression in the national legal system. Conversely, the legal system, as a social asset and a specific objective entity, requires effective protection against external or internal threats. Consequently, the state's legal system not only embodies legal values important to the nation but also serves as an object whose state of protection is ensured by legal security.

In the most general sense, the category of 'legal security' is used as a contrast to the categories of 'legal danger' and 'legal instability', and is interpreted as a specific state within the state and society characterised by internal stability, reliability, the predictability of the law, and the correspondence between the ideal law and its actual content and implementation within the system of social relations.

At the same time, the implementation of the legal security system in Ukraine remains largely ineffective, as the efforts of the state and civil society in this area are as yet disorganised, and the development of the theoretical and methodological

foundations of legal security is proceeding slowly and is not without its contradictions.

Analysis of recent research and publications.

Theoretical and practical issues relating to the effectiveness of the law, the legal system and the requirements for their protection have been the subject of research by many scholars and practitioners, such as A. Yezorov, V. Pavlenko, V. Pylypchuk, M. Pendyura, V. Furashev, O. Shyshka and others. The concept of legal certainty as a result of the rule of law was developed directly by S. Golovaty, M. Kozubra, S. Maksimov, N. Onishchenko, N. Parkhomenko, P. Rabinovich, V. Tatsii, Y. Shemshuchenko and others. The issues of legal security were addressed most systematically and comprehensively by I. F. Korzh [1,2,3,4,5,6], A. M. Loboda [7], and P. O. Dobrodumov [8].

We believe that I. F. Korzhem's monographic study 'Legal Security as a Criterion of the State of Legal Life', published in 2024 [6], is of particular methodological value in this context. In it, an approach to legal security as a characteristic of the state of legal life is substantiated; its relationship with the legal system is defined; the object, subject and principles of legal security are elucidated; the relationship between legal security and national security is examined; and the main ways and directions for ensuring it are substantiated.

A. M. Loboda's doctoral thesis [7] is devoted to identifying the links between an individual's legal security and national security; analysing legal security as a legal category with its inherent features of the protection of an individual's rights, freedoms and interests; justifying the inclusion of legal guarantees, legal regulation and protection mechanisms within the structure of an individual's legal security; and analysing the factors and threats to legal security in the context of social, political or economic crises.

In the scholarly work by S. Petkov, O. Yavny, and O. Koretsky [9], it is demonstrated that the concept of legal security is founded on the sources, methods, and mechanisms for countering negative influences on the legal system; it is established that the essence of legal security lies in the protection of national interests and the creation of necessary and sufficient conditions for the effective functioning of the law.

However, despite the efforts made, the concept of legal security does not yet demonstrate sufficient scientific and practical sophistication. Even the task of terminological clarity regarding the definition of legal security remains unresolved and requires

further expert analysis and relevant research. Overall, it is not only the substance of legal certainty that requires in-depth study, but also the problem of ensuring it in the current Ukrainian context.

The purpose of the article an examination of the concept of legal certainty as it stands today; an analysis of the characteristics and substance of legal certainty; and the identification of the fundamental principles of legal certainty. The findings of this study are intended to contribute to the refinement of the theoretical and methodological foundations of the legal certainty system in Ukraine, as well as to the identification of the main directions and means of ensuring it.

Presentation of the main material. The term ‘legal security’ is relatively new and is not yet widely used in the field of domestic legal scholarship.

Most of the studies analysed emphasise that the concept of legal security was first introduced in the 1930s by the German legal philosopher Gustav Radbruch, who, in his works “Philosophy of Law” (1932) and “Law, Unlawfulness and Super-Law” (1946), laid the methodological foundations for understanding the relationship between law, justice and legal security. G. Radbruch developed the concept of the “idea of law”, identified three fundamental values of law (justice; expediency; legal security (Rechtssicherheit)) and demonstrated that legal security consists in the actual guarantee of a stable legal order; the clarity of legal norms; the predictability of law enforcement; and the protection of the individual against arbitrariness. Overall, W. Radbruch viewed legal security not as a specific characteristic (property) of the law, but as an independent value of law. The so-called ‘formula’ bearing his name is also counted among the well-known quintessences of G. Radbruch’s work; its essence is that a positive law which is extremely unjust and denies equality before the law ceases to be a legal norm.

Within contemporary legal scholarship, legal security is most often considered in the context of issues related to legal regulation, human rights, and the role of law as a social value. At the same time, recent years have seen the emergence of specialised studies in which legal security is viewed as an element of national security.

An analysis of the academic positions on the understanding of legal security found in the literature indicates a lack of consensus. Moreover, no single methodological paradigm for analysing legal security has yet been developed. Indeed, as far back as 2005, the Ukrainian scholar P. O. Dobrodumov [8] identified at least two main

approaches to understanding legal security. The first is that legal security is a category used to assess the state of the legal system, its capacity for effective functioning and development. The second is that legal security is a category used to assess the process of protecting the legal system, the implementation of a set of actions and procedures for its protection (i.e., legal regulation). By broadly categorising these approaches, we conclude that legal security, as a social and legal phenomenon, has a complex organic nature and shares such properties with law as social value, certainty and a regulatory character.

Analysing existing definitions of legal security, we see that conceptual constructs such as “capacity”, “legal security”, “legal effectiveness”, “legal orderliness”, “legal regulation”, “legal principle” and so on are used in their formulation.

Thus, I. Korzh, in his monograph [6, p. 128], provides the following definition: legal security is the capacity of the state, as well as legal subjects, to realise and safeguard their vital interests by establishing social relations that are protected and safeguarded by the totality of measures, means and methods of legal regulation implemented within the state’s legal system. According to S. Petkov, O. Yavny, and O. Koretsky [9, p. 8006], the essence of legal security boils down to the legal protection (legal safeguarding) of the vital interests of the subject of legal security from negative influences, prevention, and blocking – that is, the minimisation of legal elements of risks, challenges, and threats. Experts on general security issues, O. Danilyan, O. Dzoban and M. Panov, assess legal security from the perspective of its belonging to the national security system and its connection to the legal system. In this context, a defining feature of legal security is that it serves as a fundamental principle for the construction of the legal system, branches of law and their institutions, with a view to ensuring the secure functioning and development of social relations [10, pp. 227–228].

Taking into account the positions analysed and recognising the commonality between legal security and the categories of social and national security – as social phenomena that in most cases denote the absence of threats – we propose an understanding of legal security as a guaranteed state of protection for the individual, society and the state, in which the rule of law, the stability and predictability of legal regulation, the reality and effectiveness of the exercise of rights and freedoms, as well as the proper functioning of mechanisms for their protection and defence against internal and external threats.

In Ukrainian legal scholarship, legal security is regarded as an independent form of security which is, however, closely linked to national security. If we proceed from the legally enshrined concept of national security as the protection of state sovereignty, territorial integrity, the democratic constitutional order and other national interests of Ukraine from real and potential threats, then the difference between national and legal security lies, first and foremost, in the scope, content and functional purpose of these concepts. National security is a broad, comprehensive concept encompassing the protection of the vital interests of the state, society and the individual, and reflecting the absence of threats in key spheres of public life – the military, political, economic, information, environmental and, in particular, legal spheres. The purpose of national security lies in ensuring the stability of the state, its sovereignty, territorial integrity and the sustainable development of the state and society. In contrast, legal security is a narrower concept, relating to the state of protection of the legal system, human rights and freedoms, as well as the stability of legal regulation. The components of legal security, which reflect its level, include such indicators as: the quality of legislation; the protection of rights and freedoms; trust in the courts; effective law enforcement; the implementation of the principle of legal security; and a high level of public legal awareness and legal culture. The purpose of legal security is to ensure the stability, predictability and fairness of the law and the legal system. These characteristics are key to the approaches to understanding the concept of legal security documented in the literature, in particular through the categories of: a) legal order, legality, and guarantees of human rights (O. Skakun); b) the real, rather than formal, guarantee of human and civil rights and freedoms (P. Rabinovich); c) constitutional stability and the effectiveness of mechanisms for the protection of rights, particularly in the context of transformational processes (Y. Todika). Analysing the views on the relationship between the categories of national and legal security found in the literature, the following main approaches can be identified: a) the functional approach, within which legal security is regarded as a component of the mechanism for ensuring national security; b) the autonomous approach, based on the recognition of legal security as a relatively independent category with its own subject matter and its own internal logic of development; c) the integrative approach, within which legal security is recognised as a structural element of national security. In light of the above,

in the context of analysing the links between national and legal security, we conclude that legal security is a necessary structural component of national security, providing its normative, institutional and value-based foundation. Therefore, it can be described as an instrument for ensuring the legitimacy of national security. In the context of its functional relationship with national security, legal security: a) ensures the legality of the activities of public authorities; b) objectifies trust in the state and its legal institutions; c) serves as an element of the system for countering threats, particularly in the legal sphere. At the same time, legal security retains relative autonomy, as it has its own principles, mechanisms and criteria for effectiveness.

This enables us to identify and elaborate on the *essential characteristics of legal security*:

1. *Social nature*. Legal security is, by its very nature, a social phenomenon and an integral part of the overall security system. In examining the social nature of legal security, we emphasise that the right to security is one of the fundamental human rights. Consequently, legal security constitutes a distinct, independent form of social security; yet, when considering the functional purpose of law as an instrument, it serves as the primary, key element of the system ensuring all other forms of security. Thus, legal security forms part of the system of general social security, whilst at the same time serving as a unique instrument for ensuring it. The essence of legal security boils down to the legal protection (legal safeguarding) of the vital interests of the object (in particular, the legal system) from threatening influences, preventing them and neutralising them. It is absolutely clear that without an adequate level of legal security in society, the phenomenon of legal nihilism may assume threatening proportions, public support for state policy may decline, and the effectiveness of legal regulation may be weakened. In addition to the above, an effective legal security regime is designed to prevent the emergence and development of social and political threats such as human rights violations; corruption; manifestations of discrimination and social injustice; the criminalisation of society; the usurpation of power; political instability; and the absence of social harmony, etc. Therefore, in light of the above, legal security should be regarded as a state in which legal risk factors, challenges, dangers and threats to the legal system have been minimised to the greatest extent possible.

2. *Objective nature, dynamism*. The objective nature of legal security means that this phenomenon exists not only on a conscious and psychological level (as a subjective sense of security), but as a

phenomenon of objective reality, a state of the legal system that can be assessed by specific indicators (such as: stable legislation, an effective judicial system, a high level of law and order, and well-developed mechanisms for the protection of human rights). As I. Korzh, P. Bohutskyi and V. Pylypchuk rightly note in this context, “legal security should be regarded as an objective legal phenomenon that depends on a subjective attitude towards the stability and predictability of the law, and towards the methods and means which, in their unity, are capable of ensuring the protection of the legal system, its normative, organisational, institutional and ideological components from real and potential threats” [5, p. 22]. The dynamic nature of legal security, in our view, manifests itself in its ability to objectify the characteristics and patterns of the socio-political, financial, spiritual and cultural aspects of all spheres of social life.

3. *The link to national security.* An examination of the relationship and interdependence between legal security and national security leads to the conclusion that legal security forms the foundation that guarantees legality, stability and the rule of law within society and the state, and provides the legal basis for the state’s activities in all spheres. In particular, the activities of state bodies and officials aimed at ensuring and guaranteeing national security are possible only and exclusively on the basis of legal norms, and only through legal means, which are, in essence, components of the legal system. Without an effective system of legal security, certain negative anti-legal phenomena (such as lawlessness, corruption, legal nihilism, etc.) may take root and reach alarming proportions in society, rendering the state vulnerable to internal and external threats. Without effective legal regulation, as a component of legal security, it is impossible to ensure the protection and defence of the state, counter terrorism, ensure information security, or combat corruption – that is, to effectively protect national interests. Thus, legal security is based on a system of legislation that defines mechanisms for protection against threats, whilst a stable legal order prevents internal threats and ensures the functioning of the state. In general, to elucidate the interconnection between legal and national security, we consider it important to take the following parameters into account: a) legal security is a component of national security; b) both national and legal security are designed to ensure and guarantee the protection of national interests; c) both national and legal security, in terms of assessing the state of social relations, are the result of specific state activities carried out by legal means

within the legal system. This determines the role and significance of legal security in safeguarding Ukraine’s national interests and its leading position among other types of security.

4. *Objectification in the context of the principles of the rule of law and legal certainty.* An analysis of approaches to the concept of legal security suggests that its key components include the following requirements: a) clarity and predictability of the law; b) stability of legislation; c) the absence of unforeseeable changes in legislation; d) the non-retroactivity of the law in space and time; e) the accessibility of legislation; f) the finality of court decisions; g) the protection of legitimate expectations; h) a clear definition of the powers of public authorities. Overall, this principle forms the fundamental basis of the rule of law, according to which the law has the highest legal force in the state, and the activities of public authorities, officials and citizens are subject to the law, which is based on the ideas of justice, freedom and equality. This principle ensures that legal norms are clear, accessible to understanding, do not change haphazardly, and guarantee the protection of citizens’ legitimate expectations and the finality of court decisions, thereby preventing the arbitrary exercise of power. V. Furashev, in particular, emphasises this understanding of the principle of legal security when he interprets the term “legal security” primarily as legal security, that is, the assurance of a system whereby citizens’ rights are delegated to the state authorities and local representative bodies as the sole source of power [11]. In this context, we also consider the views of S. Petkov, O. Yavny and O. Koretsky [9, p. 8005] that “legal security expresses and embodies the tradition and historical continuity of the state and legislation, and defines the social purpose of law as a regulator of social relations and legal security as an integral part of the state’s security system”.

5. *The existence of an enforcement mechanism.* Drawing on the results of research into the concept and components of the legal enforcement mechanism in the context of legal security issues, it is proposed that the mechanism for ensuring legal security be understood as a comprehensive system of legal instruments, institutions, procedures and safeguards through which the state and other public law entities carry out the prevention, detection, minimise and neutralise threats to the legal system, human rights and freedoms, and ensure the stability and predictability of legal regulation. We believe that the primary purpose of such a mechanism should be to achieve, through appropriate legal means, a state of functioning of the legal system that

best meets the needs of the individual, society and the state, and guarantees its further development. In functional and structural terms, the mechanism for ensuring legal security is a complex and multi-component structure encompassing such interrelated subsystems as: a) the normative subsystem (the body of legal norms, principles, legal regimes and guarantees that define the foundations of the legal order and security); b) institutional (a system of state authorities, law enforcement and judicial bodies authorised to ensure compliance with the law and the rule of law, as well as the protection of human rights); c) procedural (procedures and guarantees established by law that safeguard and protect the legal system, the rule of law and human rights and freedoms).

6. *The specific status of the entities and forms (areas) of enforcement.* As legal security is, in procedural terms, closely linked to the sphere of public administration, the entities responsible for ensuring it are public authorities, in particular: bodies of the executive (law enforcement agencies, the public prosecutor's office, judicial bodies) and judicial branches of government; the President of Ukraine; and local government bodies. The task of ensuring legal security is carried out by these entities through law-making, law-enforcement, operational-executive and supervisory-audit activities, including the creation of legal norms and the issuance of acts for their application.

7. *The existence of a distinct system of principles governing its operation and implementation.* The state's activities aimed at ensuring legal security, as well as the functioning of the legal security system, are based on clearly defined principles, which we propose to understand as a system of fundamental, normatively grounded ideas regarding the content and direction of legal security, requirements regarding the activities of entities in the sphere of guaranteeing the stability of the legal system, protecting human rights and freedoms, as well as requirements regarding activities to neutralise threats directed against the legal system. Taking into account the static (state) and dynamic (assurance) nature of legal security, we propose that the list of principles of legal security should include the following principles: a) legality; b) the rule of law; c) the priority of human rights and freedoms; d) legal certainty; e) the effectiveness of legal protection; f) the inevitability of legal liability; g) proportionality; h) prevention; i) systematic and comprehensive approach; j) guarantee. We regard these principles, taken as a whole, as the methodological basis for the state to ensure a real and effective state of legal security.

To conclude this general theoretical analysis of the concept of legal security and its characteristics, we would emphasise that legal security entails the protection of the legal system, legislation and the legal framework as a whole from dangers and threats.

Conclusions and prospects for further research.

All of the above gives us grounds to conclude that:

1. The concept of legal security is intrinsically linked to the ideas of the value and supremacy of the law, the need to improve legal regulation and the protection of rights, as well as the notion that legal security is connected to systems of general (social) and national security. Legal security, as a social and legal phenomenon, has a complex, organic nature and shares characteristics with the law, such as social value, certainty and a regulatory nature.

2. Current methodological approaches to understanding legal security include an approach whereby this category is used to assess the state of the legal system and its capacity for effective functioning, as well as an approach whereby legal security is linked to the process of safeguarding the legal system and the sphere of legal regulation.

3. The concept of legal security should be understood as a guaranteed state of protection for the individual, society and the state, under which the rule of law, the stability and predictability of legal regulation, the reality and effectiveness of the realisation of rights and freedoms, as well as the proper functioning of mechanisms for their protection and defence against internal and external threats, are ensured.

4. The category of legal security is characterised by the following essential features: a) its social nature; b) its objective and dynamic nature; c) its connection with national security; d) embodiment in the requirements of the rule of law and legal security; e) the existence of an enforcement mechanism; f) the special status of the subjects and forms (areas) of enforcement; g) the existence of its own system of principles of functioning and implementation.

5. The principles of legal security constitute a system of fundamental, normatively grounded ideas regarding the content and direction of legal security, requirements concerning the activities of actors in the sphere of ensuring the stability of the legal system and the protection of human rights and freedoms, as well as requirements concerning activities to neutralise threats directed against the legal system.

6. The system of principles of legal security comprises the following principles: a) legality; b) the rule of law; c) the priority of human rights and

freedoms; d) legal certainty; e) the effectiveness of legal protection; f) the inevitability of legal liability; g) proportionality; h) preventiveness; i) systematicity and comprehensiveness; j) guarantee.

7. Legal security, as a socio-legal phenomenon and a sphere of state activity, must guarantee the realisation of such types of security as national, state, personal, economic, information and others. It is for this reason that legal security occupies a priority position within the overall security system and requires more active academic research and practical improvement.

We consider the following to be promising areas of research into issues of legal security: 1) further theoretical and methodological analysis of legal security, in particular with a view to establishing a unified academic definition of legal security; clarifying its place within the legal and security systems; and developing a conceptual and categorical framework; 2) the development of a concept of legal security in the context of martial law and post-conflict transformation, in particular by focusing on issues of balance between state security and human rights; restrictions on rights under martial law; and the restoration of the legal system after the war; 3) justifying institutional guarantees of legal security, in particular such as the independence and effectiveness of the judiciary and anti-corruption bodies, the effectiveness of constitutional review, etc.

References

1. Korzh I. F. (2018). *Pryntsypy prava v konteksti pravovoi bezpeky Ukrainy* [Principles of law in the context of legal security of Ukraine]. *Pravo i suspilstvo*, no. 3, pp. 25–34 [in Ukrainian].
2. Korzh I. F. (2021). *Pravova bezpeka Ukrainy: stan, problemy* [Legal security of Ukraine: state and problems]. In *The latest development of the modern legal sciences and education in Ukraine and EU countries: an experience, challenges, expectations*. Riga, Latvia: Baltija Publishing, pp. 296–317.
3. Korzh I. F. (2020). *Kontseptualni zasady pravovoi bezpeky* [Conceptual foundations of legal security]. *Informatsiia i pravo*, no. 1 (32), pp. 55–65 [in Ukrainian].
4. Korzh I. F. (2020). *Pravo i pravova bezpeka v ukrainskykh realiiakh* [Law and legal security in Ukrainian realities]. *Vcheni zapysky Tavriiskoho natsionalnoho universytetu imeni V. I. Vernadskoho. Seriya: yurydychni nauky*, vol. 31 (70), no. 2, pp. 13–19 [in Ukrainian].
5. Korzh I. F., Bohutskyi P. P., Pylypchuk V. H. (2023). *Pravova bezpeka Ukrainy: poniattia ta zmist* [Legal security of Ukraine: concept and content]. *Visnyk Natsionalnoi akademii pravovykh nauk Ukrainy*, no. 30 (4), pp. 15–35. DOI: <https://doi.org/10.31359/1993-0909-2023-30-4-15> [in Ukrainian].
6. Korzh I. F. (2024). *Pravova bezpeka yak kryterii stanu pravovoho zhyttia* [Legal security as a criterion of the state of legal life]. Kyiv : Politiia [in Ukrainian].
7. Loboda A. M. (2013). *Pravova bezpeka osoby v suchasni ukrainskii derzhavi (teoretyko-pravove doslidzhennia)* [Legal security of an individual in the modern Ukrainian state (theoretical and legal research)]. PhD thesis. Kyiv : Natsionalna akademiia vnutrishnikh sprav, p. 198 [in Ukrainian].
8. Dobrodumov P. O. (2005). *Pravova bezpeka yak skladova natsionalnoi bezpeky* [Legal security as a component of national security]. *Natsionalna bezpeka Ukrainy: stan, kryzovi yavyscha ta shliakhy yikh podolannia* [National security of Ukraine: state, crisis phenomena and ways to overcome them]. Kyiv : Natsionalna akademiia upravlinnia. Tsentr perspektyvnykh sotsialnykh doslidzhen, pp. 176–181 [in Ukrainian].
9. Pietkov S., Yavnyi O., Koretskyi O. (2024). *Pravo i pravova bezpeka v suchasnykh ukrainskykh realiiakh* [Law and legal security in modern Ukrainian realities]. *Path of Science*, no. 10 (1). DOI: <https://doi.org/10.22178/pos.100-9> [in Ukrainian].
10. Danilian O. H., Dzoban O. P., Panov M. I. (2002). *Natsionalna bezpeka Ukrainy: struktura ta napriamky realizatsii* [National security of Ukraine: structure and directions of implementation]. Kharkiv : Folio [in Ukrainian].
11. Furashev V. (2011). *Pro poniattia "pravova bezpeka"* [On the concept of "legal security"]. *Pravova informatyka*, no. 1 (29), pp. 47–53 [in Ukrainian].

Received / Стаття надійшла до редакції: 27.02.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 24.03.2026

Published / Опубліковано: 30.06.2026

ДРУЧЕК ОЛЕНА ВАСИЛІВНА

*кандидат юридичних наук, доцент,
професор кафедри правового забезпечення та правоохоронної діяльності,
Київський інститут Національної гвардії України
<https://orcid.org/0000-0002-7460-8137>*

ВОЛУЙКО ОЛЕКСІЙ МИКОЛАЙОВИЧ

*кандидат юридичних наук, доцент,
начальник кафедри правового забезпечення та правоохоронної діяльності,
Київський інститут Національної гвардії України
<https://orcid.org/0000-0002-0894-5004>*

ПРАВОВА БЕЗПЕКА: ПОНЯТІЙНИЙ КОНЦЕПТ, ОЗНАКИ, ПРИНЦИПИ

Встановлено, що концептуальні основи правової безпеки ґрунтуються на визнанні цінності та необхідності захисту права та правової системи держави, а також на розумінні взаємозв'язку між правовою безпекою та системами загальної (соціальної) та національної безпеки. У дослідженні обґрунтовано, що правова безпека, як соціальне та правове явище, має складну та органічну природу та має спільні з правом характеристики, включаючи соціальну цінність, правозастосовність та регулятивний характер.

Визначено та проаналізовано основні методологічні підходи до розуміння правової безпеки. Зокрема, підхід, згідно з яким категорія правової безпеки пов'язана з оцінкою стану правової системи, її здатності ефективно функціонувати та розвиватися. А також підхід, згідно з яким категорія правової безпеки пов'язана з оцінкою процесу та результату захисту правової системи та ефективності правового регулювання.

Критично проаналізовано та переосмислено існуючі визначення правової безпеки. У статті пропонується авторське тлумачення правової безпеки як гарантованого стану захищеності особи, суспільства та держави, за якого забезпечується верховенство права, стабільність та передбачуваність правового регулювання, ефективна реалізація прав і свобод, а також належне функціонування механізмів їх захисту від внутрішніх та зовнішніх загроз.

Визначено та розкрито суттєві ознаки правової безпеки, а саме: соціальна природа; об'єктивний та динамічний характер; взаємозв'язок з національною безпекою; прояв у суттєвих вимогах верховенства права та правової визначеності; наявність механізму реалізації; конкретний статус суб'єктів та форм (напрямків) реалізації; та наявність автономної системи принципів, що регулюють її функціонування та реалізацію.

***Ключові слова:** безпека; правова безпека; національна безпека; забезпечення безпеки; правове регулювання; правова визначеність; принципи; правовий механізм.*



KOVALOVA TETIANA

*Candidate of of Legal Sciences, Associate Professor,
Associate Professor at the Department of State Security,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0009-0001-0668-3047>*

ORGANIZATIONAL AND LEGAL FOUNDATIONS OF PREVENTING AND COUNTERING MILITARY CRIME UNDER MARTIAL LAW

This article examines the organisational and legal foundations for preventing and combating war crimes under martial law. Based on an analysis of legislation, official statistics, contemporary academic works and law enforcement practice, the article explores the nature of war crimes as a factor destabilising military law and order, identifies the structure of the relevant mechanism, the system of actors involved in its implementation is characterised, and directions for improving the regulatory, institutional, analytical and personnel-psychological support are substantiated.

Keywords: *military crime, military criminal offences, martial law, military law and order, military discipline, Military Law Enforcement Service, risk-based prevention.*

Statement of the problem. The current stage in the development of Ukrainian statehood is characterised by the Russian Federation's ongoing armed aggression against Ukraine and the prolonged imposition of a legal regime of martial law. Under these conditions, the protection of the state's sovereignty and territorial integrity takes on not only a military-strategic but also a distinct legal dimension, since the effectiveness of defence depends directly on the state's ability to maintain an appropriate level of legality, discipline and law and order within military formations.

During wartime, military law and order ceases to be a purely internal organisational category. It serves as a functional prerequisite for the controllability of troops, the continuity of combat command, the proper execution of orders and the preservation of the defence forces' personnel potential. This is precisely why criminal offences against the established order of military service or military duty currently pose an increased public danger, as they may result in the failure of combat missions, a breakdown in discipline, the disorganisation of command, the loss of a unit's resilience, and other direct threats to the state's defence capability.

Official statistics record not merely an increase in the number of military criminal offences, but a significant shift in their place within the overall crime structure. Whereas in 2021 they accounted for 0.94 % of all recorded criminal offences, by 2024 this figure had risen to 19.07 %, and in the first quarter of 2025 to 32.10 % [1]. This trend indicates that military crime in the context of a protracted war is not a random side effect, but one of the systemic criminogenic phenomena of wartime.

Military criminal offences are generated by a combination of interrelated factors: intense combat demands, staffing difficulties, psychological exhaustion of personnel, shortcomings in the organisation of service, gaps between disciplinary and criminal procedural responses, as well as the incompleteness of the institutional model of military justice. Therefore, their prevention and counteraction require not piecemeal but systematically coordinated solutions.

Research into the organisational and legal foundations for the prevention and counteraction of military crime is relevant both for the development of military law, criminology and the organisation of law enforcement activities, and for improving



© T. Kovalova, 2026

© Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine, 2026

the practice of ensuring military law and order under martial law.

Analysis of recent research and publications.

The theoretical basis of this study is provided by the works of M. I. Kharvoniuk, S. O. Kharitonov, I. M. Koropatik, P. P. Bohutskyi, M. S. Turkot, V. O. Bugaev and other scholars, in which the basic criminal law approaches to understanding military criminal offences, their elements, compositions, qualifying characteristics and features of criminal liability have been formulated. The significance of these works lies in the fact that they laid the doctrinal foundation for the legal classification of military offences and defined the scope of application of the provisions of Section XIX of the Criminal Code of Ukraine. At the same time, the predominance of the criminal law approach meant that military crime was studied primarily as a set of criminal offences, whilst the organisational and legal mechanisms for its prevention, detection, documentation and the restoration of military law and order remained only fragmentarily addressed.

Among the most recent studies directly relevant to the stated issue, the publications by A. V. Borovik [2], O. M. Kropyvnytskyi [3], T. I. Kovalova and R. M. Kovalov [4; 5], D. A. Morkvin and D. V. Kaznacheyeva [6]. The works of T. I. Kovalova, R. M. Kovalov, as well as D. A. Morkvin and D. V. Kaznacheyeva demonstrate that the structure of military crime is dominated by acts that directly undermine the strength of units, the execution of orders and the continuity of service, and therefore have not only a criminal-law dimension but also a distinct organisational and managerial dimension [2–6]. In the works of A. V. Borovik, D. A. Morkvin and D. V. Kaznacheyeva, using the examples of unauthorised absence from a military unit, evasion of service and related offences, it is shown that the practice of responding to military crime lies at the intersection of two approaches – punitive and restorative [2; 6]. O. M. Kropyvnytskyi's research reveals that the role of the State Bureau of Investigations in this sphere is not limited to pre-trial investigation.

The purpose of this article is to comprehensive theoretical, legal and practical analysis of the organisational and legal framework for preventing and combating war crimes under martial law, and the formulation, on this basis, of

proposals for improving the relevant mechanism in Ukraine. To achieve this objective, it is necessary to: clarify the content and structure of the aforementioned framework; to characterise current trends in war crimes and the system of actors responsible for their prevention, suppression and procedural response; to justify priority areas for improving the regulatory, institutional, analytical and personnel-psychological mechanisms under the legal regime of martial law.

Presentation of the main material. The methodological basis of this article lies in the combination of general scientific and specialised legal methods of inquiry. The dialectical method is employed to explore the interrelationship between the transformation of the security environment, the development of legislation, and changes in the nature of war crimes; the systemic-structural method – to analyse the internal structure of the mechanism for prevention and counteraction and the interaction of its elements; the formal-legal method – to interpret the provisions of the Constitution of Ukraine, the Criminal Code of Ukraine, the Criminal Procedure Code of Ukraine, military statutes and departmental acts. The statistical method enabled the generalisation of data from the Office of the Prosecutor General regarding trends in criminal offences for the period 2021–first quarter of 2025. The comparative legal method was applied during the analysis of parliamentary and international materials concerning models of military justice and standards for the protection of servicemen's rights.

For the purposes of this study, military crime should be understood in a broad criminological sense – as a relatively widespread, socially conditioned and historically variable phenomenon, manifested in a range of criminally punishable acts arising in the sphere of military service relations and undermining military discipline, the rule of law, the manageability and combat effectiveness of the armed forces. Its normative core consists of military criminal offences provided for in Section XIX of the Criminal Code of Ukraine; however, from a criminological perspective, those unlawful acts determined by the specific nature of the military environment and directly affecting the state of military law and order are also significant.

The organisational and legal foundations for the prevention and combating of military crime should

be understood as a multi-level system of regulatory provisions, institutional powers, administrative procedures, information and analytical tools, personnel and psychological measures, and forms of inter-agency coordination aimed at the early detection of crime-related risks, the prevention of offences, their cessation, documentation, pre-trial investigation, judicial proceedings and the restoration of proper military law and order. In this sense, the concept of 'prevention' encompasses primarily preventative, educational, personnel, psychological and social protection measures, whilst 'counteraction' includes the cessation of offences, the exercise of procedural powers, bringing the guilty to justice and remedying the consequences of destructive acts.

The legal regime of martial law constitutes the regulatory framework within which the entire mechanism for preventing and combating military crime operates. The Law of Ukraine "On the Legal Regime of Martial Law" defines it as a special legal regime that provides state authorities, military command, military administrations and local self-government bodies with the powers necessary to avert threats, repel armed aggression and ensure national security [10].

The Internal Service Regulations of the Armed Forces of Ukraine hold commanders personally responsible for combat readiness, military discipline, the morale and psychological well-being of personnel, the safekeeping of weapons, and internal order [11], whilst the Disciplinary Statute of the Armed Forces of Ukraine defines military discipline as the impeccable and unwavering observance by all military personnel of the order and rules established by legislation and statutes [12]. Therefore, the organisational and legal foundations for combating military crime do not begin with criminal proceedings, but with the proper organisation of service, timely oversight, effective command, legal briefing, and systematic recording of incidents and disciplinary offences.

At the same time, strengthening administrative and organisational mechanisms during wartime does not mean abandoning the principle of the rule of law. On the contrary, the growing role of the command, specialised law enforcement agencies and procedural instruments must be combined with adherence to standards of legality, clarity of powers, proportionality of restrictions and respect

for the rights of military personnel. It is precisely this balance that makes it possible to effectively maintain military law and order without turning it into an exclusively punitive system.

These figures point to at least three key trends. Firstly, in 2024, offences against the established rules of military service rose to one of the leading positions in terms of proportion within the overall crime statistics, and in the first quarter of 2025 they effectively became the dominant category. Secondly, the increase in the proportion of military criminal offences is occurring in parallel with a decrease in the proportion of property offences, which were traditionally the most common [2, p. 373]. Thirdly, the dynamics of military crime have proved to be more sensitive to the combat situation, staff shortages, the duration of deployment in the combat zone, rotation issues and moral and psychological exhaustion than other types of crime [6, p. 127].

The internal structure of military crime in the narrow sense has also undergone a significant transformation. Its main body is formed not by offences related to military property or isolated instances of abuse of office, but by acts that directly undermine the integrity of units, the execution of orders and the continuity of service: insubordination, unauthorised absence from a military unit or place of service, desertion, and evasion of military service [4, p. 41; 5, p. 518]. It is precisely this circumstance that indicates that the central challenge today is not merely the punishment of the guilty, but the early detection of risks of personnel attrition, unit disorganisation, and moral and psychological instability.

The issue of latency requires separate consideration. The conditions of combat operations, the movement of units, the remoteness of deployment locations, the lack of time to fully document events, and, in some cases, the command's reluctance to discredit the unit objectively affect the completeness of the recording of offences. Therefore, official data should be viewed as a minimum measure of the problem, rather than its exhaustive scope. It is precisely from this that the need for an analytical approach arises, one that combines criminal statistics, data on disciplinary practice, the results of internal investigations, psychological monitoring and personnel assessment.

Table 1 – Trends in military criminal offences

Period	Total number of criminal offences recorded	Military criminal offences (Chapter XIX of the Criminal Code of Ukraine)	Proportion of military offences, %	Proportion of property offences, %
2021	321 443	3 037	0,94	49,38
2022	362 636	13 766	3,80	31,20
2023	475 595	28 666	6,03	37,62
2024	492 497	93 900	19,07	26,99
I qtr. 2025	167 420	53 734	32,10	16,68

Source: compiled by the author based on official statistics from the Office of the Prosecutor General and their current academic analysis [1].

The legal framework of the mechanism under study is cross-sectoral. Its criminal law component is formed by Section XIX of the Criminal Code of Ukraine [13], its criminal procedure component by the provisions of the Criminal Procedure Code of Ukraine regarding jurisdiction, evidence and procedural control [14], and its service law component by legislation on military duty and military service, military statutes and other acts regulating the procedure for military service [11; 12], and the special-organisational component – the provisions defining the status of the Military Law Enforcement Service, the State Bureau of Investigations, the Public Prosecutor's Office and other entities within the relevant mechanism [15–17].

These changes have a dual significance. On the one hand, they serve to humanise the restoration of military service and provide the state with a means of retaining motivated personnel. On the other hand, they confirm that modern efforts to combat military crime cannot be based solely on a repressive model. It requires a combination of punitive, rehabilitative, organisational and socio-psychological measures. It is precisely this cross-sectoral combination that constitutes one of the key features of the organisational and legal foundations of the mechanism under study.

The scope of the mechanism for preventing and combating military crime is not limited to criminal justice bodies. It encompasses the military command, the Military Law Enforcement Service, pre-trial investigation bodies, the prosecution service, the courts, as well as personnel, psychological and socio-legal units that perform an early preventive function. It is precisely this multi-agency nature that necessitates a clear demarcation of competences and proper coordination.

The commander of a military unit is the primary link in maintaining law and order. It is the commander who organises duties, monitors discipline, ensures that orders are carried out, initiates internal investigations, establishes procedures for responding to breaches, and bears personal responsibility for internal order [11; 12; 19]. At the same time, the commander is tasked with an excessively wide range of duties – from combat command to disciplinary prevention – which, in conditions of intense combat operations, often results in a shortage of time and resources for effective preventive work.

The Military Law Enforcement Service is a specialised law enforcement unit within the Armed Forces of Ukraine, tasked with ensuring law and order and military discipline, preventing and suppressing offences, and protecting the rights of military personnel and military property [15].

Table 2 – Key actors in the mechanism for preventing and combating war crimes

Entity	Main powers and functions
Military command, commanders (officers)	Organising the service, maintaining discipline and internal order, identifying risks, conducting internal investigations, providing an initial response to incidents and reporting on them.
Military Law Enforcement Service	Ensuring law and order and military discipline; preventing and stopping offences; protecting the rights of military personnel and military property; liaising with the command and law enforcement agencies.
State Bureau of Investigations	Pre-trial investigation of military criminal offences (excluding Article 422 of the Criminal Code of Ukraine – Ukrainian Security Service), analytical summarisation of investigative practice, compilation of evidence, and criminal procedural responses.
The Public Prosecutor's Office	Conducting pre-trial investigations, representing the prosecution, and ensuring compliance with the law during criminal proceedings.
Court	Judicial oversight, the handling of criminal proceedings, the establishment of standards for law enforcement, and the safeguarding of procedural safeguards and a fair trial.
Human resources, psychological and social and legal departments	Early identification of at-risk groups, psychological support, legal advice, rehabilitation, post-conflict adjustment, and prevention of deviant behaviour.

Source: compiled by the author based on current legislation and recent research [3; 7; 11–18; 23].

However, the debate regarding the transformation of the military law enforcement service into a military police force with broader powers remains relevant. Parliamentary research and Draft Law No. 6569-d on the Military Police indicate that, as of 2026, the legislature is still seeking the optimal model for the institutional development of this branch [7; 25].

The State Bureau of Investigations and the prosecution system perform a key function in the sphere of criminal procedural countermeasures. At the same time, as O. M. Kropyvnytskyi rightly points out, the effectiveness of the State Bureau of Investigations depends not only on formal jurisdiction but also on the presence within the institution of an analytical and criminological component capable of identifying patterns, typical determinants and high-risk segments of military crime [3, p. 660]. This approach is well-founded,

as investigating individual cases without generalising the causes and mechanisms of their occurrence does not ensure a fully effective preventive effect.

The court provides the final legal assessment of an act, judicial oversight of the observance of rights and freedoms, and establishes standards of law enforcement that influence the entire prevention system. In contrast, personnel and psychological services, officers responsible for moral and psychological support, and social support services for military personnel perform a different but no less significant function: they ensure the early diagnosis of crisis states, work with at-risk groups, provide psychological support, facilitate post-traumatic adaptation, and reduce the likelihood of deviant behaviour. It is precisely the inclusion of these subsystems within the overall mechanism

that distinguishes a scientifically grounded model from a narrow punitive approach.

The analysis conducted provides grounds for identifying a number of systemic problems. The first is the fragmented nature of regulatory frameworks: criminal law, procedural, disciplinary, personnel and information mechanisms do not function as a unified system, but rather as a collection of relatively autonomous units. The consequence of this is temporal and procedural gaps between the initial detection of an incident, an internal investigation, the transfer of information to law enforcement, procedural classification and an actual managerial response.

The second problem is the prevalence of reactive logic over preventive logic: institutions are far better equipped to record offences that have already been committed than to detect the risks of their occurrence at an early stage.

The third problem is the weakness of the information and analytical infrastructure. Despite the obligation to keep records of incidents and disciplinary breaches, in practice information remains scattered across military units, the Military Law Enforcement Service, the State Bureau of Investigations, the prosecution service and the courts. This complicates criminological monitoring, forecasting and the assessment of the effectiveness of preventive measures.

The fourth problem relates to the personnel and psychological dimension: prolonged combat stress, the loss of comrades, insufficient rotations, family crises, a sense of injustice, and problems with social and legal protection often lead to disciplinary breakdowns, unauthorised absence from the unit, insubordination or other forms of deviant behaviour [2, p. 374; 6, p. 1027].

The fifth problem is the incompleteness of the institutional model of military justice. The Research Service of the Verkhovna Rada of Ukraine rightly points out that an effective system of military justice must ensure an adequate level of military discipline and the rule of law, contribute to enhancing combat capability, and at the same time comply with international standards for the functioning of military justice [7]. International

materials from DCAF and OSCE/ODIHR emphasise that specialised military institutions must combine professional specialisation with democratic control, parliamentary oversight, the right to an effective remedy, and due process guarantees [8; 9].

In view of this, the priority is to introduce a risk-based prevention model in military units. The essence of this model lies in shifting from a formal response to offences that have already been committed to the ongoing identification of high-risk groups and situations. Such indicators may include repeated disciplinary offences, prolonged lack of rotation, signs of psychological and emotional exhaustion, conflict within the unit, instances of alcohol abuse, family and social crises, and failure to properly inform service personnel of their rights, safeguards and the procedure for obtaining assistance. For each risk category, pre-defined algorithms for command, psychological, legal and personnel responses must be applied.

The second area is the standardisation of inter-agency cooperation procedures. It is necessary to harmonise, both in terms of regulations and technology, the procedures for initial reporting, internal investigations, evidence collection, notification of the pre-trial investigation authority, prosecutorial procedural guidance, and subsequent briefing of the command on the progress of proceedings. In line with Ministry of Defence Order No. 604, it is advisable to establish a secure digital system for recording offences and disciplinary incidents, which would provide standardised classifications, monitoring of response times, analytical reports for commanders at various levels, and integration with criminal statistics.

The third area is strengthening the personnel and psychological component. International standards clearly demonstrate that respect for the rights of service personnel, the ability to seek help, the functioning of complaint mechanisms, legal certainty in disciplinary procedures, and appropriate conditions of service directly influence the level of discipline and law and order. Therefore, the prevention of military crime must include not

only educational work, but also professional psychological support, legal counselling, post-traumatic stress adaptation programmes, and a timely response to signs of professional maladjustment.

The fourth area is the institutional development of specialised law enforcement and judicial components. Further consideration of draft law No. 6569-d on the Military Police, as well as the discussion on the model of specialised military justice, must be conducted not only through the prism of expanding law enforcement capacity, but also with due regard to the requirements of legality, accountability, and parliamentary and judicial oversight. For Ukraine, the optimal model appears to be one in which the specialisation of bodies is combined with the preservation of constitutional guarantees, a clear demarcation of jurisdiction and transparent procedures for monitoring human rights compliance.

Improvements to the organisational and legal framework for preventing and combating military crime should not rely on isolated, ad hoc solutions, but on the systematic modernisation of the entire system – from the regulatory framework and personnel management to analytics, digital record-keeping, inter-agency coordination and the institutional architecture of military justice.

Conclusions and prospects for further research. The present study provides grounds for asserting that, under martial law, military crime has taken on the characteristics of a systemic criminogenic phenomenon which directly affects not only the rule of law within military formations, but also the controllability of troops, the continuity of combat operations, the retention of personnel, and the overall capability of the defence forces. This is precisely why it cannot be viewed solely as a collection of individual criminal offences under Section XIX of the Criminal Code of Ukraine. A scientifically sound approach is one in which military crime is understood as a broader criminological and organisational-legal phenomenon, determined by the specific characteristics of the military environment, combat workload, staffing imbalances, moral and

psychological exhaustion, shortcomings in service organisation, and the incompleteness of the institutional model of military justice.

Contemporary research has already established a solid foundation for understanding the criminal-legal nature of military criminal offences, their structure, trends and specific institutional response mechanisms. At the same time, academic discourse is still dominated by either a criminal law or a narrowly institutional approach, whilst a comprehensive cross-sectoral model for preventing and combating military crime under conditions of prolonged martial law remains underdeveloped. This allows us to conclude that the scientific novelty of the article lies precisely in the justification of such a mechanism as a unified system, in which legal regulation, institutions, administrative procedures, analytics, prevention and law enforcement must function not in isolation, but in interconnection.

The organisational and legal foundations for the prevention and combating of war crimes should be viewed as a multi-level, cross-sectoral mechanism that combines criminal law, criminal procedure, service discipline, information and analysis, personnel and psychological, and human rights protection components. This approach makes it possible to move beyond a narrow understanding of countering military crime as merely a reaction to an offence that has already been committed. The effectiveness of this mechanism is determined not so much by the severity of punishment as by the state's ability to identify crime-related risks in a timely manner, prevent destructive behaviour, ensure proper coordination among response agencies, and restore the violated military legal order while upholding the rule of law and human rights.

Following the introduction of martial law, military criminal offences have significantly altered their position within the overall structure of crime and have become one of its dominant categories. This trend reflects not only a quantitative increase in such acts but also the accumulation of deeper organisational and socio-psychological problems in the functioning of the military environment.

Under martial law, effective counteraction against war crimes is only possible through a combination of specialisation, rapid response, inter-agency coordination and strict adherence to constitutional and procedural safeguards. In this context, promising areas for improvement include: the regulatory and technological integration of procedures for initial reporting, internal investigations and criminal procedural responses; the creation of a unified, secure digital system for recording offences and disciplinary incidents; strengthening the analytical role of the State Bureau of Investigations, the Military Law Enforcement Service and the command; expanding personnel and psychological support for military personnel; and completing the establishment of a specialised law enforcement and judicial infrastructure in accordance with standards of democratic oversight and human rights protection.

The results obtained are of both theoretical and practical significance. Theoretically, they clarify the content of the category of organisational and legal foundations for the prevention and counteraction of military crime and reveal it as a coherent system, rather than a collection of separate legal and administrative instruments. In practice, they can be utilised in legislative activities, in the work of military command bodies, the Military Law Enforcement Service, the State Bureau of Investigations, the Public Prosecutor's Office, the courts, as well as in the training of personnel in the fields of military law, criminology and security studies. Prospects for further research lie in the development of applied methodologies for assessing crime-related risks in military units, in the empirical analysis of the effectiveness of mechanisms for the voluntary return of military personnel to service, and in determining the optimal model for the relationship between the military police, the specialised prosecutor's office and judicial institutions within the Ukrainian military justice system.

References

1. Ofis Heneralnoho prokurora (2026). *Pro zareiestrovani kryminalni pravoporushennia ta rezultaty yikh dosudovoho rozsliduvannia* [On registered criminal offences and the results of their pre-trial investigation]. Retrieved from: <https://surl.li/ghviou> (accessed 13 February 2026) [in Ukrainian].
2. Borovyk A. V. (2025). *Kryminalna vidpovidalnist za samovilne zalyshennia viiskovoi chastyny abo mistsia sluzhby (SZCh): problemy pravovoho rehuliuвання ta sudovoi praktyky* [Criminal liability for unauthorized abandonment of a military unit or place of service (SZCh): problems of legal regulation and judicial practice]. *Pravo i suspilstvo*, no. 1, pp. 371–378. DOI: <https://doi.org/10.32842/2078-3736/2025.1.54> [in Ukrainian].
3. Kropyvnytskyi O. M. (2025). *Rol i mistse Derzhavnoho biuro rozsliduvan v systemi subiektiv zapobihannia viiskovym kryminalnym pravoporushenniam v umovakh voiennoho stanu v Ukraini* [Role and place of the State Bureau of Investigation in the system of entities responsible for preventing military criminal offences under martial law in Ukraine]. *Yurydychnyi naukovyi elektronnyi zhurnal*, no. 1, pp. 659–662. DOI: <https://doi.org/10.32782/2524-0374/2025-1/153> [in Ukrainian].
4. Kovalova T. I. (2025). *Teoretychni osnovy viiskovoi zlochynnosti ta yii zapobihannia v umovakh pravovoho rezhymu voiennoho stanu* [Theoretical foundations of military crime and its prevention under the legal regime of martial law]. *Pivdennoukrainskyi pravnychi chasopys*, no. 2, pp. 39–45. DOI: <https://doi.org/10.32850/sulj.2025.2.7> [in Ukrainian].
5. Kovalova T. I., Kovaliov R. M. (2024). *Kryminalna vidpovidalnist za voienni ta viiskovi zlochyyny v sektori bezpeky ta oborony* [Criminal responsibility for war crimes and military crimes in

the security and defense sector]. *Yurydychnyi naukovi elektronnyi zhurnal*, no. 1, pp. 517–519. DOI: <https://doi.org/10.32782/2524-0374/2024-1/121> [in Ukrainian].

6. Morkvin D. A., Kaznacheieva D. V. (2025). *Zlochynnist viiskovosluzhbovtziv v Ukraini v umovakh povnomasshtabnoi viiny: stan, struktura, tendentsii* [Criminality among military personnel in Ukraine during full-scale war: status, structure, and trends]. *Naukovi perspektyvy*, no. 10 (20), pp. 1025–1036. DOI: [https://doi.org/10.52058/3041-1254-2025-10\(20\)-1025-1036](https://doi.org/10.52058/3041-1254-2025-10(20)-1025-1036) [in Ukrainian].

7. Doslidnytska sluzhba Verkhovnoi Rady Ukrainy (2025). *Parlamentske doslidzhennia shchodo implementatsii systemy viiskovoi yustytzii v Ukraini* [Parliamentary research on the implementation of military justice in Ukraine]. Retrieved from: <https://surl.it/aejpeb> (accessed 13 February 2026) [in Ukrainian].

8. VanLandingham, R. E., Jasutis, G., Cernejute, K. (2024). *Military Justice: A Comparative Study of Parliamentary Oversight in Euro-Atlantic Countries*. Geneva : DCAF. Retrieved from: <https://surl.li/krqrye> (accessed 13 February 2026) [in English].

9. OSCE ODIHR, DCAF (2021). *Human Rights of Armed Forces Personnel: Compendium of Standards, Good Practices and Recommendations*. Warsaw; Geneva. Retrieved from: <https://surl.li/dcpkxo> (accessed 13 February 2026) [in English].

10. OSCE ODIHR, DCAF (2021). *Human Rights of Armed Forces Personnel: Compendium of Standards, Good Practices and Recommendations*. Warsaw; Geneva. Retrieved from: <https://surl.li/wbslpq> (accessed 13 February 2026) [in English].

11. *Zakon Ukrainy "Pro Statut vnutrishnoi sluzhby Zbroinykh Syl Ukrainy" № 548-XIV* [Law of Ukraine about the Internal Service Statute of the Armed Forces of Ukraine activity no. 548-XIV]. (1999, March 24). Retrieved from: <https://surl.li/cfvbxv> (accessed 13 February 2026) [in Ukrainian].

12. *Zakon Ukrainy "Pro Dystsyplinarnyi statut Zbroinykh Syl Ukrainy" № 551-XIV* [Law of Ukraine about the Disciplinary Statute of the Armed Forces of Ukraine activity no. 551-XIV]. (1999, March 24). Retrieved from: <https://surl.cc/cmlind> (accessed 13 February 2026) [in Ukrainian].

13. *Kryminalnyi kodeks Ukrainy № 2341-III* [Criminal Code of Ukraine activity no. 2341-III] (2001, April 5). Retrieved from: <https://surl.li/smxkug> (accessed 13 February 2026) [in Ukrainian].

14. *Kryminalnyi protsesualnyi kodeks Ukrainy № 4651-VI* [Criminal Procedure Code of Ukraine activity no. 4651-VI]. (2012, April 13). Retrieved from: <https://surl.cc/yucerx> (accessed 13 February 2026) [in Ukrainian].

15. *Zakon Ukrainy "Pro Viiskovu sluzhbu pravoporiadku u Zbroinykh Sylakh Ukrainy" № 3099-III* [Law of Ukraine about the Military Law Enforcement Service in the Armed Forces of Ukraine activity no. 3099-III]. (2002, March 7). Retrieved from: <https://surl.li/knjeqd> (accessed 13 February 2026) [in Ukrainian].

16. *Zakon Ukrainy "Pro Derzhavne biuro rozsliduvan" № 794-VIII* [Law of Ukraine about the State Bureau of Investigation activity no. 794-VIII]. (2015, November 12). Retrieved from: <https://surl.li/eifcse> (accessed 13 February 2026) [in Ukrainian].

17. *Zakon Ukrainy "Pro prokuraturu" № 1697* [Law of Ukraine about the Prosecutor's Office activity no. 1697]. (2014, October 14). Retrieved from: <https://surl.li/khbawx> (accessed 13 February 2026) [in Ukrainian].

18. *Nakaz Ministerstva oborony Ukrainy "Pro zatverdzhennia Instruksii z nadannia dopovidei i donesen pro podii, kryminalni pravoporushennia, viiskovi administratyvni pravoporushennia, administratyvni pravoporushennia, poviazani z koruptsiieiu, porushennia viiskovoi dystsypliny ta yikh oblik u Ministerstvi oborony Ukrainy, Zbroinykh Sylakh Ukrainy ta Derzhavnii spetsialnii sluzhbi transportu" № 604* [Order of the Ministry of Defence of Ukraine "On approval of

the Instruction on reports and records of incidents, criminal offences, military administrative offences, corruption-related administrative offences and breaches of military discipline" activity no. 604]. (2018, November 29). Retrieved from: <https://surli.cc/yvuwx> (accessed 13 February 2026) [in Ukrainian].

19. *Nakaz komanduvacha Natsionalnoi hvardii Ukrainy "Pro orhanizatsiiu roboty iz zabezpechennia nalezhnogo stanu viiskovoi dystsypliny sered osobovoho skladu Natsionalnoi hvardii Ukrainy" № 150* [Order of the Commander of the National Guard of Ukraine "On organizing work to ensure the proper state of military discipline among the personnel of the National Guard of Ukraine" activity no. 150]. (2021, April 14) [in Ukrainian].

20. *Zakon Ukrainy "Pro vnesennia zmin do Kryminalnoho kodeksu Ukrainy, Kryminalnoho protsesualnoho kodeksu Ukrainy ta inshykh zakoniv Ukrainy shchodo vdoshkonalennia kryminalnoi vidpovidalnosti za zlochyny proty vstanovlenoho poriadku nesennia abo prokhozhenia viiskovoi sluzhby pid chas dii voiennoho stanu" № 3902-IX* [Law of Ukraine about the Improving criminal liability for offences against the established order of military service during martial activity no. 3902-IX]. (2024, August 20). Retrieved from: <https://surli.li/dhxann> (accessed 13 February 2026) [in Ukrainian].

21. *Zakon Ukrainy "Pro vnesennia zmin do deiakykh zakoniv Ukrainy shchodo poriadku prokhozhenia viiskovoi sluzhby okremymy katehoriïamy viiskovosluzhbovtsiv pid chas dii voiennoho stanu" № 4392-IX* [Law of Ukraine about the Procedure for military service by certain categories of service personnel during martial activity no. 4392-IX]. (2025, April 30). Retrieved

from: <https://surli.li/rwrlud> (accessed 13 February 2026) [in Ukrainian].

22. *Nakaz Ministerstva oborony Ukrainy "Pro zatverdzhennia Zmin do Instruktсии pro orhanizatsiiu vykonannia Polozhennia pro prokhozhenia hromadianamy Ukrainy viiskovoi sluzhby u Zbroinykh Sylakh Ukrainy" № 274* [Order of the Ministry of Defence of Ukraine "On amendments to the Instruction on military service by citizens of Ukraine in the Armed Forces of Ukraine" activity no. 274]. (2025, April 28). Retrieved from: <https://surli.li/axrxet> (accessed 13 February 2026) [in Ukrainian].

23. Derzhavne biuro rozsliduvan (2025). *Dyrektor DBR Oleksii Sukhachov: zavdiaky zakonu ta rozroblenomu mekhanizmu do viiska povernulosia ponad 29 tysiach biitsiv, yaki samovilno zalyshyly chastyny* [SBI Director Oleksii Sukhachov: thanks to the law and the developed mechanism, more than 29 thousand fighters who had left their units without authorization returned to the military]. Retrieved from: <https://surli.li/edtwsn> (accessed 13 February 2026) [in Ukrainian].

24. *Zakon Ukrainy "Pro viiskovy oboviazok i viiskovu sluzhbu" № 2232-XII* [Law of Ukraine about the Military duty and military service activity no. 2232-XII]. (1992, March 25). *Vidomosti Verkhovnoi Rady Ukrainy*. Retrieved from: <https://surli.li/avquva> (accessed 13 February 2026) [in Ukrainian].

25. Verkhovna Rada Ukrainy (2024). *Proiekt Zakonu pro Viiskovu politsiiu: kartka zakonoproiektu № 6569-d* [Draft Law on the Military Police: bill card no. 6569-d]. Retrieved from: <https://surli.li/ubkzcx> (accessed 13 February 2026) [in Ukrainian].

Received / Стаття надійшла до редакції: 02.03.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 25.03.2026

Published / Опубліковано: 30.06.2026

КОВАЛЬОВА ТЕТЯНА ІВАНІВНА

*кандидат юридичних наук, доцент,
секретар секретаріату вченої ради,*

Київський інститут Національної гвардії України

<https://orcid.org/0009-0001-0668-3047>

ОРГАНІЗАЦІЙНО-ПРАВОВІ ЗАСАДИ ЗАПОБІГАННЯ І ПРОТИДІЇ ВІЙСЬКОВІЙ ЗЛОЧИННОСТІ В УМОВАХ ВОЄННОГО СТАНУ

Обґрунтовано організаційно-правові основи запобігання та протидії військовій злочинності в умовах воєнного стану та сформульовано пропозиції щодо вдосконалення відповідного механізму в Україні.

Охарактеризовано сучасні тенденції у військових кримінальних правопорушеннях та систему суб'єктів, відповідальних за запобігання, виявлення, документування, досудове розслідування та судове реагування.

Обґрунтовано пріоритетні напрямки вдосконалення нормативного, інституційного та аналітико-профілактичного механізму в умовах правового режиму воєнного стану.

Доведено, що військову злочинність в умовах воєнного стану слід розуміти не лише як сукупність кримінальних правопорушень, визначених у розділі XIX Кримінального кодексу України, а й як ширше кримінологічне явище, що безпосередньо впливає на військову дисципліну, правопорядок, управління військами, злагодженість підрозділів та боєздатність.

Запропоновано авторське визначення організаційно-правових основ запобігання та протидії військовій злочинності як багаторівневу систему правових норм, інституційних повноважень, процедур управління, інформаційно-аналітичних інструментів, кадрових та психологічних заходів, а також форм міжвідомчої координації, спрямованої на раннє виявлення криміногенних ризиків, запобігання правопорушенням, їх припинення, документування, розслідування та відновлення військового правопорядку.

Показано, що військові кримінальні правопорушення перетворилися з периферійного сегмента злочинності на одну з її домінантних категорій. Також визначено основні проблеми чинної моделі: фрагментацію регулювання, переважання реактивної логіки над превентивною, слабку аналітичну інфраструктуру, надмірне навантаження на командирів як первинних превентивних суб'єктів, високу латентність та незавершеність інституційної моделі військової юстиції. Обґрунтовано, що чинна система вимагає переходу до ризик-орієнтованої моделі профілактики у військових частинах, уніфікації міжвідомчих алгоритмів, цифровізації обліку інцидентів та кримінологічного моніторингу, посилення психологічного та правового забезпечення військовослужбовців, а також завершення інституційного розвитку спеціалізованих військових правоохоронних та правосуддєвих механізмів з урахуванням принципів верховенства права та прав людини.

Практична цінність запропонованого підходу полягає в можливості його використання в законодавчій роботі, правозастосовній практиці, діяльності органів військового управління, Військової служби правопорядку, Державного бюро розслідувань, органів прокуратури, а

також в освітньому та дослідницькому процесі в галузі військового права, кримінології та безпекознавства.

Ключові слова: військова злочинність; військові кримінальні правопорушення; воєнний стан; військовий правопорядок; військова юстиція; Військова служба правопорядку; ризик-орієнтована профілактика.



KOZALIETOV VITALII

*Adjunct,
National Academy of the National Guard of Ukraine,
<https://orcid.org/0009-0007-9540-8277>*

METHODOLOGY FOR SUBSTANTIATING THE COMPOSITION OF THE GROUP OF THE NATIONAL GUARD OF UKRAINE FOR SCRUBBING A POPULATED POINT IN THE DEOCCUPIED TERRITORY

The relevance of the study is determined by the need for a scientifically grounded approach to determining the composition of the grouping of the National Guard of Ukraine for performing search and stabilization tasks in de-occupied territories. The purpose of the article is to develop a methodology for determining the functional and numerical composition of an National Guard of Ukraine grouping intended to conduct search operations (sweeping operations) in a populated area within a de-occupied territory. The proposed methodology combines practical recommendations for organizing service and combat operations with formalized approaches based on graph theory and analytical dependencies.

A modular structure of the grouping is substantiated, including a command group, an isolation echelon, a search echelon, a support echelon, and a reserve. Two variants for organizing the isolation echelon are identified depending on the operational environment conditions (Class A – moderate; Class B – complicated), and corresponding analytical dependencies for calculating its personnel strength are provided. The composition of the search echelon is substantiated using a routing method: the road network of a populated area is modeled as a weighted graph, in which edge-simple longest paths between sets of insertion and extraction points of search groups are determined.

A graphical approach for evaluating the effectiveness of search operation variants is proposed based on the criteria of maximizing the number of inspected objects and minimizing search time. The developed methodology is implemented through four consecutive stages and ensures consistency between tactical actions of units, their functional purpose, and personnel strength. The practical significance of the results lies in the possibility of their direct use by National Guard of Ukraine military command bodies during the planning of search operations, as well as in the feasibility of implementing the methodology as an automated module based on a geoinformation platform.

Keywords: *sweeping operations; National Guard of Ukraine grouping; isolation echelon; search echelon; modular structure; stabilization operation; de-occupied territory; graph theory; routing method; route plan; personnel strength; special operation.*

Statement of the problem. The full-scale armed aggression of the Russian Federation against Ukraine has highlighted the task of ensuring security, law, and order in de-occupied territories. The experience of liberating Kyiv, Kharkiv, and Kherson oblasts demonstrated that after the withdrawal of enemy troops, members of illegal armed groups (IAGs), diversionary-reconnaissance groups (DRGs), collaborators, and other threats to the population and authorities may remain.

One of the primary methods to neutralize these threats is conducting search operations (combing) within a settlement as part of special operations. At the same time, an analysis of the activities of

military command organs shows that determining the composition of the force grouping is often carried out without sufficient scientific justification, which reduces the efficiency of mission execution.

Thus, it is urgent to develop a methodology for forming a force grouping to conduct search operations (combing) in settlements. This methodology should combine practical provisions for organizing service and combat operations with formalized approaches to determining the functional and numerical composition of the grouping, ensuring the rational use of the combat capabilities of the forces and assets of the components of Ukraine's security and defense sector.



© V. Kozalietov, 2026

© Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine, 2026

Analysis of recent research and publications.

The scientific work of specialists from the National Guard of Ukraine (NSU) and related scientific institutions covers a number of interconnected areas that collectively form the necessary theoretical foundation for justifying the composition of the NSU grouping during the organization and conduct of search operations in settlements. Specifically, the works of T.A. Sutyushev and P.V. Pistryak defined the essence and principles of organizing search and strike actions of the former Internal Troops of the Ministry of Internal Affairs of Ukraine, laying the groundwork for the further development of the tactics of employing law enforcement forces in special operations.

The further development of these provisions was achieved in the studies of V.Yu. Panchenko, V.V. Obriadin, V.V. Kalianda, and P.V. Pistryak, which examined the organizational and tactical aspects of the service and combat activities of the NSU in stabilization operations and substantiated approaches to planning search operations in settlements.

The issue of countering the enemy's diversionary-reconnaissance groups was considered in the works of V. I. Baratiuk, O. V. Lazorenko, and V. B. Korchev, where practical recommendations for organizing relevant measures were proposed.

A separate direction consists of the studies of M. M. Orlov, O. S. Nadtochy, and R. O. Honchar, which are dedicated to the development of the intelligence support system and the employment of unmanned assets.

The purpose of the article is to develop and present a methodology for determining the functional and numerical composition of the NSU grouping for conducting search operations in a

settlement within a de-occupied territory.

Presentation of the main material.

General Approaches to Forming the NSU Grouping. The formation of a grouping for conducting search operations is carried out taking into account the interagency nature of the special operation and the need for the effective use of the capabilities of various components of the security and defense sector. Justifying the composition of the grouping includes:

- Analyzing the operational situation;
- Determining the role of the NSU within the grouping;
- Developing the concept of search operations;
- Determining the appropriate composition of forces.

This approach corresponds to practical recommendations for planning stabilization operations.

Modular Structure of the Grouping.

Command and control of the forces and assets of the grouping consists of coordinating search operations organized under a single concept during a special operation. Based on the generalization of practical experience and scientific approaches, a modular structure of the grouping has been substantiated (Fig. 1).

In this study, the combat composition of the NSU grouping is understood as a set of organic, attached, and reinforcing forces and assets designed to ensure the effective execution of search operations (combing) under specified situational conditions. The logistical support component of the grouping is not detailed separately within this study and is assumed to fully meet the needs of the grouping during the execution of the assigned tasks.

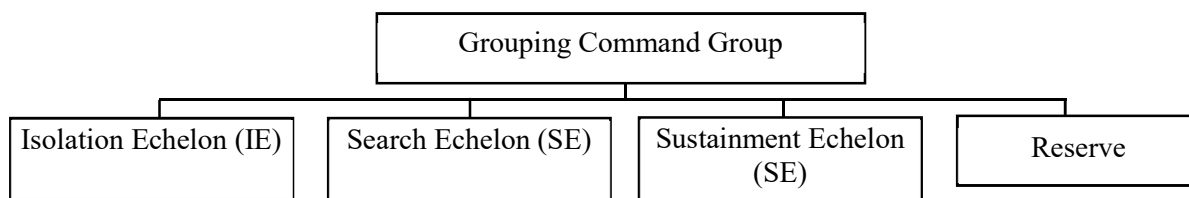


Figure 1 – Typical modular structure of the NSU grouping for conducting search operations in a settlement (variant)

It is advisable to form the NSU grouping as a set of functional elements, each performing a specified volume of tasks during search operations (combing), namely:

- **Grouping Command Group** – exercises leadership, coordinates actions, and organizes sustainable command and control of forces;
- **Isolation Echelon** – ensures the isolation (blocking) of the settlement, cuts off possible escape routes for IAG members, and creates conditions for the safe operation of search groups;
- **Search Echelon** – executes direct search measures: combing the terrain, inspecting buildings, checking citizens, and detecting and detaining suspicious persons;
- **Sustainment Echelon (Group)** – provides sub-units with material resources, transport, fuel, food, and other resources necessary for the continuous execution of designated missions;
- **Reserve** – designed to respond to sudden changes in the situation, reinforce specific directions, and perform unforeseen tasks.

The specified structure and functionality ensure the adaptability of the grouping to situational changes and the possibility of its flexible deployment.

Justifying the Composition of the Isolation Echelon. During isolation operations (blocking, encirclement) of settlements or specific areas of urban development, an NSU battalion (company, platoon) can perform tasks as part of military detachments and functional groups forming the isolation echelon of the special operation area. This echelon may include blockposts, control-and-access points, screens, patrols, secret observation posts, observation posts, and other elements of the isolation system.

The forces and assets of the isolation echelon are deployed in advance and operate in cooperation with search groups according to a single concept of the special operation. For each platoon (group), sectors of responsibility are defined, covering specifically designated areas of the urban territory.

If intelligence is available regarding the presence of small groups of IAG members in the settlement and the probability of organized armed resistance, assault groups (teams) from special purpose units may be involved in executing the tasks.

Taking into account the nature of the operational situation, available forces and assets, and the specifics of the special operation area, the isolation echelon can be built according to two variants:

Class A – moderate situation, one control-and-access point (CAP) and one vehicle patrol are

deployed in each sector, with service conducted in two to three shifts. Thus, service in one sector will be carried out by a composite sub-unit (module) numbering 14 servicemen. Based on the above initial premises, the required numerical strength of the main sub-units of the EI, whose combat order is built according to Class A, will be determined by the expression:

$$\Psi C_{EI(A)} \approx (k_{\text{сект.}} \cdot k_{\text{змш.}} \cdot 14) + P_{EI(A)}$$

where $k_{\text{сект.}}$ is the number of sectors; $k_{\text{змш.}}$ is the number of shifts (depends on the established service mode – two or three shifts); $P_{EI(A)}$ is the IE reserve amounting to 5% of the obtained value (remains in readiness to perform suddenly arising tasks in a specified EI sector).

Class B – complicated situation, the basis of the IE consists of blockposts and screens. If necessary, vehicle patrolling of the sector can be carried out using an armored vehicle (APC) of a blockpost or a screen. Furthermore, in the event of a sharp complication of the operational situation when IAG members are detected in the settlement and mount armed resistance, it is advisable to establish a round-the-clock, non-releasable service mode for EI elements. Based on the above initial premises, the sufficient numerical strength of the main sub-units of the EI, whose combat order is built according to Class B, will be determined by the expression:

$$\Psi C_{EI(B)} \approx \sum_{i=1}^{k_{\text{сект.}}} [\Psi_{\text{БП}} + (\Psi_{\text{з}} \cdot k_{\text{мш.}}^i)] + P_{EI(B)}$$

where $k_{\text{сект.}}$ is the number of sectors; $\Psi_{\text{БП}}$ is the numerical strength of one blockpost (23–25 servicemen); $\Psi_{\text{з}}$ is the numerical strength of a screen in open terrain (23 servicemen); $k_{\text{мш.}}^i$ is a coefficient characterizing the terrain type in the i -th sector ($k_{\text{мш.}}^i = 1$ - open, $k_{\text{мш.}}^i = 1,5$ medium-broken, $k_{\text{мш.}}^i = 2$ closed terrain); $P_{EI(B)}$ is the IE reserve amounting to 5% of the obtained value (remains in readiness to perform suddenly arising tasks in a specified IE sector).

The numerical strength is determined by analytical dependencies, taking into account the number of sectors, the service mode, and terrain conditions.

At the initial stage of the special operation, the occupation of designated lines by the forces and assets of the isolation echelon can be carried out:

- concealed – deployment of forces and assets of the isolation echelon to the settlement if there is a sufficient reserve of time or upon

receiving reliable intelligence about the presence of large groups of IAG members in it (Figure 2);

- unconcealed – deployment of isolation echelon forces to the settlement under conditions of insufficient time and occupying designated lines from the march (Figure 3).

Table 1 – Comparative characteristics of IE combat order variants

Indicator	Class A (Moderate)	Class B (Complicated)
Main element	CAP + vehicle patrol	Blockpost + screen + vehicle patrol
Strength per sector	14 servicemen	46–69 servicemen
Service mode	2–3 shifts	Round-the-clock, non-releasable
Armored vehicles	Armored car	APC or armored car
Total strength of sub-units in a sector	28/42 servicemen	46–69 servicemen

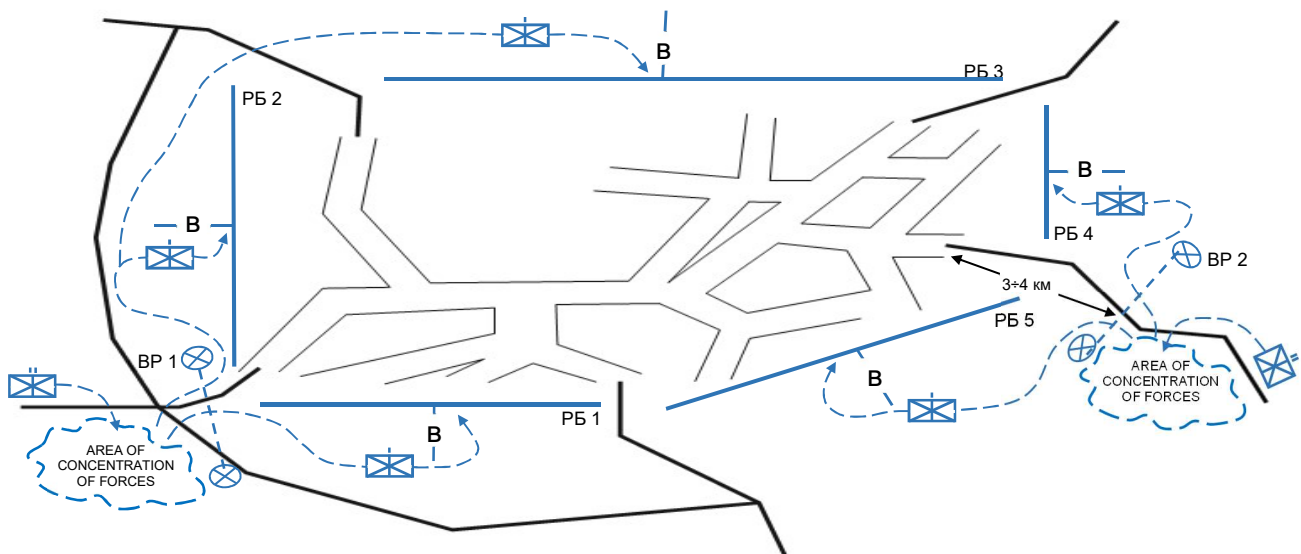


Figure 2 – Concealed deployment of forces and assets of the isolation echelon to the settlement

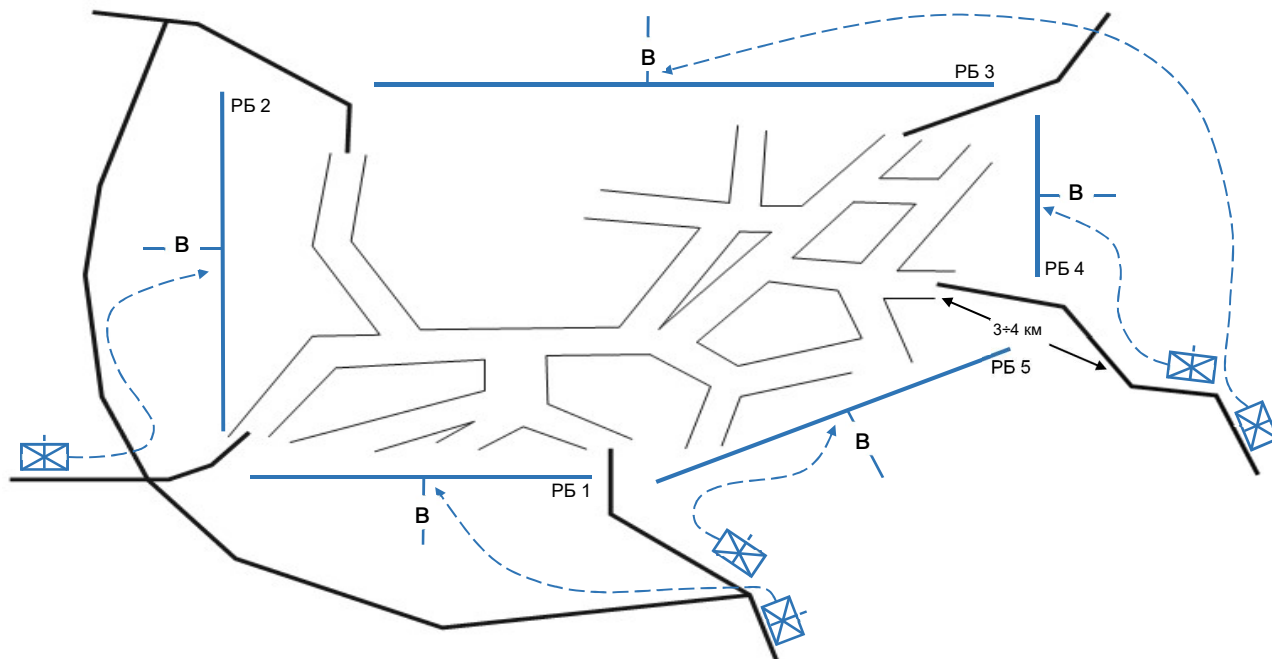


Figure 3 – Unconcealed deployment of forces and assets of the isolation echelon to the settlement

Justifying the Composition of the Search Echelon. The search echelon is the main element of the grouping executing the direct combing of the settlement. The movement routes of search groups are determined by the Routing Method, which is based on graph theory. The road network of the settlement is modeled as a weighted graph:

$$G(V, E, w), \quad (3)$$

where V is a set of vertices (intersections); E is a set of edges (streets); w is the edge weight (the number of objects to be checked along the street section).

On graph G , all edge-simple longest paths between the sets of entry points A and exit points B are found. Each such path is the route of an individual search group. The number of routes determines the required number of groups. The total strength of the EP is determined by the expression:

$$N_{EP} = n_{nr} \cdot N_{nr}, \quad (4)$$

where n_{nr} is the number of search groups; $N_{nr} = 15$ servicemen (the typical numerical strength of one group: inspection team (8 servicemen); K9 handler with a dog (1 serviceman + 1 dog); mine-clearing team (2 servicemen); medic (1 serviceman); APC/LBA crew (3 servicemen)).

Tactical Foundations. The tactics of search groups are based on the provisions of the service and combat activities of the NSU and the

experience of countering enemy DRGs. Search groups operate along designated routes, ensuring a sequential inspection of the territory and objects. The search tempo depends on the density of the built-up area and can range from 300 to 600 meters per hour.

Formalization of Routing. To justify the number of search groups, the Routing Method developed in work is applied, which is based on the use of graph theory. The road network of the settlement is modeled as a weighted graph, allowing the determination of optimal routes for the movement of search groups and ensuring load balancing between them. Two variants of building inspection tactics are distinguished:

- *Variant 1 (Pair):* The first pair controls the perimeter and windows, while the second carries out the direct inspection inside;
- *Variant 2 (Trio):* Simultaneous control of the entrance, rooms, and adjacent territory, which is advisable for multi-story or complex objects.

Generalized Methodology for Determining Grouping Composition. As a result of integrating modules with corresponding properties into a single system, it becomes possible to form a rational structure, functional purpose, and the required numerical strength of an NSU grouping capable of effectively executing tasks to search for armed criminals in a settlement.

Thus, actions aimed at searching for armed criminals should be divided into three main (basic) components: isolation of the settlement, combing

the settlement (search actions within the settlement), and sustainment (supporting) actions.

Accounting for this approach became the basis for developing a general methodology for determining the necessary functional and numerical composition of an NSU grouping designed to execute tasks to search for armed criminals in a settlement. The methodology combines four sequential, logically connected stages, namely: Stage I – "Determining the required functional and numerical composition of the IE"; Stage II – "Determining the required functional and numerical composition of the SE"; Stage III – "Determining the required functional and numerical composition of the SE"; Stage IV – "Determining the numerical strength of the NSU grouping as a whole," which is defined by the expression:

$$N_{\text{ЧСГ}} = N_{\text{ЕІ}} + N_{\text{ЕІІ}} + N_{\text{ЕІІІ}} + N_{\text{псз}}. \quad (5)$$

The result of applying the methodology is the determination of the necessary functional and numerical composition of the NSU grouping both by individual elements and as a whole, the formation of the combat order of the isolation echelon, and the development of a route plan for searching for armed criminals by the forces of the search echelon within a designated settlement. The application of the methodology ensures coordination between the tactical actions of sub-units, their functional purpose, and their numerical strength.

Evaluating the Effectiveness of Search Action Variants. During the preparation and planning of actions, the military command organ, as a rule, elaborates several variants for the employment of forces and assets.

Based on the results of formalizing the process of searching for armed criminals (IAG representatives) in a settlement, the formed set of decision variants $x_1, x_2, \dots, x_m$, where m is the number of elaborated variants, can be ordered by their degree of effectiveness, allowing the selection of the most expedient decisions and the exclusion of the least effective variants.

To select a rational variant, a graphical approach to evaluating effectiveness based on the ratio of results to resource costs is proposed.

The graphical approach to evaluating the effectiveness of various decision variants elaborated according to the criterion of the maximum number of checked objects is presented in Figure 4. With established (directive) values of the target result ($I_{\text{ну}}^{\text{сгм}}$) and resource costs ($W_{\text{зр.НГУ}}^{\text{сгм}}$) for maintaining the National Guard grouping, it becomes clear that effective decision variants will be located in Quadrant I (highlighted in a different color), Figure 4. Variants located in Quadrants II, III, and IV must be discarded as ineffective.

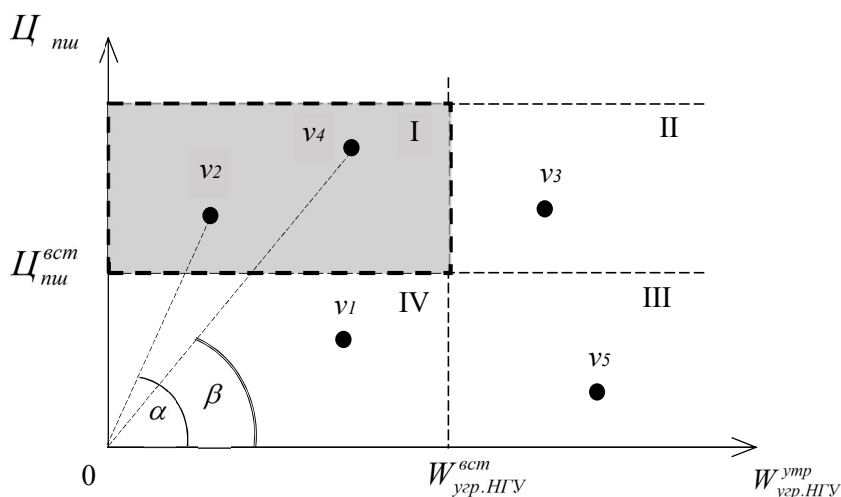


Figure 4 – Determining the best decision variant for conducting search operations in a settlement (according to the criterion of the maximum number of checked objects)

Thus, the effective variants are v_2 and v_4 . The best of these two variants will be the one for which the tangent of the angle is the largest – the costs for such a variant are lower. Therefore, based on Figure 4, preference will be given to variant v_2 ($v_2 \succ v_4$, since $\text{tg}\alpha > \text{tg}\beta$). By operating

with the values of the tangent of the angle, one can determine both the relative and absolute advantages of one variant over another.

Based on physical meaning, effective variants elaborated according to the criterion of the minimum total search time will be located in Quadrant IV. In this case, the effective variant is variant v_4 , and it

is the only one, Figure 5. The remaining variants must be discarded as not meeting the criterion.

If several variants of action are located in Quadrant IV, the best of them is also determined through the tangent of the angle – just as in the first case, Figure 4.

If all points (their corresponding elaborated variants) are located in inappropriate quadrants, the decision-making process must be repeated by changing (adjusting) the initial data or loosening the boundary conditions.

Practical Recommendations. When using the developed methodology, it is advisable for officials of the NSU military command organs to adhere to the following provisions and take into account these aspects:

Determine the number of sectors of the EI combat order according to the terrain conditions, using natural and artificial lines (transport communications, rivers, forests, tree lines, etc.) as sector boundaries. Assign a senior commander from among the junior command staff in each sector, granting them the right to maneuver forces and assets within the sector, followed by a report to the IE commander.

In conditions of a planned check of a settlement, carry out the concentration of forces and assets of the NSU grouping concealedly, and occupy the designated sectors with EI forces and assets

simultaneously. Under conditions of limited time, conduct the occupation of sectors from the march, as forces and assets arrive in the designated area.

Given an elongated geometry of the settlement, it is advisable to determine the general direction of the search along the longer side or the main transport communication, which reduces the required number of EP search groups. Entry points into the search (set A) and exit points from the search (set B) should be chosen on opposite sides of the settlement; the number of points in each set should be 3–5. The formation of search routes should be carried out until the transitive closure between sets A and B disappears.

When constructing the initial weighted graph $\bar{G}'$, take into account all transport communications (routes) of the settlement where search groups can pass in a deployed combat order.

Given sufficient time, it is advisable to choose the maximum number of checked objects as the optimization criterion for search measures, and under limited time conditions – the minimum time for conducting the search. If several variants are processed according to one of the criteria, preference should be given to the variant with the highest probability value of detecting criminals during the implementation of the corresponding route plan.

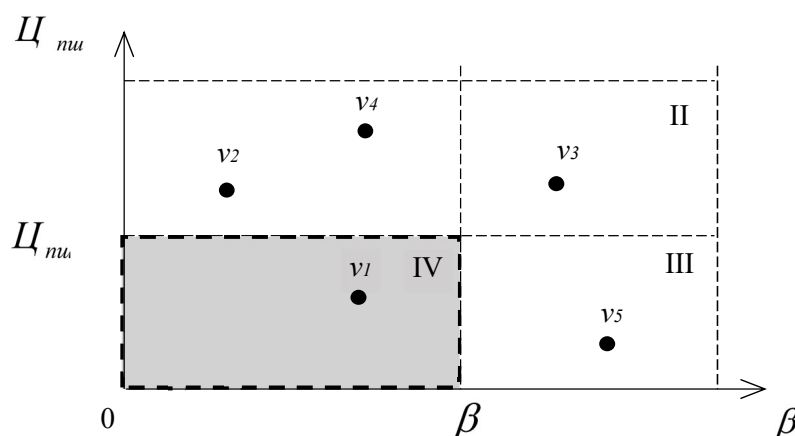


Figure 5. Determining the best decision variant for conducting search operations in a settlement (according to the criterion of the minimum total search time)

Given sufficient time, it is advisable to choose the maximum number of checked objects as the optimization criterion for search measures, and under limited time conditions – the minimum time for conducting the search. If several variants are processed according to one of the criteria, preference should be given to the variant with the

highest probability value of detecting criminals during the implementation of the corresponding route plan.

It is advisable to plan the start of search group actions simultaneously. If it is impossible to introduce all groups into the search at the same time, introduce groups with the highest load in terms of

the number of checked objects first, followed by groups with a lower load. The actions of search groups must be supported by UAV assets, and group commanders must maintain stable communication with the grouping's command group and the SE commander.

After determining the search routes, mandatory re-engineering must be carried out to minimize the spread of route weight estimates ($w_1, w_2, \dots, w_n$), where n is the number of formed search routes. Re-engineering should be carried out by reassigning the initial and final edges of routes between different search groups.

Given the complexity of calculations within dense network objects and the limited time for processing variants of action, it is advisable to implement the developed methodology for determining the necessary functional and numerical composition of the NSU grouping designed to search for armed criminals in a settlement in the form of an automated software module based on a geoinformation platform.

Conclusions and prospects for further research. The article develops a methodology for justifying the functional and numerical composition of an NSU grouping designed to conduct search operations (combing) in a settlement within a de-occupied territory. The proposed approach is based on combining practical recommendations for organizing service and combat operations with formalized methods of analysis and routing of search groups.

In the course of the study, the modular structure of the NSU grouping was substantiated, the functional purpose of its main elements was determined, and approaches to forming the isolation echelon and search echelon were developed, taking into account the specifics of the operational situation and urban development.

An approach to evaluating the effectiveness of search action variants according to the criteria of performance and resource costs is proposed, providing the opportunity to select the most expedient variants for employing the forces and assets of the NSU grouping during a special operation.

The practical significance of the obtained results lies in the possibility of using the developed methodology by the NSU military command organs during the planning and conduct of search operations in settlements within de-occupied territories, as well as the expediency of its further automation based on modern geoinformation systems.

The direction of further research should be considered the improvement of approaches to planning and conducting search operations in settlements within de-occupied territories using modern geoinformation systems and automation tools. The development of software solutions to support decision-making by NSU military command organs is also promising, which will allow for faster formation of search group routes, evaluation of possible action variants, and more effective use of available forces and assets under a complex operational situation.

References

1. Kozalietov V. V., Batsamut V. M. (2025). *Problemni pytannia u diialnosti orhaniv upravlinnia Syl bezpeky pid chas planuvannia poshukovykh dii u naselenykh punktakh na deokupovanii terytorii Ukrainy: shliakhy vyrishennia* [Problematic issues in the activities of security forces management bodies in planning search operations in settlements on the deoccupied areas of Ukraine: solutions]. *Bezpeka derzhavy*, no. 1 (5), pp. 47–55 [in Ukrainian].
2. Sutiusev T. A., Pistriak P. V. (2009). *Sutnist, zavdannia, pryntsypy ta pobudova poshukovo-udarnykh dii vnutrishnikh viisk u spetsialnii operatsii z lokalizatsii ta neitralizatsii vnutrishnoho zbroinoho konfliktu* [The essence, tasks, principles, and structure of search-and-strike operations of internal troops in a special operation to localize and neutralize an internal armed conflict]. *Systemy ozbroiennia i viiskova tekhnika*. Kharkiv : NU povitrianykh syl im. I. Kozheduba, no. 4 (20), pp. 17–21 [in Ukrainian].
3. Panchenko V. Yu., Obriadin V. V., Kalianda V. V. (2021). *Orhanizatsiino-taktychni aspekty sluzhbovo-boiovoi diialnosti NHU u stabilizatsiinykh operatsiiakh* [Organizational and tactical aspects of the service and combat activities of the NGU in stabilization operations]. *Chest i zakon*, no. 3 (78), pp. 24–32 [in Ukrainian].
4. Kozalietov V. V., Batsamut V. M. (2026). *Metod marshrutyatsii poshukovykh hrup na statsionarnii merezhi dlia efektyvnoho prochysuvannia naselenykh punktiv* [Method of routing search groups on a stationary network for effective combing of settlements]. *Chest i zakon*, no. 1 (96), pp. 81–93. DOI: [https://doi.org/10.33405/2078-7480/2026/96/1\(96\)/363052](https://doi.org/10.33405/2078-7480/2026/96/1(96)/363052) [in Ukrainian].
5. Panchenko V. Yu., Obriadin V. V., Kalianda V. V., Pistriak P. V., Kryvenko O. V. (2022). *Udoskonalennia systemy upravlinnia pidrozdilamy NHU u stabilizatsiinykh diiakh* [Improvement of the command and control system

of the NGU units in stabilization operations]. *Zbirnyk naukovykh prats Natsionalnoi akademii Natsionalnoi hvardii Ukrainy*. Kharkiv : NA NHU, vol. 2, pp. 44–53 [in Ukrainian].

6. Panchenko V. Yu., Obriadin V. V., Kalianda V. V., Kryvenko O. V. (2023). *Osoblyvosti zastosuvannya NHU u stabilizatsiinykh operatsiinykh na deokupovanykh terytoriakh* [Peculiarities of the use of the NGU in stabilization operations in de-occupied territories]. *Chest i zakon*, no. 1 (84), pp. 12–21 [in Ukrainian].

7. Obriadin V. V., Kalianda V. V., Panchenko V. Yu. (2023). *Rol NHU u systemi zabezpechennia vnutrishnoi voiennoi bezpeky derzhavy* [The role of the NGU in the system of ensuring internal military security of the state]. *Visnyk Natsionalnoho Universytetu tsyvilnoho zakhystu Ukrainy. Seriya: derzhavne upravlinnia*. Cherkasy : Nationalnyi universytet tsyvilnoho zakhystu Ukrainy, no. 2, pp. 67–75 [in Ukrainian].

8. Baratiuk V. I., Lazorenko O. V., Korchev V. B. (2020). *Rekomendatsii shchodo orhanizatsii borotby z DRH protyvyka u prykordonnykh raionakh* [Recommendations on the organization of the fight against enemy sabotage and reconnaissance groups in border areas]. *Chest i zakon*, no. 2 (73), pp. 34–41 [in Ukrainian].

9. Baratiuk V. I., Korchev V. B., Lazorenko O. V. (2021). *Osoblyvosti dii prykordonnykh pidrozdiliv u vypadku zbroinykh provokatsii na derzhavnomu kordonni* [Peculiarities of the actions of border units in the event of armed provocations on the state border]. *Nauka i tekhnika Povitrianykh Syl*. Kharkiv: NU povitrianykh syl im. I. Kozheduba, no. 1, pp. 98–106 [in Ukrainian].

10. Lazorenko O. V., Baratiuk V. I. (2022). *Metodyka navchannia ofitseriv prykordonnoi sluzhby shchodo planuvannya spetsialnykh dii z poshuku pravoporushnykiv* [Methods of training border service officers in planning special actions to search for offenders]. *Zbirnyk naukovykh prats Natsionalnoi akademii Derzhavnoi prykordonnoi*

sluzhby. Seriya: viiskovi ta tekhnichni nauky. Khmelnytskyi : NA DPSU, vol. 2 (27), pp. 55–63 [in Ukrainian].

11. Orlov M. M., Nadtochyi O. S., Honchar R. O. (2013). *Pidkhody do formuvannia systemy rozvidky uhrupovannia vnutrishnikh viisk u terytorialnii oboroni* [Approaches to the formation of the intelligence system of a grouping of internal troops in territorial defense]. *Chest i zakon*, no. 1, pp. 40–48 [in Ukrainian].

12. Orlov M. M., Honchar R. O. (2012). *Kontseptualni pidkhody do rozroblennia metodyky formuvannia systemy rozvidky vnutrishnikh viisk* [Conceptual approaches to the development of methods for the formation of the intelligence system of the internal troops]. *Chest i zakon*, no. 1, pp. 32–37 [in Ukrainian].

13. Honchar R. O. (2021). *Pidkhody do zastosuvannia bezpilotnykh litalnykh aparativ dlia okhorony vazhlyvykh derzhavnykh obektiv* [Approaches to the use of unmanned aerial vehicles for the protection of important state facilities]. Proceedings of the International scientific and practical conference "Zastosuvannia informatsiinykh tekhnolohii u pidhotovtsi ta diialnosti syl okhorony pravoporiadku" (Ukraine, Kharkiv, March 15, 2021). Kharkiv : NA NHU, pp. 9–10 [in Ukrainian].

14. Bondarenko O. H., Yemanov V. V., Batsamut V. M., Morkvin D. A., Puzyrov M. S., Hladkov V. S., Kozalietov V. V., Butuzov V. Yu., Danko V. V., Lavrov I. S., Manzhura S. A., Adamchuk M. M. (2024). *Perspektyvna model rozvytku NHU dlia zabezpechennia vnutrishnoi bezpeky derzhavy (NDR «Perspektyva»)* [Perspective model of NGU development for ensuring internal security of the state (R&D "Perspektiva")]. State registration no. 0123U101405. Kharkiv : NA NHU [in Ukrainian].

Christofides, N. (1975). *Graph Theory: An Algorithmic Approach*. London : Academic Press [in English].

Received / Стаття надійшла до редакції: 02.04.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 30.04.2026

Published / Опубліковано: 30.06.2026

КОЗАЛІСТОВ ВІТАЛІЙ ВАЛЕРІЙОВИЧ

ад'юнкта,

Національна академія Національної гвардії України

<https://orcid.org/0009-0007-9540-8277>

МЕТОДИКА ОБҐРУНТУВАННЯ СКЛАДУ УГРУПОВАННЯ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ ДЛЯ ПРОЧІСУВАННЯ НАСЕЛЕНОГО ПУНКТУ НА ДЕОКУПОВАНІЙ ТЕРИТОРІЇ

Розроблено методику визначення функціонального й чисельного складу угруповання Національної гвардії України для проведення пошукових заходів (прочісування) у населеному пункті на деокупованій території. Запропонована методика поєднує практичні рекомендації щодо організації службово-бойових дій із формалізованими підходами на основі теорії графів та аналітичних залежностей.

Обґрунтовано модульну структуру угруповання, до якого входять група управління, ешелон ізоляції, ешелон пошуку, ешелон забезпечення та резерв. Визначено два варіанти побудови ешелону ізоляції залежно від характеру оперативної обстановки (клас А – помірна; клас Б – ускладнена), а також наведено відповідні аналітичні залежності для розрахунку його чисельного складу. Склад ешелону пошуку визначається методом маршрутизації: дорожня мережа населеного пункту моделюється зваженим графом, у якому здійснюється пошук реберно-простих найдовших шляхів між множинами точок введення та виведення пошукових груп.

Запропоновано графічний підхід до оцінювання ефективності варіантів пошукових дій за критеріями максимуму об'єктів перевірки та мінімуму часу проведення пошуку. Розроблена методика передбачає чотири послідовні етапи й забезпечує узгодженість тактичних дій підрозділів із їх функціональним призначенням і чисельним складом. Практичне значення результатів полягає у можливості їх використання органами військового управління Національної гвардії України під час планування пошукових заходів, а також у реалізації розробленої методики у вигляді автоматизованого модуля на базі геоінформаційної платформи.

Ключові слова: *прочісування; угруповання Національної гвардії України; ешелон ізоляції; ешелон пошуку; модульна структура; стабілізаційна операція; деокупована територія; теорія графів; метод маршрутизації; маршрутний план; чисельний склад; спеціальна операція.*



MARCHENKO MAKSYM

Candidate of Juridical Sciences,

Doctoral Student,

Kharkiv National University of Internal Affairs

<https://orcid.org/0009-0006-0078-8346>

LEGAL REGULATION OF MINE ACTION ACTIVITIES: EVOLUTION OF THE OTTAWA CONVENTION IN THE CONTEXT OF NEW SECURITY CHALLENGES

The legal regulation of mine action activities in the context of the transformation of the global security architecture has been analyzed, necessitating a reassessment of international and national mechanisms prohibiting anti-personnel mines. The historical retrospective of the development of humanitarian restrictions from the late twentieth century to contemporary state practice has been examined, with particular emphasis on the processes of genesis, implementation, and conceptual reconsideration of the 1997 Ottawa Convention.

The reception of the Convention's provisions into national legislation has been considered, and the legal grounds for the temporary suspension of international obligations due to a fundamental change of circumstances caused by the full-scale armed aggression of the Russian Federation against Ukraine have been substantiated. The necessity of strengthening international and national legislation governing mine action activities has been justified, along with enhancing the level of institutional clarity regarding mandates and coordination mechanisms of mine action actors under conditions of increasing instability in the global security environment.

Keywords: *international law, international treaties, national and international security, anti-personnel mines, mine action, international humanitarian law, denunciation of an international treaty, non-governmental organizations.*

Statement of the problem. The scale of human losses among civilian populations caused by the use of landmines has, for decades, provoked international outrage and served as a catalyst for the development of international legal mechanisms aimed at their complete prohibition. The culmination of these efforts was the conclusion in 1997 of the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction (hereinafter – the Ottawa Convention), which remains a key instrument of international humanitarian law.

However, the transformation of the contemporary security architecture and the escalation of high-intensity armed conflicts have revived the discussion concerning the effectiveness of existing prohibition regimes. According to the Landmine Monitor 2024 report, the number of casualties caused by anti-personnel mines and explosive remnants of war (ERW) worldwide increased by 22% compared to previous years, reaching the highest levels recorded over the past five years [1]. At the same time, approximately

84–90% of all victims are civilians, nearly half of whom are children [2]. This alarming dynamic is driven by the large-scale use of mines in conflicts in Myanmar and Syria, as well as a consequence of the armed aggression of the Russian Federation against Ukraine.

The issue has acquired critical significance against the backdrop of developments in recent years, during which several states, including Poland, Finland, and the Baltic States (Lithuania, Latvia, and Estonia), began openly discussing or taking steps toward reconsidering their membership in the Ottawa Convention, motivated by the fundamental deterioration of the security situation in Europe and the need to establish effective defensive lines [3]. For Ukraine, this issue is existential: being engaged in a full-scale war, the state is compelled to balance humanitarian obligations with its inherent right of self-defence. This has created a unique precedent for suspending the operation of certain provisions of the Convention on the basis of the norms of the Vienna Convention on the Law of Treaties, requiring



© M. Marchenko, 2026

© Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine, 2026

thorough legal analysis through the prism of the doctrine of fundamental change of circumstances.

Therefore, the relevance of this study is determined by the necessity of scholarly reconsideration of the balance between military necessity and the protection of human rights under conditions of an unstable global security landscape. Analysis is required not only of the historical genesis of prohibition norms but also of contemporary challenges to the universalization of the Ottawa Convention, when leading military powers of the world (the United States, the Russian Federation, and China) remain outside its framework, while States Parties are compelled to adapt their obligations to the realities of modern conventional warfare.

Analysis of recent research and publications.

The study of anti-personnel mines and mine action activities has, for decades, remained the focus of attention of international legal scholars, security experts, and human rights institutions. Contemporary academic discourse has evolved from purely humanitarian condemnation of indiscriminate weapons toward a complex analysis of the legitimacy of their use under conditions of large-scale conventional warfare.

The foundation of this research consists of works examining the problem of anti-personnel mines through the prism of the principles of international humanitarian law. In particular, T. Chittle analyzes the history of mine use as a weapon inherently cruel in nature and incompatible with the standards of the Hague Conventions. The scholar rightly notes that even where technological alternatives exist (self-destruct mechanisms), the financial and logistical burden of fully replacing arsenals remains a barrier for many states [4].

The historical continuity of humanitarian restrictions has been examined by

N. Yevhlevska. The scholar analyzed the significance of the 1868 St. Petersburg Declaration as the first international agreement establishing the foundations of humanitarian law. The author emphasized that already in the nineteenth century the international community recognized the necessity of limiting the means and methods of warfare [5]. However, under contemporary conditions, these principles require adaptation to the realities of high-intensity combat operations.

The role of civil society in shaping the “Ottawa Process” is thoroughly highlighted in the works of D. Hüber, who interprets the prohibition of mines as a successful case of global humanitarian advocacy [6]. This position is shared by

K. Droege and M. Brehm, who in their publication dispel the illusion of the “security” allegedly provided by minefields, emphasizing the long-term risks posed to civilian populations [7]. An important argument against the legitimization of anti-personnel mines was the collective statement issued by more than 100 recipients of the 1997 Nobel Peace Prize, who in 2025 called upon states that had announced their withdrawal from the Ottawa Convention to reconsider their decisions [8]. This position demonstrates the profound concern of the global academic and human rights community regarding the possible erosion of the humanitarian consensus.

United Nations materials [9] and the annual Landmine Monitor reports [1] remain the primary sources of empirical data. They document an alarming trend: despite decades of progress, an increase in the number of victims continues to be observed. This is associated with the emergence of new conflict zones and the large-scale use of mines by states not party to the Convention (particularly the Russian Federation).

Ukrainian scholars have laid the theoretical foundation for understanding anti-personnel mines as a complex administrative and legal category [10]. In particular, previous works of the author of this study emphasized the problem of fragmented legal regulation in this field [11], substantiated the necessity of systematizing national legislation [12], and identified the role of international cooperation in shaping the Ukrainian demining model [13]. However, the full-scale aggression of the Russian Federation has created new challenges that had not previously been reflected in domestic doctrine, particularly the issue of temporary suspension of the operation of certain treaty obligations.

A review of contemporary literature indicates the emergence of a new direction of research — the analysis of the “crisis of the Ottawa regime.” Whereas earlier attention focused primarily on the universalization of the Convention, today the problem of denunciation or withdrawal from obligations by the Baltic States, Poland, and Finland due to a fundamental change of circumstances (*rebus sic stantibus*) has come to the forefront. It is precisely this aspect — the search for a balance between the imperatives of state survival and humanitarian standards — that remains the least researched and constitutes the scientific novelty of this publication.

The purpose of the article is to conduct a comprehensive historical-legal and comparative analysis of the genesis of the Ottawa Convention, to determine the role of international and non-state

actors in its formation, and to examine the transformation of the international obligations of Ukraine and EU states in the context of contemporary security challenges and the application of the doctrine of fundamental change of circumstances.

Presentation of the main material. The genesis of the legal regulation of mine action cannot be considered separately from the general evolution of international humanitarian law, which is based on the continuous search for a compromise between military expediency and the requirements of humanity. The formation of the normative foundation that subsequently enabled the codification of the prohibition of specific types of weapons began with the recognition of the necessity to establish limits on violence in armed conflicts.

The 1868 St. Petersburg Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight, together with the 1863 Lieber Code and the 1864 Geneva Convention, laid the foundation for the modern law of armed conflict. Although designated as a "Declaration," it possessed full legal force for the 17 participating states and entered into force on 11 December 1868 [5]. The 1868 St. Petersburg Declaration became the first attempt to restrict the range of weapons used on the battlefield. It established the principle according to which the laws of humanity prohibit "the use of arms which uselessly aggravate the sufferings of disabled men or render their death inevitable" [6].

However, it was not the substantive part of the St. Petersburg Declaration that entered history, but rather its preamble, which established principles that remain fundamental to international humanitarian law even today. Recognizing that circumstances exist in which "military necessity ought to be reconciled with the requirements of humanity," it formulated the existence of limitations in the choice of means and methods of warfare and developed the first definition of the concept of "military necessity." The boundaries of an acceptable level of violence were defined as contributing to the weakening of the "military forces of the enemy." The condemnation of the "employment of arms which uselessly aggravate the sufferings of disabled men" contains a clear formulation of the principle prohibiting superfluous injury and unnecessary suffering. Furthermore, harm inflicted upon civilians became recognized as an unlawful object of warfare [5].

Although anti-personnel mines were first employed during the Civil War in the United States

of America, their widespread use began during the First World War. Anti-tank mines were initially used primarily to strengthen defensive positions, but given the relative predictability of their placement and the possibility of their rapid detection and neutralization by the enemy, anti-personnel mines were developed, namely engineering munitions (explosive devices) activated by the presence, proximity, or contact of a person or machine. Their distinctive feature lies in their smaller size compared to anti-tank or naval mines and in their intended purpose, which is to disable or maim enemy personnel rather than to inflict fatal injury. Conceptually, their emergence was based on the assumption that a wounded servicemember creates a greater burden for medical and logistical services than a deceased one, while a significant number of wounded personnel additionally exerts a negative impact on the morale of other servicemembers.

Mine warfare played a significant role during the Second World War. However, owing to the long-term persistence of explosive charges and the difficulties associated with maintaining proper marking, even correctly installed minefields eventually became a serious threat to civilian populations. Contemporary casualties caused by mines from that period in the State of Libya and the Republic of Poland testify to this reality [6, p. 21]. In Europe, following the end of the Second World War, prisoners of war were frequently involved in demining operations. Although the pace of such operations was high, the methods employed at the time are, from a contemporary perspective, considered extremely hazardous and resulted in numerous casualties. In order formally to reconcile such practices with the provisions of the 1929 Geneva Convention, certain prisoners of war were classified as "Surrendered Enemy Personnel" (SEP). In 1949, Article 52 of the Geneva Convention was revised and established that "unless he be a volunteer, no prisoner of war may be employed on labour which is of an unhealthy or dangerous nature. The removal of mines or similar devices shall be considered as dangerous labour" [9].

By the 1990s, the mine problem had become one of the key issues on the global humanitarian agenda. The world's largest humanitarian demining organization, *The HALO Trust*, in recent years actively conducted operations in the Islamic Republic of Afghanistan, the Kingdom of Cambodia, the Republic of Angola, the Republic of Mozambique, the Chechen Republic within the Russian Federation, as well as in the territories of

self-proclaimed entities, namely Nagorno-Karabakh and the Republic of Abkhazia. According to estimates of the United Nations (hereinafter, the UN), the total number of mines emplaced in these territories amounts to 38,200,000 units. However, based on precise accounting of mined territories and actually neutralized mines, *The HALO Trust* considers that the real number of mines does not exceed 1,910,000, or approximately 5% of the official figures.

The situation in the Republic of Abkhazia acquired absurd dimensions. The UN published an estimate according to which approximately 2,000,000 mines were present in the region, whereas according to calculations of *The HALO Trust* the number did not exceed 50,000. The reasons for this substantial discrepancy lie in the use of flawed methodology and pressure exerted by interested parties. According to Mike Croll, some states exaggerate the extent of mine contamination in order to attract international financial assistance, part of which may subsequently be squandered due to administrative incompetence or corruption. Commercial demining organizations and manufacturers of automated demining devices also have an interest in overstating the scale of the problem to secure more profitable contracts. According to HALO data, the real cost of clearing territories in the aforementioned states may range from USD 350 to 400 million and require approximately ten years. At the same time, UN estimates envisage expenditures at the level of USD 33 billion. Such inflation of mine contamination figures may mislead donors and cause inefficient allocation of resources. Ultimately, the diversion of funds from practical demining to the implementation of mine prohibition policies may have catastrophic consequences for civilian populations that continue to suffer from the mine threat [4].

In light of this, within the context of contemporary Ukrainian experience, a methodology based on field surveys, verified data, and gradual clarification of contamination levels appears more substantiated, as practiced by specialized demining operators, particularly *The HALO Trust*. By contrast, aggregated assessments formed without sufficient field verification may result in significant overestimation and distortion of policy priorities. For Ukraine, this means that humanitarian demining planning and the attraction of international assistance should be based precisely on operationally verified data.

Ultimately, the diversion of funds from

practical demining to the implementation of mine prohibition policies may have catastrophic consequences for civilian populations that continue to suffer from the mine threat.

The growing awareness of the humanitarian consequences of the large-scale use of anti-personnel mines led to the establishment of a broad transnational coalition of non-governmental organizations, namely the International Campaign to Ban Landmines (ICBL). This coalition included such influential international non-governmental organizations engaged in demining issues as the *Vietnam Veterans of America Foundation*, *Medico International*, *Handicap International*, *Mines Advisory Group*, and *Physicians for Human Rights*.

The principal objectives of the ICBL were identified as follows:

- the introduction of an international prohibition on the use, production, stockpiling, sale, transfer, or export of anti-personnel mines;
- the establishment of an international fund under the auspices of the UN designed to support and finance programs assisting mine victims, mine risk awareness programs, as well as mine clearance and destruction measures worldwide;
- ensuring financial contributions to the said fund from states engaged in the production and distribution of anti-personnel mines.

According to Don Hubert, the International Committee of the Red Cross (hereinafter, the ICRC) played a significant yet underestimated role in the development of the campaign against anti-personnel mines from its earliest stages. Although individual ICRC medical personnel had publicly drawn attention to the human casualties caused by anti-personnel mines as early as the late 1980s, the organization's first official response to the crisis emerged only in 1992 in the form of a publication entitled *Anti-personnel Mines: An Overview*. This document emphasized the importance of compliance with international humanitarian law and formulated calls for the responsible use of anti-personnel mines, including:

- the development of self-destruction and self-neutralization mechanisms;
- the prohibition of mines that cannot be detected after emplacement;
- the imposition of responsibility for mine clearance upon the forces that emplaced them.

Within the UN system, the campaign to prohibit anti-personnel mines received support from the Secretary-General and three important institutions. Within the framework of the UN, the United Nations Office for the Coordination of Humanitarian Affairs was designated as the

coordinating center for mine-related activities. As early as 1992, the United Nations Office for the Coordination of Humanitarian Affairs and the Department of Peacekeeping Operations held the first in a series of meetings with UN departments and non-governmental organizations to exchange information regarding demining and legal control over the use of mines. In September 1993, the United Nations Children's Fund declared anti-personnel mines a priority issue and instructed its national committees to commence advocacy activities. UNICEF also prepared a comprehensive report documenting the harmful impact of mines on children and examining prospects for restricting their use.

By the end of 1994, a number of specialized UN bodies had become active participants in the international campaign. The European Union also undertook measures to address the problem of anti-personnel mine proliferation by adopting, in December 1992, a resolution calling for a five-year moratorium on the export of anti-personnel mines. In 1994, the Parliament of the Kingdom of Sweden called for a complete prohibition of anti-personnel mines, while the Kingdom of the Netherlands committed itself to destroying all of its mine stockpiles. In 1995, the Kingdom of Belgium adopted legislation prohibiting the use, production, acquisition, sale, and transfer of anti-personnel mines [6]. Although nearly all European states became parties to the Convention, major states such as the United States of America, the People's Republic of China, the Republic of India, and the Russian Federation have not acceded to it to this day.

Consequently, as a result of dynamic interaction, shared objectives, and the pooling of efforts by four principal groups of actors, namely non-governmental organizations, the ICRC, specialized UN bodies, and states, a large-scale international campaign prohibiting anti-personnel mines was initiated. Its outcome was the adoption of the Ottawa Convention, which entered into force on 1 March 1999.

According to the explanatory note to the draft Law on Ratification, the purpose of accession to the Convention was to demonstrate to the international community Ukraine's readiness to implement its provisions and to provide a new impetus for cooperation with potential donors in the sphere of destroying existing mine stockpiles. Indeed, ratification of this international treaty constituted a necessary precondition for donor states to provide financial assistance for the destruction of approximately six million PFM-type

mines that were, at that time, stored in the depots of the Armed Forces of Ukraine [14]. The Convention was ratified in 2005 [15].

On 30 March 2016, the Government of Ukraine informed the Secretary-General of the UN that, due to the temporary occupation by the Russian Federation of part of the territory of Ukraine, namely the Autonomous Republic of Crimea and the city of Sevastopol, as a consequence of the armed aggression committed by the Russian Federation against Ukraine, and pending the full restoration of constitutional order and effective control by Ukraine over such occupied territory, as well as over certain areas of Donetsk and Luhansk regions temporarily beyond Ukraine's control as a result of Russian aggression, the application and implementation by Ukraine of its obligations under the Ottawa Convention with respect to the above-mentioned occupied and uncontrolled territories of Ukraine are limited and not guaranteed [16].

The 2018 notification stated that in 2007 Ukraine fulfilled its obligations under Article 5 of the Ottawa Convention by submitting to the Secretary-General of the UN its initial declaration indicating the absence of areas contaminated by anti-personnel mines within the territory of Ukraine. In order to ensure the vital interests of society and the state, normative legal acts concerning the legal regime of temporarily occupied territories were adopted, pursuant to which the Russian Federation, as the aggressor state and occupying power, bears full responsibility for its actions and their consequences in temporarily occupied territories under international law. Ukraine bears no responsibility for the unlawful actions of the Russian Federation and its occupation administration. In view of the foregoing, and without prejudice to the application of other provisions of the Ottawa Convention, Ukraine declared that from 20 February 2014 and throughout the period of temporary occupation by the Russian Federation of the Autonomous Republic of Crimea, the city of Sevastopol, and certain areas of Donetsk and Luhansk regions resulting from the armed aggression of the Russian Federation against Ukraine, and until the full restoration of Ukraine's constitutional order and rule of law in such occupied territories, including Ukraine's effective control over the Ukrainian-Russian state border, the application and implementation by Ukraine of its obligations under Article 5 of the Ottawa Convention applicable to the above-mentioned occupied territories are limited and not guaranteed [17].

Policies of governments regarding the Ottawa Convention are changing due to growing threats to national security, particularly under conditions of war and aggression by the Russian Federation. Certain states, including the Republic of Poland and the Baltic States, consider that the prohibition of anti-personnel mines restricts their defensive capabilities and limits their ability to protect their borders effectively. Such an approach reflects a reassessment of the balance between humanitarian obligations and military necessity under conditions of real threats.

In 2025, the governments of several states adopted unprecedented decisions concerning withdrawal from the Ottawa Convention. Pursuant to Article 20 of the Ottawa Convention [18], the Convention is of unlimited duration; however, each State Party, in exercising its sovereign right, may withdraw from it. For this purpose, the government of a state must notify in writing all other States Parties, the Depositary (the Secretary-General of the UN), and the UN Security Council. The notification of withdrawal must contain an explanation of the reasons motivating such a decision. Such withdrawal enters into force only six months after the date on which the Depositary receives the notification of withdrawal. Thus, on 27 June 2025, the Governments of the Republic of Estonia, the Republic of Latvia, and the Republic of Lithuania submitted notifications of withdrawal from the Ottawa Convention to the Secretary-General of the UN. Withdrawal for these states entered into force on 27 December 2025. On 10 July, the Government of the Republic of Finland officially announced an analogous step, for which withdrawal entered into force on 10 January 2026 [19]. These states justified their decisions by referring to a fundamental change in the regional security environment. The Republic of Poland remains at the final stage of the denunciation process, since on 23 July 2025 the President of the Republic of Poland, Andrzej Duda, signed the relevant law, and the Secretary-General of the UN was officially notified thereof at the end of August 2025.

The Ministry of Foreign Affairs of Ukraine, for its part, adopted a somewhat different decision, conditioned by the provisions of the same Convention, according to which denunciation by a State Party during an armed conflict is not envisaged, while withdrawal from the Convention takes effect only after the expiration of six months from the notification of denunciation and upon the termination of the armed conflict. In view of the foregoing, and owing to the absence of a prescribed

procedure for the "suspension of operation" of the Ottawa Convention, Ukraine applied the provisions of Article 62 of the Vienna Convention on the Law of Treaties. Accordingly, on 15 July 2025, Ukraine adopted Law No. 4519-IX *"On the Suspension for Ukraine of the Operation of the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction"* [20]. On 18 July 2025, the Government of Ukraine transmitted the corresponding official notification to the Secretary-General of the UN [19].

Changes in state policy provoked a sharp reaction from the international human rights and academic communities. ICRC legal advisers Cordula Droege and Maya Brehm draw attention to the fact that recent challenges associated with anti-personnel mines reflect broader threats to the vital protections ensured by international humanitarian law. The authors emphasize that justifications for the use of anti-personnel mines generally fail to reflect actual battlefield conditions and do not take into account the horrific consequences of this dangerous weapon. Furthermore, they stress that attempts to circumvent or even renounce the Convention contradict the fundamental principles of international humanitarian law and undermine the international rule of law. They further call for strengthened compliance with humanitarian norms as essential guarantees for the protection of humanity during war [7].

Nobel Prize laureates called upon the governments of the Republic of Finland, the Republic of Poland, the Republic of Lithuania, the Republic of Latvia, and the Republic of Estonia, in a statement published on 18 June 2025, to reverse their decisions to withdraw from the Ottawa Convention, describing this treaty as a cornerstone of international humanitarian law [8]. The statement was prepared by Jody Williams and the International Campaign to Ban Landmines, recipients of the 1997 Nobel Peace Prize for their efforts promoting the conclusion of the Mine Ban Treaty. The statement was supported by 100 Nobel Prize laureates.

The conclusions arising from public criticism and the positions of the international community, particularly the statement of the Nobel Prize laureates, demonstrate profound concern regarding the potential consequences of states withdrawing from the Ottawa Convention. The concern lies in the fact that such a step creates a dangerous precedent capable of undermining the humanitarian consensus achieved through years of effort and may trigger a new wave of legitimization

of prohibited categories of weapons. Civil society and experts warn that the return of anti-personnel mines not only endangers civilian lives but also undermines confidence in international law as an effective instrument of protection under conditions of armed conflict.

Conclusions and prospects for further research. It has been demonstrated that the legal regime of the Ottawa Convention in the twenty-first century is undergoing profound transformation, conditioned by the return of large-scale conventional warfare. Despite the considerable humanitarian progress achieved during the decades of the Convention's existence, the contemporary erosion of the global security architecture has revived the dilemma between the imperatives of civilian protection and the inherent right of states to self-defence enshrined in Article 51 of the Charter of the United Nations.

The emergence of a precedent of destabilization of the international treaty regime has been identified through initiatives of the so-called "frontier" states, particularly the Republic of Poland, the Republic of Finland, and the Baltic States, aimed at reconsidering their membership status or denouncing the Convention. It has been substantiated that such measures testify to a crisis in the universality of humanitarian norms in regions exposed to a high risk of territorial aggression, thereby placing the viability of the Ottawa Process in its original conceptual form under threat.

On the basis of an analysis of Ukraine's relations with the Secretary-General of the UN as Depositary and with other States Parties, it has been established that the armed aggression of the Russian Federation created a unique legal situation. While declaring its commitment to the objectives of the Convention, Ukraine was compelled to resort to the temporary suspension of the implementation of certain obligations. This case demonstrates the critical complexity of complying with absolute humanitarian prohibitions in a situation where the aggressor employs mine weapons on a massive scale as an instrument of terror, effectively nullifying the defensive parity of the state subjected to aggression.

It has been argued that the paradigm shift concerning the use of anti-personnel mines requires a contemporary doctrinal interpretation of Article 62 of the Vienna Convention on the Law of Treaties. The application of the doctrine of fundamental change of circumstances (*rebus sic stantibus*) in the field of mine action should be clearly regulated in order to prevent abuse while

simultaneously ensuring states' right to effective deterrence against aggression. A clear delimitation must be established between the lawful suspension of obligations within the exercise of the right to self-defence and violations of peremptory norms of international humanitarian law.

Prospects for further scholarly research in this field are seen in the development of a comprehensive international legal mechanism that would enable States Parties to the Ottawa Convention to adapt their defence strategies to conditions of existential threat without destroying the global humanitarian consensus or undermining the foundational principles of international law.

References

1. International Campaign to Ban Landmines – Cluster Munition Coalition (ICBL-CMC) (2024). Landmine monitor 2024 : 26th annual edition. Retrieved from: <https://surl.li/imynir> (accessed 28 February 2026) [in English].
2. Humanity & Inclusion (2024). Landmines: 22 % more victims in one year. Retrieved from: <https://surl.li/qicbui> (accessed 28 February 2026) [in English].
3. United Nations (2025). Landmine casualties hit four-year high as treaty setbacks deepen. Retrieved from: <https://surl.li/bhitgv> (accessed 28 February 2026) [in English].
4. Cheatle, T. (1998). The History of Landmines. *Journal of the Royal Society of Medicine*, vol. 91, no. 11, pp. 606–607. Retrieved from: <https://surl.li/vtalaf> (accessed 28 February 2026) [in English].
5. Jevglevskaja, N. (2015). St Petersburg, 1868: First International Agreement Prohibiting the Use of Certain Weapons. *Online Atlas on the History of Humanitarianism and Human Rights*. Retrieved from: <https://surl.li/sfsekf> (accessed 28 February 2026) [in English].
6. Hubert, D. (2000). The Landmine Ban: A Case Study in Humanitarian Advocacy. *Occasional Papers, Thomas J. Watson Jr. Institute for International Studies*. Retrieved from: <https://surl.li/adcbbg> (accessed 28 February 2026) [in English].
7. Drohe K., Brem M. (2025). *Protypikhotni miny: iluziia bezpeky vnaslidok viry u vyniatkovist pid chas viiny* [Landmines: The illusion of security resulting from the belief in exceptionalism during war]. *Mizhnarodnyi komitet Chervonoho Khresta*. Retrieved from: <https://surl.li/nqspcj> (accessed 28 February 2026) [in Ukrainian].
8. Nobel Women's Initiative (2025). Nobel Laureates back the ban on antipersonnel

landmines. Retrieved from: <https://surl.li/qbtufr> (accessed 28 February 2026) [in English].

9. United Nations Mine Action Service (2020). Together for mine action: A multilateral success story. Retrieved from: <https://surl.li/jgecfb> (accessed 28 February 2026) [in English].

10. Marchenko M. Yu. (2024). *Poniattia ta kharakterystyka protymynnoi diialnosti yak administratyvno-pravovoi katehorii* [The concept and characteristics of mine action as an administrative-legal category]. *Visnyk Kryminolohichnoi asotsiatsii Ukrainy*, no. 3 (33), pp. 853–866. Retrieved from: <https://doi.org/10.32631/vca.2024.3.81> (accessed 28 February 2026) [in Ukrainian].

11. Marchenko M. Yu. (2025). *Osnovni zasady protymynnoi diialnosti v Ukraini* [Basic principles of mine action in Ukraine]. *Naukovi zapysky. Seriya: pravo*, vol. 18, pp. 133–138. DOI: <https://doi.org/10.36550/2522-9230-2025-18-133-138> [in Ukrainian].

12. Teremetskyi V. I., Marchenko M. Yu. (2025). *Systema subiektiv administratyvno-pravovoho zabezpechennia protymynnoi diialnosti v Ukraini* [System of subjects of administrative and legal support of mine action in Ukraine]. *Visnyk Penitentsiarnoi asotsiatsii Ukrainy*, no. 2 (32), pp. 147–160. DOI: <https://doi.org/10.34015/2523-4552.2025.2.17> [in Ukrainian].

13. Teremetskyi V. I., Marchenko M. Yu. (2025). *Pravovi zasady mizhnarodnoho spivrobitnytstva Ukrainy u sferi rozminuvannia* [Legal foundations of Ukraine's international cooperation in the field of demining]. *Pryvatne pravo i pidpriemnytstvo*, vol. 25, pp. 367–375. DOI: <https://doi.org/10.32849/2409-9201.2025.25.41> [in Ukrainian].

14. *Proiekt Zakonu pro ratyfikatsiiu Konventsii pro zaboronu zastosuvannia, nakopychennia zapasiv, vyrobnytstva i peredachi protypikhotnykh min ta pro yikhnies znyshchennia № 0253* [Draft Law on ratification of the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction no. 0253]. (2005, March 29). Retrieved from: <https://surl.li/whwrik> (accessed 28 February 2026) [in Ukrainian].

15. *Zakon Ukrainy "Pro ratyfikatsiiu Konventsii pro zaboronu zastosuvannia, nakopychennia zapasiv, vyrobnytstva i peredachi*

protypikhotnykh min ta pro yikhnies znyshchennia" № 2566-IV [Law of Ukraine about the Ratification of the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction activity no. 2566-IV]. (2005, May 18). Retrieved from: <https://surl.li/wtzboe> (accessed 28 February 2026) [in Ukrainian].

16. United Nations Treaty Collection (2016). Ukraine: Communication. Reference: C.N.121. 2016.TREATIES-XXVI.5 (Depositary Notification). Retrieved from: <https://surl.li/rxcckns> (accessed 28 February 2026) [in English].

17. United Nations Treaty Collection (2018). Ukraine: Communication. Reference: C.N. 285.2018. TREATIES-XXVI.5 (Depositary Notification). Retrieved from: <https://surl.li/wrcuww> (accessed 28 February 2026) [in English].

18. *Konventsiiia pro zaboronu zastosuvannia, nakopychennia zapasiv, vyrobnytstva i peredachi protypikhotnykh min ta pro yikhnies znyshchennia* [Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction]. (1997, September 18). Retrieved from: <https://surl.li/akqvpv> (accessed 28 February 2026) [in Ukrainian].

19. United Nations Treaty Collection (1997). Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction. Retrieved from: <https://surl.li/qogdrp> (accessed 28 February 2026) [in English].

20. *Zakon Ukrainy "Pro zupynennia dlia Ukrainy dii Konventsii pro zaboronu zastosuvannia, nakopychennia zapasiv, vyrobnytstva i peredachi protypikhotnykh min ta pro yikhnies znyshchennia" № 4519-IX* [Law of Ukraine about the Suspension for Ukraine of the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction activity no. 4519-IX]. (2025, July 15). Retrieved from: <https://surl.li/ezqfxj> (accessed 28 February 2026) [in Ukrainian].

Received / Стаття надійшла до редакції: 23.03.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 10.04.2026

Published / Опубліковано: 30.06.2026

МАРЧЕНКО МАКСИМ ЮРІЙОВИЧ

кандидат юридичних наук, докторант,
Харківський національний університет внутрішніх справ
<https://orcid.org/0009-0006-0078-8346>

ПРАВОВЕ РЕГУЛЮВАННЯ ПРОТИМІННОЇ ДІЯЛЬНОСТІ: ЕВОЛЮЦІЯ ОТТАВСЬКОЇ КОНВЕНЦІЇ В УМОВАХ НОВИХ ВИКЛИКІВ БЕЗПЕКИ

Проаналізовано правове регулювання протимінної діяльності в контексті трансформацій глобальної архітектури безпеки, що зумовлює необхідність переоцінювання міжнародних і національних механізмів заборони протипіхотних мін. Досліджено історичну ретроспективу розвитку гуманітарних обмежень від кінця ХХ ст. до сучасної державної практики. Особливий акцент зроблено на процесах генезису, імплементації та концептуального переосмислення Оттавської конвенції 1997 р.

Розглянуто питання реценції положень Конвенції у національне законодавство, а також обґрунтовано правові підстави для тимчасового зупинення дії міжнародних зобов'язань через докорінну зміну обставин, спричинену повномасштабною збройною агресією російської федерації проти України. Зазначено про необхідність зміцнення міжнародного й національного законодавства, що регламентує протимінну діяльність, а також підвищення рівня інституційної визначеності щодо мандатів і механізмів координації суб'єктів протимінної діяльності в умовах зростаючої нестабільності глобального безпекового середовища.

Ключові слова: міжнародне право; міжнародні договори; національна й міжнародна безпека; протипіхотні міни; протимінна діяльність; міжнародне гуманітарне право; денонсація міжнародного договору; неурядові організації.

**OLEKSANDR MOROZOV**

*Doctor of Technical Sciences, Professor,
Chief Researcher of the
Scientific and Methodological Center for the Organization
and Implementation of Educational Activities,
National Defense University of Ukraine
<https://orcid.org/0000-0002-1352-1783>*

TASKS OF MANAGEMENT OF THE TECHNICAL CONDITION OF COMPLEX TECHNICAL SYSTEMS

The article presents a methodological framework that defines the structure and main tasks of parametric control of the technical state of complex technical systems, as well as methods for solving the main problems that constitute this process. The objects of control are the properties and parameters of complex technical systems and their constituent elements. The control process is considered to be closed-loop. Parametric control of the technical state of complex technical systems is represented as ensuring the required level of operability margin of such systems, as well as monitoring and forecasting its value during their operation.

To solve the first problem, a search-based method is applied. The problem of monitoring and forecasting the state of complex technical systems is reduced to pattern recognition in the parameter space, determining whether the current state vector of the system belongs to a particular subregion of the operable state domain.

Keywords: technical state control; parametric control; operability margin; operable region; complex technical system.

Statement of the problem. The management of the technical state (hereinafter TS) of complex technical systems (hereinafter CTS) is based on the measurement and/or monitoring of system parameters and their comparison with permissible (limit) values, the exceedance of which indicates that the system is inoperable. The main models of TS management of CTS differ in that, in the preventive maintenance model, parametric influence on the system is carried out at specified time intervals, whereas in the condition-based operation model it is performed at the moment when one or more parameters may reach their permissible (limit) values. To prevent parameter values from exceeding the boundaries (region) of the operable state, regulation of the parameters of subsystems, units, and assemblies (hereinafter elements) of CTS is performed. Thus, parametric control of the technical state of a complex technical system is implemented. Such control is most effective when using the second model, which requires continuous monitoring and forecasting of changes in the technical state of the system. The

basis for solving such problems should be information about the boundaries of the operability domain of CTS. Therefore, it is important to formulate the methodological foundations of the process of parametric control of the TS of CTS and to define methods for solving the main problems that constitute this process.

Analysis of recent research and publications. Parametric control of the technical state (TS) of complex technical systems (CTS) is a persistent problem that is addressed at all stages and phases of their life cycle and is solved through a set of problems related to parametric synthesis, monitoring, and state prediction of systems [1–3].

The theoretical foundations for the development and operation of CTS discussed in [2, 4] define the main tasks of technical state control in a general form, approaches to their solution, and the key factors that must be considered when addressing these problems. However, they do not provide methods for solving parametric control problems.

Analysis of scientific sources shows that the proposed methods of TS control are based on two



main groups of CTS operation models: preventive maintenance and condition-based operation. Parametric state control is most effective under condition-based operation of CTS [5, 6]. However, this requires the application of methods and tools for parameter measurement and monitoring, prediction of their variation, assessment of compliance with allowable values or determination of their location within predefined operability boundaries, and, in case of non-compliance, the implementation of structural and/or parametric control actions [2, 4, 7].

In the design of modern CTS, condition-based operation models are incorporated into their operation, which presupposes different approaches and methods of parametric control of their technical state [8–10]. Changes or degradation of elements of any CTS are caused by the influence of adverse factors or disturbances of various nature, which must be taken into account in parametric control of system technical states [8, 11, 12].

Parametric control of the TS of CTS at all stages of their life cycle should be based on determining the levels of operability margin of such systems, as well as on monitoring and predicting its value during system operation.

The purpose of the article is to determine the structure and tasks of parametric control of the TS of CTS and the methods for solving the main problems that constitute this process.

Presentation of the main material. The technical state of a CTS is understood as the internal determinacy of the system, characterized at a given time by properties specified in the technical documentation for such systems, which serve as initial conditions for the processes of their subsequent evolution [13].

The set of internal properties of any CTS and their characteristics at a fixed point in time defines its internal technical state. This state is characterized by a combination of the technical states of the CTS elements and its switching (configuration) state, which is determined by the system structure. The set of functional properties and output parameters of a CTS at a given instant defines its functional technical state.

In addition to the considered types of technical state, the environmental state can be distinguished,

which defines the operating mode of the CTS, i.e., it represents the operational state (in a broad sense). Since part of the external influences are purposefully modified (set) by the operating personnel or automation systems, the environmental state is reasonably represented by two groups: the operating mode (in a narrow sense) and the state of usage conditions of the CTS, which are determined by natural conditions, the degree of system element loading, and the quality of maintenance and repair. All sets of system technical states are interrelated and correspond to the diversity of technical state types distinguished during operation.

To describe the evolution of the CTS technical state, structural and parametric disturbances should be distinguished [13, 14]. Parametric disturbances are caused by the continuous variation in the intensity of element properties of the CTS due to aging, wear, and the influence of external perturbations. These disturbances lead to the continuous accumulation of parametric deviations and, consequently, to changes in the system's operability margin, each level of which, according to a specified discretization, corresponds to a certain technical state.

Structural disturbances, in contrast to parametric ones, lead to the accumulation of structural deviations and, consequently, to the loss of one or several properties of CTS elements, which affects the system structure and ultimately results in sudden failure.

The quality and efficiency of CTS operation are determined by the methods of controlling the processes of formation and preservation of the required properties and parameter values at all stages and phases of the life cycle: research, design, manufacturing, and operation. In this context, technical state control of a CTS is understood as a purposeful process of modifying control actions, internal parameters, and system structure in order to prevent and eliminate failures of its elements and to achieve an optimal functional performance quality according to a specified criterion.

In the most general form, the process of technical state control of a CTS, covering all stages and phases of its life cycle, can be represented by a structural diagram shown in the figure.

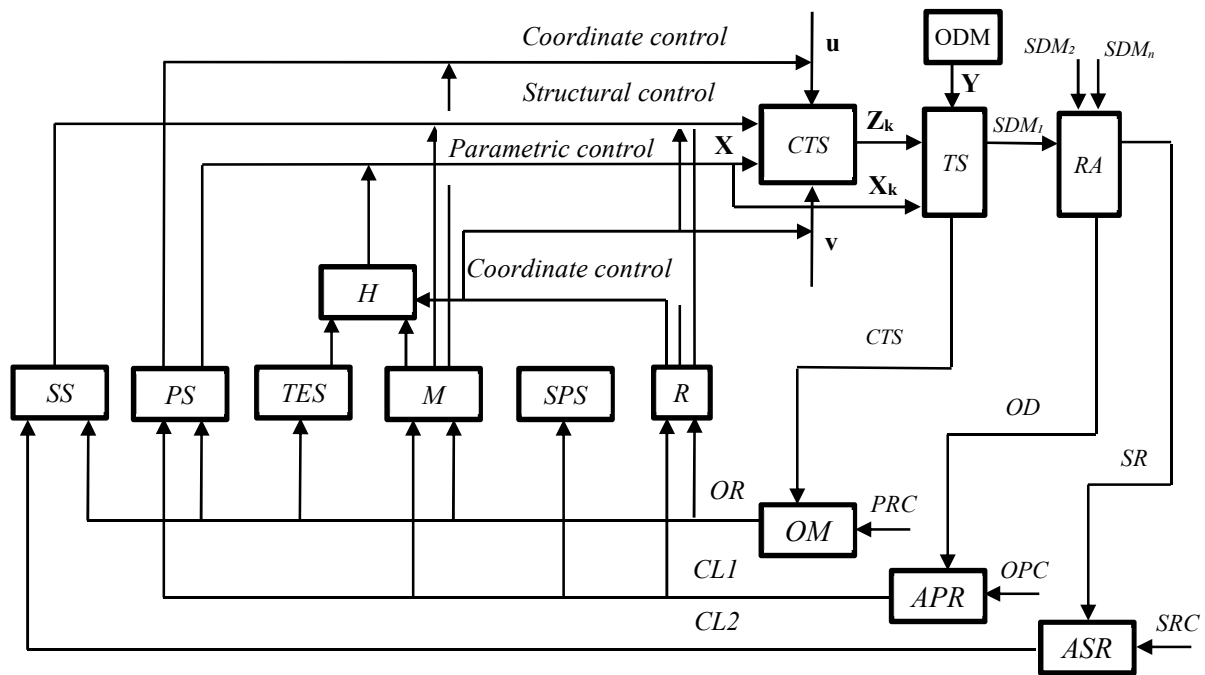


Figure 1 – Structure of the technical state control process of a complex technical system

The properties and parameters of the CTS and its constituent elements act as the objects of control. Three control loops of the technical state can be distinguished: parametric, coordinate, and structural control. Parametric control involves a purposeful influence on the internal parameters $\mathbf{X}$ of the CTS. In coordinate control, these actions correspond to changes in the parameters of input signals $\mathbf{u}$ and external influences $\mathbf{v}$, which define the operating conditions of the CTS. In structural control, the control actions consist of changes in the composition of CTS elements and/or the relationships between them. A necessary condition for the implementation of any control loop is the ability to determine the technical state of the CTS and its elements at any instant in time. In condition-based control of the technical state, operational decision-making (hereinafter ODM) is carried out taking into account the requirements of the specified operability criterion K_{np} of the CTS.

Statistical decision-making (hereinafter SDMpp and SDMss) is based on the assessment of parametric reliability (hereinafter APR) and structural reliability (hereinafter ASR), which are obtained as a result of reliability analysis (hereinafter RA) based on messages $\mathcal{D}_1^H, \mathcal{D}_2^H, \dots, \mathcal{D}_n^H$ describing changes in the technical state, gradual and sudden failures of CTS elements. In this process, the requirements of the parametric reliability criterion $K_{\Pi H}$ and the structural

reliability criterion K_{ch} . are taken into account. Operational decision-making (hereinafter OD) determines, at the operation stage of the CTS, the required scope of maintenance (hereinafter M) or condition-based repair (hereinafter R), as well as the types of structural synthesis (hereinafter SS).

Parametric control during testing of experimental samples (hereinafter TES) is carried out based on the results of the tuning operation (hereinafter T). Structural synthesis is implemented through system structure reconfiguration and redundancy functions. At the design stage, the decision involves performing structural synthesis (searching for a feasible technical solution and selecting the optimal variant according to a given criterion) and parametric synthesis (hereinafter PS). Statistical decision-making (hereinafter SD11) at the operation stage involves scheduled maintenance and repair, whereas at the design stage it involves solving the parametric synthesis problem according to a criterion that takes into account the parametric reliability indicators of the CTS. Statistical decision-making (hereinafter SD22) at the design stage involves implementing redundancy functions in order to ensure structural reliability.

The considered process of technical state control of the CTS is a closed-loop process. As shown in the figure, the most important task is the implementation of parametric control of the technical state of the CTS. For optimal control of

this process, it is necessary to develop a theory, methods, and tools for the integrated solution of parametric synthesis, tuning, and technical state assessment problems of CTS, which arise at different stages of its life cycle.

The problem of parametric synthesis, the result of which is the determination of nominal values of the internal parameters (nominals) of the CTS and the permissible limits of their variation (tolerances), is solved at the preliminary design stage. In this context, the internal system parameters are considered as controllable parameters. The calculation of these parameters, optimal with respect to a given criterion under a fixed system structure, is referred to as parametric optimization. In addition to the optimization of nominal values and tolerances, parametric optimization also addresses the problem of optimizing technical requirements imposed on the internal parameters of the CTS.

The optimization of technical requirements and tolerances differs from the optimization of nominal values in that, instead of determining a single point characterizing the nominal values of internal properties, it results in a certain region in the parameter space. This region defines the accuracy classes of the CTS components and characterizes the ranges of permissible parameter values under which system operability is ensured, while also achieving an extreme value of the selected objective function.

The control process considered above is iterative and involves repeated execution of analysis tasks that allow the assessment of the technical state of the CTS for different variants of its structure and certain fixed values of internal parameters. Such an assessment is possible through the identification of reference parameter values, which include: $X_{\text{ном}}$ – nominal value (serves as the reference point for measuring deviations); $X_{\text{доп}}$ – maximum or minimum permissible value at which the functional quality of the CTS becomes unacceptably degraded; $X_{\text{гр}}$ – limit value (determining the impossibility of the physical realization of the CTS). For the reference values of parameter X , the following relation holds:

$$|X_{\text{ном}}| < |X_{\text{доп}}| \leq |X_{\text{гр}}|.$$

For the output parameters Y and the internal parameters Z^v , which are state variables at the outputs of the CTS elements, the following are considered reference values: $Y_{\text{доп}}(Z_{\text{доп}}^v)$ –

allowable value of a parameter, determined by the technical requirements specified in the technical specification during the design stage of the CTS or its elements. Violation of these requirements results in a reduction in the effectiveness of the system in performing its intended functions; $Y_{\text{гр}}(Z_{\text{гр}}^v)$ – limit value of a parameter, i.e., the calculated maximum or minimum value at which the functioning of the CTS, with respect to the performance of its intended functions, becomes impossible; $Y_{\text{кр}}(Z_{\text{кр}}^v)$ – critical value of a parameter at which the operation of the CTS becomes fundamentally impossible. For the reference values of the output parameters Y and the internal parameters Z^v , the following relation holds:

$$|Y_{\text{доп}}(Z_{\text{доп}}^v)| < |Y_{\text{гр}}(Z_{\text{гр}}^v)| \leq |Y_{\text{кр}}(Z_{\text{кр}}^v)|.$$

An important result of the analysis is determining whether the operability conditions are satisfied. These conditions are understood as the necessary conditions for the failure-free operation of the system and are expressed in the form of the following inequalities:

$$\begin{aligned} Y_{j \min} \leq Y_j = F_j(X) \leq Y_{j \max}, j = \overline{1, m}, \\ Z_{j \min}^v \leq F_j^v(X) \leq Z_{j \max}^v, \\ X_{i \min} \leq X_i \leq X_{i \max}, i = \overline{1, n}, \end{aligned}$$

де $Y_{j \max}(Z_{j \max}^v)$, $Y_{j \min}(Z_{j \min}^v)$, $Y_j(Z_j^v)$ – respectively, the maximum and minimum permissible values of the j -th output (internal).

The first inequality represents an external operability condition, whereas the second and third inequalities represent internal operability conditions of the CTS. These conditions define the operability domain. G , which constitutes the set of admissible values of the internal parameters X , for which all requirements for the output Z^v and internal Z^v parameters of the system are satisfied. The shape of the region G may have a complex configuration. Problems of determining and assigning tolerances are distinguished. Determining tolerances is understood as solving the problem of constructing the operability domain, which is usually specified as a set of boundary points. Assigning tolerances is generally understood as solving the problem of approximating the operability domain by a hyper-rectangular parallelepiped (box) of maximum volume that can be inscribed in or circumscribed around this domain.

The main quality indicators that determine the choice of the objective function in parametric

optimization of CTS are mission performance, reliability, and economic indicators. Mission performance indicators characterize the properties of CTS that define the main functions for which the system is intended. Reliability indicators characterize the properties of CTS that determine its ability to maintain an operable state during its intended use. Under limited statistical data on the probability distributions of CTS internal parameters over time, the indicator of parametric reliability is the operability margin [15]. Economic indicators characterize the costs associated with the development, manufacturing, and operation of CTS. In parametric state control, these indicators determine: costs of information support related to the assessment of the system's technical state; costs of restoring CTS operability in case of parametric failures; and accuracy classes of CTS elements, which affect the overall system cost.

Parametric control of the technical state is reduced to ensuring the required level of the operability margin of the CTS, as well as monitoring and forecasting its value during system operation.

To solve the first problem, a search-based method is proposed, the essence of which is as follows. At the first stage, the boundary of the domain G is determined using known methods [16, 17], which consists of a finite number of hypersurfaces Φ_j , each of which can be described with a given accuracy using the operability conditions. In the space of internal parameters R^n , a metric l , is introduced, which is a function of the coordinates of any two points in this space, for example, of points A and B . In this case

$l = \sqrt{\sum_{i=1}^n \mu_i (X_i(A) - X_i(B))^2}$, where $\mathbf{X}(A)$, $\mathbf{X}(B)$ – denote the coordinate vectors of points A and B respectively; μ_i – is the normalization coefficient for the i -th coordinate of the variables $\mathbf{X}$. If one of the points, for example point A , lies on the boundary of the domain G , while point B is located inside this domain and its coordinates characterize the current technical state of the technical control system (TCS), then the proposed metric defines the system's operability margin ρ and serves as a criterion for narrowing the initial domain $G^{(0)}$ in order to determine the coordinates of the optimal point. Further, the domain $G^{(0)}$ is narrowed according to the criterion $l = \rho$. For this purpose, the criterion is varied by an increment Δl , i.e., $l^{(1)} = l^{(0)} + \Delta l$. An analytical description of the boundary of the domain $G^{(1)}$ is obtained, and the corresponding set of its boundary points is determined.

We derive the equation that maps the coordinates of the boundary points of the domain $G^{(0)}$ to the coordinates of the boundary points of the domain $G^{(1)}$. Let us assume that the domain $G^{(0)}$ is defined on the plane of two parameters X_1 and X_2 . For a boundary point $A^{(0)}(X_1^{(0)}, X_2^{(0)})$ of the domain $G^{(0)}$ the equation of the normal to the curve $\Phi^{(0)} \in G^{(0)}$, on which the point $A^{(0)}$ lies, has the form:

$$c_2(X_1^{(1)} - X_1^{(0)}) - c_1(X_2^{(1)} - X_2^{(0)}) = 0, \\ c_1 = \partial\Phi^{(0)}(X_1, X_2)/\partial X_1, c_2 = \partial\Phi^{(0)}(X_1, X_2)/\partial X_2.$$

Taking into account that $(X_1^{(1)} - X_1^{(0)})^2 + (X_2^{(1)} - X_2^{(0)})^2 = \Delta l_1^2$ and solving these equations, we obtain:

$$\begin{aligned} |X_1^{(1)} - X_1^{(0)}| &= c_1 \Delta l / \sqrt{(c_1^2 + c_2^2)}, \\ |X_2^{(1)} - X_2^{(0)}| &= c_2 \Delta l / \sqrt{(c_1^2 + c_2^2)}. \end{aligned}$$

Generalizing to an arbitrary case and omitting the absolute value sign, we can write:

$$X_i^{(1)} = X_i^{(0)} \pm \frac{(\partial\Phi^{(0)}(\mathbf{X})/\partial X_i)\Delta l_1}{|\text{grad}\Phi^{(0)}(\mathbf{X})|}, \\ \text{grad}\Phi^{(0)}(\mathbf{X}) = \sqrt{\sum_{i=1}^n (\partial\Phi^{(0)}(\mathbf{X})/\partial X_i)^2}.$$

We obtain equations describing the domain $G^{(1)}$. To this end, for each hypersurface, we determine the coordinates N_j of the boundary points equal to the number of significant coefficients of this hypersurface. Substituting these coordinates into the system of equations

$$\begin{aligned} \varphi_j^{(1)} &= \Phi_j^{(1)}(\mathbf{X}) = b_0^1 + \sum_{i=1}^n b_i^1 X_{i\rho} + \\ \sum_{i=1}^n b_{ii}^1 X_{i\rho}^2 + \sum_{i=2}^n \sum_{v=1}^{i-1} b_{iv}^1 X_{i\rho} X_{v\rho} &= 0, \\ \rho &= \overline{1, N_j}, \end{aligned}$$

and solving it with respect to the unknown coefficients $b_0^1, b_i^1, b_{ii}^1, b_{iv}^1$, we obtain the required equations describing the boundary of the domain $G^{(1)}$.

Based on the use of logical R-functions [18] and the obtained equation $\varphi_j^{(1)}$ a single equation is formulated which, with a specified methodological error, analytically describes the tolerance domain $G^{(1)}$ at the first step of the search:

$$\begin{cases} G^{(1)} = G_{2(m+n)}^{(1)} = 0,5(G_{2(m+n)-1}^{(1)} + \varphi_{2(m+n)}^{(1)} - |G_{2(m+n)-1}^{(1)} - \varphi_{2(m+n)}^{(1)}|); \\ \dots G_j^{(1)} = 0,5(G_{j-1}^{(1)} + \varphi_j^{(1)} - |G_{j-1}^{(1)} - \varphi_j^{(1)}|); \dots G_1^{(1)} = \varphi_1^{(1)}. \end{cases}$$

Similarly, the tolerance domain $G^{(2)} \in G^{(1)}$ is determined, and the process of narrowing the initial domain $G^{(0)}$ is cyclically repeated until an optimal solution is obtained at $N = 1$. Based on the mapping $\Phi_Z : G \rightarrow F$ in the parameter space Z the domains G_k correspond to the domains F_k . Each subdomain $G_k(F_k)$ corresponds to a specific level of operability reserve of the technical system (TS). Thus, the problem of assessing the technical state of the system is reduced to recognizing, in the parameter space Z the membership of the vector of the current technical state of the system in a particular subdomain F_k . If, after substituting the values obtained during monitoring into the equation analytically describing the domain F , it is found that $F < 0$, this implies that the technical system (TS) is in an operable state, and further the validity of the inequalities is checked. $F_k < 0, k = 1, 2, \dots, (S + 1)$. If $F_k \leq 0$ i $F_{k+1} > 0$, it follows that the vector of the current technical state of the system belongs to the subdomain F_k and the operability reserve of the technical system (TS) is equal to ρ_k . If $F > 0$ – the system is in a non-operable state. In this case, a parametric adjustment of the tunable parameters is performed, and the CTS restores its operable state.

Conclusions and prospects for further research. The process of parametric control of the technical state of CTS includes a comprehensive set of analysis and synthesis problems, including tasks related to methodological support of the process, parametric synthesis, monitoring, and prediction of the system's technical state. The solution of these problems requires information about the boundaries of the system's operability domain.

In this context, it is possible to ensure parametric optimization of the CTS according to the operability margin criterion, as well as a high reliability of monitoring. For the analytical description of operability domains with low methodological error, a method based on the application of logical R-functions should be used.

References

1. Boichuk B. H., Lozynskiy O. Yu., Tsiapa V. B., Holovach I. R. (2026). *Strukturno-parametrychnyi syntez system avtomatyzovanykh elektropriyvodiv* [Structural-parametric synthesis of automated electric drive systems]. Kyiv : Mahnoliia [in Ukrainian].
2. Smirnov Ye. B., Tkachenko V. I., Ruban I. V., Maliuha V. H., Trystan A. V. (2018). *Teoretychni*

osnovy formuvannia ta dehradatsii skladnykh orhanizatsiino-tekhnichnykh system [Theoretical foundations of the formation and degradation of composite organizational and technical systems]. Kharkiv : KhNURE [in Ukrainian].

3. Pribyliev Yu. B., Podorozhniak A. O., Sakovych L. M. (2016). *Postanovka zavdannia parametrychnoi optymizatsii skladnykh tekhnichnykh system ta mozhlyvi pidkhody do yii vyrishennia* [Setting the task of parametric optimization of composite technical systems and possible approaches to its solution]. *Systemy upravlinnia, navihatsii ta zviazku*, no. 2 (38), pp. 48–52 [in Ukrainian].

4. Zachko O. B., Zachko I. H. (2016). *Modeli ta metody bezpeko-orientovanoho upravlinnia proektamy rozvytku skladnykh system: metodolohichni pidkhid* [Models and methods of safety-oriented management of composite system development projects: methodological approach]. *Visnyk Natsionalnoho tekhnichnoho universytetu "KhPI"*, no. 2 (1174), pp. 86–90. DOI: <https://doi.org/10.20998/2413-3000.2016.1174.19> [in Ukrainian].

5. Openko P. V., Polishchuk V. V., Myroniuk M. Yu., Kozyr A. H. (2021). *Dosvid zastosuvannia adaptivnykh stratehii tekhnichnoho obsluhovuvannia i remontu ozbroiennia ta viiskovoi tekhniki v derzhavakh-chlenakh NATO* [Experience in the use of adaptive strategies for the maintenance and repair of armaments and military equipment in NATO member states]. *Zbirnyk naukovykh prats Derzhavnoho nauково-doslidnoho instytutu viprobuvan i sertyfikatsii ozbroiennia ta viiskovoi tekhniki*, no. 2 (8), pp. 101–111. DOI: <https://doi.org/10.37701/dndivsovt.8.2021.11> [in Ukrainian].

6. Buiak L. M. (ed.), Adamiv O. P., Bashutska O. S., Bodnar D. I., Buiak L. M., Vozniak O. H., Danyliuk I. V., Duma L. V., Mushak A. Ya., R. M. Pasichnyk, Pryshliak K. M., Khoma N. H. (2021). *Metody ta modeli upravlinnia skladnyimi systemami* [Methods and models for managing complex systems]. Ternopil : Universytetska dumka [in Ukrainian].

7. Burtsev V. V., Voronin V. V., Kolomiitsev O. V., Burtseva V. V., Tretiak V. F., Zhyrna O. V. (2025). *Teoretychni osnovy rozrobky ta ekspluatatsii system ozbroiennia. Model prohozuvannia bezvidmovnosti komplektuiuchykh radioelektronnoi aparatury ozbroiennia ta viiskovoi tekhniki* [Theoretical basis for the development and operation of weapons systems. Model for predicting the reliability of radioelectronic equipment for weapons and

military equipment]. *Vyprobuvannia ta sertyfikatsiia*, no. 2 (8), pp. 64–74. DOI: <https://doi.org/10.37701/ts.08.2025.07> [in Ukrainian]

8. Volkov V. P., Kryvoshapov S. I., Volkova T. V., Kuzhel V. P., Verkhloshchuk V. V. (2026). *Udoskonalennia tekhnologii kontroliu i upravlinnia tekhnichnym stanom munitsypalnykh transportnykh zasobiv v umovakh intelektualnykh transportnykh system* [Improvement of technology for control and management of the technical condition of municipal transport facilities in the context of intellectual transport systems]. *Visnyk mashynobuduvannia ta transportu*, vol. 1 (23), pp. 25–33. DOI: <https://doi.org/10.31649/2413-4503-2026-23-1-25-33> [in Ukrainian].

9. Shevchenko D. O., Strilets V. Ye. (2026). *Bahatorivneva informatsiina tekhnologhiia diahnostuvannia tekhnichnykh system na osnovi danykh monitorynhu* [Bachelor's degree in information technology diagnostics of technical systems based on monitoring data]. *Visnyk Natsionalnoho tekhnichnoho universytetu "KhPI"*, no. 1 (15), pp. 134–154. DOI: <https://doi.org/10.20998/2411-0558.2026.01.09> [in Ukrainian].

10. Vazhynskyi A. I., Zhukov S. F. (2024). *Zastosuvannia aparatu neironnykh merezh dlia rishennia zavdan prohnozuvannia stanu skladnykh system* [Applications of neural network apparatus to solve the problem of predicting the state of composite systems]. *Naukovi pratsi DonNTU. Serii: elektrotehnika i enerhetyka*, no. 1 (30), pp. 52–57. DOI: <https://doi.org/10.31474/2074-2630-2024-1-52-57> [in Ukrainian].

11. Poliarus O. V., Lebedynskyi A. V., Chepusenko Ye. O. (2021). *Metod, modeli ta informatsiina tekhnologhiia pryiniattia rishen pro stan tekhnichnykh ob'ektiv v umovakh nestatsionarnykh vkhidnykh vplyviv* [Methods, models and information technology solutions for the state of technical objects in conditions of non-

stationary input influences]. *Visnyk Kharkivskoho natsionalnoho avtomobilno-dorozhnoho universytetu*, no. 95, pp. 229–234. DOI: <https://doi.org/10.30977/BUL.2219-5548.2021.95.0.229> [in Ukrainian].

12. Kryvova S. H. (2025). *Stvorennia skladnykh tekhnichnykh system z urakhuvanniam faktoru nevyznachenosti* [Creation of composite technical systems taking into account the uncertainty factor]. *Mechanics and Advanced Technologies*. vol. 9, no. 1, pp. 32–39. DOI: [https://doi.org/10.20535/2521-1943.2025.9.1\(104\).316582](https://doi.org/10.20535/2521-1943.2025.9.1(104).316582) [in Ukrainian].

13. Herasymchuk O. P. (2023). *Teoriia tekhnichnykh system* [Theory of technical systems]. Luts'k : LNTU [in Ukrainian].

14. Kornienko V. I., Husiev O. Yu., Herasina O. V., Shchokin V. P. (2017). *Teoriia system keruvannia* [Theory of system control]. Dnipro : Natsionalnyi hirnychiy universytet [in Ukrainian].

15. Ihnatkin V. U., Levkivskyi K. M., Skotna N. V., Tuz Yu. M., Sianov O. M., Lytvynenko V. A. (2019). *Matematychne zabezpechennia tekhnichnykh zasobiv vymiruvannia i kontroliu* [Mathematical support for technical measurement and control]. Kamianske : Dniprovskyi derzhavnyi tekhnichniy universytet [in Ukrainian].

16. Sakhno Ye. Yu., Tereshchuk O. I., Chupryna V. M., Kovalenko S. V. (2022). *Osnovy systemotekhniki* [Fundamentals of systems engineering]. Chernihiv : NU "Chernihivska politehnika" [in Ukrainian].

17. Klymenko H. P., Vasylchenko Ya. V., Shapovalov M. V. (2018). *Yakist i nadiinist tekhnologichnykh system* [Quality and reliability of technological systems]. Kramatorsk : Donbaska derzhavna mashynobudivna akademiia [in Ukrainian].

18. Rvachov V. L. (1982). *Teoriia R-funktsii ta deiaki ii dodatky* [Theory of R-functions and their applications]. Kiiv : Nauk. dumka [in Ukrainian].

Received / Стаття надійшла до редакції: 30.03.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 21.04.2026

Published / Опубліковано: 30.06.2026

МОРОЗОВ ОЛЕКСАНДР ОЛЕКСАНДРОВИЧ,
доктор технічних наук, професор,
головний науковий співробітник
науково-методичного центру організації
та провадження освітньої діяльності,
Національний університет оборони України
<https://orcid.org/0000-0002-1352-1783>

ЗАДАЧІ УПРАВЛІННЯ ТЕХНІЧНИМ СТАНОМ СКЛАДНИХ ТЕХНІЧНИХ СИСТЕМ

Наведено методичний апарат, що визначає структуру й основні задачі параметричного управління технічним станом складних технічних систем, а також методи їх розв'язання у межах цього процесу. Об'єктом управління є властивості й параметри складних технічних систем та їх складових елементів. Процес управління розглядається як замкнутий. Параметричне управління технічним станом складних технічних систем полягає у забезпеченні необхідного рівня запасу працездатності таких систем, а також контролю і прогнозування його значення у процесі їх експлуатації.

Для розв'язання першої задачі застосовується пошуковий метод. Задача контролю та прогнозування стану складних технічних систем передбачає розпізнавання у просторі параметрів належності вектору поточного стану системи до певної підобласті працездатного стану.

Ключові слова: управління технічним станом; параметричне управління; запас працездатності; область працездатності; складна технічна система.



MOSKALETS Valentyn

*Doctor of Agricultural Sciences, Associate Professor,
Lecturer in the Department of Intelligence,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0000-0002-0831-056X>*



SEMENOV Mykola

*Senior Lecturer Department of Combat and Logistics Support,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0009-0006-0543-204X>*

ASSESSMENT OF LAND CONTAMINATION RISK BY EXPLOSIVE ORDNANCE: CASE STUDY OF THE CHERNIHIV REGION

The article addresses the problem of systemic land contamination by explosive ordnance (EO) in Ukraine caused by the full-scale armed aggression of the Russian Federation. The study substantiates the importance of spatial risk assessment as a key instrument for ensuring humanitarian security, restoring agricultural land use, supporting environmental recovery, and improving the effectiveness of humanitarian demining activities.

The purpose of the research is to develop and validate a spatial-functional model for assessing the risk of explosive ordnance contamination, taking into account land-use patterns, intensity of hostilities, contamination density, and demining progress. Chernihiv Oblast was selected as a representative case study due to its border location, significant agricultural specialization, extensive combat operations in 2022, and the availability of official data on contamination and clearance activities.

A risk index was developed to quantify residual threats based on contamination density and clearance rates, enabling the identification of priority areas for intervention.

The results reveal that agricultural land constitutes the most affected category, accounting for approximately 60 % of the contaminated territory. Spatial analysis identified the Snovsk, Novhorod-Siverskyi, Horodnia, Nizhyn, and Koriukivka territorial communities as critical risk zones due to high contamination density, low clearance rates, and their proximity to the state border. Correlation analysis confirmed a positive relationship between the intensity of military operations and the density of explosive ordnance contamination.

Keywords: *risk assessment; explosive ordnance; Chernihiv region; land use restoration; GIS technologies; humanitarian demining; mathematical modeling; national security.*

Statement of the problem. As a result of the full-scale armed aggression against Ukraine, the problem of land contamination by explosive hazards (EH) has acquired a systemic nature, generating multidimensional risks to environmental safety, food security, and the socio-economic development of regions. According to the State Emergency Service of Ukraine (SESU), as of 2025, more than 30% of the country's territory is potentially contaminated with explosive ordnance, placing Ukraine among the most affected countries in the world, alongside Afghanistan, Cambodia, Syria, and Bosnia and Herzegovina [1].

Within the scientific discourse, a new research paradigm regarding mine action is gradually emerging: it is no longer viewed solely as a technical issue of land clearance, but rather as a complex spatial-functional challenge requiring the integration of geoinformation analysis, socio-economic modeling, and environmental assessment. Ukrainian researchers [2, pp. 195–210], as well as international experts from GICHD [3], HALO Trust [4], and Humanity & Inclusion [5], emphasize the need to develop regional risk models that take into account land-use types, the intensity of hostilities, and the pace of clearance operations.



Chernihiv Region, which suffered significant destruction in February–March 2022, serves as a representative area for testing such models. Its geostrategic location, border status, agricultural land-use structure, and the availability of official data on demining processes create unique conditions for conducting spatial-functional analysis. Importantly, more than 60% of contaminated areas are agricultural lands, posing a direct threat to food security not only at the regional level but also for the country as a whole.

The need for scientific research is driven not only by the relevance of the problem but also by the insufficient development of methodological tools. Most existing studies are either nationwide or purely technical in nature, not taking into account regional characteristics, land-use structure, and the dynamics of contamination. At the same time, international approaches – particularly the IMAS methodology and GICHD index-based models – require adaptation to Ukrainian realities, including the specifics of de-occupied territories, limited data availability, and resource constraints.

Analysis of recent researches and publications. The analysis of recent publications on land contamination by explosive hazards (EH) indicates a growing interest in the environmental, social, and economic consequences of mine hazards. During the period 2022–2025, there has been a notable intensification of research in the fields of humanitarian demining, UXO/ERW (Unexploded Ordnance / Explosive Remnants of War) risk management, the implementation of geoinformation technologies, and the assessment of the impact of mine threats on land use. At the same time, a critical review of scientific sources reveals a number of methodological and applied gaps that justify the need for a regional spatial-functional study, based on the example of Chernihiv Region. In particular, domestic studies by Bazaliuk et al. [6, pp. 1–15], Zaichenko et al. [7, pp. 817–841], Dudar et al. [2, pp. 195–210], as well as data from GICHD [3, pp. 6–69], demonstrate a fragmentation of approaches, including the lack of comparison between land-use types, limited consideration of the temporal dynamics of contamination, and insufficient integration of socio-economic factors. International sources,

including GICHD [3, pp. 6–69], Humanity & Inclusion [5], UNDP [8, pp. 817–841], UNMAS [9], the Carter Center [10], and the World Bank [11], offer valuable risk assessment methodologies. However, their adaptation to the Ukrainian context – particularly to the conditions of de-occupied regions – remains incomplete. The identified gaps include: the absence of regional analyses of EH-contaminated land based on specific regions of Ukraine; insufficient attention to comparisons between land-use types (agricultural vs. non-agricultural); a lack of temporal dynamics in contamination assessment; limited use of GIS-based analysis for risk modeling and forecasting; and the absence of an integrated analytical model that combines environmental, economic, and social factors. A synthesis of current sources suggests that Chernihiv Region – given its geostrategic location, intensity of hostilities, land-use patterns, and the dynamics of clearance operations – constitutes a representative case for testing a comprehensive methodology for assessing mine contamination risk. On this basis, a scientifically grounded research framework is developed, enabling the formulation of the study's aim and objectives.

The purpose of the article is to develop a spatial-functional model for assessing the risk of land contamination by explosive hazards (EH), based on the example of Chernihiv Region, taking into account the agricultural specificity of the region, the integration of geoinformation data, international IMAS standards, and socio-economic indicators.

Research methodology. The study substantiates the selection of Chernihiv Region as an object for spatial-functional analysis of the risk of land contamination by explosive hazards (EH). This choice is driven by a combination of several factors: its geostrategic location along the northern border of Ukraine, the intensity of hostilities in February–March 2022, a high share of agricultural land use, and the availability of official data on the pace of land clearance. Particular attention is paid to the Snovska, Novhorod-Siverska, Nizhynska, Horodnianska, and Koriukivska communities, which exhibit the highest density of EH, low clearance rates, and a border location that increases the risk of recontamination [12–14].

The research materials include official reports of the State Emergency Service of Ukraine (2022–2024) [15], data from the State Service of Ukraine for Geodesy, Cartography and Cadastre [16], regional environmental passports [17], and information from international organizations such as UNMAS [1], GICHD [3], HALO Trust [4], and UNDP [8]. For clarification on the types of equipment, the reports from the Borzna community and the Ministry of Defense of Ukraine [18–20] were analyzed, confirming the use of MV-4, MV-10, and GCS-200 machines for the mechanized clearance of land.

The research methodology comprised several levels: content analysis of scientific sources to identify gaps; spatial zoning to determine the most affected land-use types; and an index-based approach adapted to the Ukrainian context based on GICHD methodology and IMAS standards [21], taking into account EH density, clearance rates, the intensity of hostilities, and socio-economic factors.

To verify the model, a comparative analysis was conducted across Chernihiv, Kharkiv, Kyiv, and Sumy regions, which share border status but differ in the level of military activity. This made it possible to assess regional differences in EH density, clearance rates, and land-use structure. A multifactor comparison was applied (area cleared, number of neutralized EH items, land-use types, intensity of hostilities, administrative structure), along with correlation analysis using Pearson's coefficient [22], which confirmed the relationship between EH density and the intensity of hostilities, consistent with international case studies (Vietnam, Syria, Bosnia).

Data processing involved normalization of indicators, calculation of average values, variance analysis, and the construction of a risk index. GIS analysis included spatial zoning, cartographic visualization of EH density, and thematic layers of cleared and contaminated areas. Open data from the State Service of Ukraine for Geodesy, Cartography and Cadastre [23] and Sentinel-2 satellite imagery (ESA) [24, 25] were used, enabling the differentiation of surface types and the assessment of landscape changes following hostilities.

QGIS 3.28 software [26] was used for data integration, thematic mapping, and spatial analysis. The Heatmap plugin was applied to generate EH density maps [27], the Raster Calculator for index calculations (including NDVI) [28], and the Field Calculator for constructing complex risk indices [29]. The integrated use of statistical and GIS methods [30] confirmed the validity of the model and enabled to develop practical recommendations for strategic planning of humanitarian demining at the regional level.

Presentation of the main material. As a result of the full-scale armed aggression against Ukraine, the problem of land contamination by explosive hazards (EH) has acquired a systemic nature, requiring not only an immediate response but also a scientifically grounded analysis for the development of an effective humanitarian demining policy. Chernihiv Region, as one of the most severely affected areas due to the intense hostilities in February–March 2022, serves as a representative model for assessing the scale of contamination, the effectiveness of clearance operations, the spatial structure of risks, and the implementation of index-based risk assessment models consistent with international IMAS standards and GICHD methodology.

The organizational structure of mine action in the region includes state, international, and non-governmental components. The key operator is the State Emergency Service of Ukraine (SESU), whose pyrotechnic units are responsible for emergency response and planned clearance activities. As of May 2024, nine permanent SESU units, four additional units from other regions, 70 personnel, and 26 units of specialized equipment are operating in Chernihiv Region, including mechanized platforms MV-4, MV-10, and GCS-200 [31].

The use of mechanical, manual, and remote clearance methods enables the adaptation of equipment to different types of terrain, levels of contamination, and the functional purpose of land. In particular, the MV-4 machine, due to its compact body and reinforced structure, is capable of withstanding the detonation of anti-personnel and anti-tank mines as well as remnants of

explosive ordnance. It is used for mechanical clearance of areas, preparation of soil for demining operations, technical survey of terrain, and removal of hazardous objects (Fig. 1).



Figure 1 – Domestic light demining machine MV-4 [32]

The MV-10 machine, due to its powerful tracked platform and reinforced armored body, is capable of withstanding detonations of anti-personnel and anti-tank mines, as well as ensuring deep mechanical clearance of areas with a high level of contamination (Fig. 2).



Figure – 2. Heavy demining machine DOK-ING MV-10 [33]

GCS-200 platforms, capable of neutralizing artillery shells and other explosive hazards at depths of up to 30 cm, are primarily used on agricultural land (Fig. 3).

According to the Ministry of Defense of Ukraine, 62 GCS-200 machines are already in operation in the country, and in 2025 the fleet is expected to be expanded by an additional 26 units, including those allocated to Chernihiv Region.



Figure – 3. Modern remotely controlled machine GCS-200 [34]

Within the region's mine action system, manual demining remains an indispensable and strategically important method that complements mechanized and remote technologies. Its relevance is determined by the specific characteristics of the local landscape, settlement density, and the high risk to the civilian population. Deminers operate under challenging conditions – near residential buildings, in forested areas, and within social infrastructure sites – using metal detectors, probes, and protective equipment. This method ensures a high level of precision in detecting and neutralizing explosive hazards, particularly in cases involving unstable munitions or their concealment.

Manual demining also has significant scientific value, as it enables the collection of empirical data on the types, locations, and conditions of explosive hazards, to develop the databases for geographic information systems, and the construction of risk models for predicting contamination. Such data are critically important for research institutions engaged in modelling the environmental consequences of war, planning territorial recovery, and developing safety standards.

In the context of humanitarian demining, Chernihiv Region demonstrates active implementation of remote technologies, including the use of unmanned aerial vehicles (UAVs) for surveying contaminated areas. In January 2025, the Ministry of Defense of Ukraine approved the national standard DSTU 8820-5:2024 [35], which regulates the use of UAVs and satellite imagery in

the processes of “land release” – the clearance of territories following non-technical and technical survey. The following types of UAVs are used for aerial photography, detection of suspicious objects, creation of digital maps, and monitoring of changes: Leleka-100 (Fig. 4), DJI Matrice 300 RTK (Fig. 5), and Autel EVO II Dual (Fig. 6).



Figure 4 – Leleka-100 UAV system – a Ukrainian multifunctional unmanned aerial vehicle developed by the private company LLC “VIK DeViro” (DeVIRo TM) for aerial reconnaissance and real-time determination of precise geographic coordinates of objects [36]

The feasibility of establishing a unified geographic information system (GIS) for mine action is recognized by the scientific community [2] as a key prerequisite for effective coordination of operators, efficient resource allocation, and the implementation of strategic risk management at the national level. Chernihiv Region, as one of the most contaminated areas, serves as a representative case for piloting such solutions.

In October 2022, the United Nations Development Programme (UNDP), in cooperation with the Government of Ukraine, initiated the development of a comprehensive GIS intended to serve as an analytical core for damage assessment, recovery planning, and coordination of mine action activities [39]. The system is designed not only to visualize contaminated areas but also to integrate satellite data, forecast risks to the population and economy, and ensure effective interaction between state and international operators.

In this context, Ukraine is actively cooperating with international organizations that are already

operating in Chernihiv Region or may expand their activities there, including HALO Trust, GICHD, UNMAS, and Demining Solutions [1, 3, 4, pp. 12–25; 40]. Their experience in GPS tracking, digital cartography, satellite monitoring, and artificial intelligence algorithms is critically important for the development of a modern mine action safety system.



Figure 5 – Professional quadcopter DJI Matrice 300 RTK [37]



Figure 6 – Autel EVO II 640T Dual drone [38]

The integration of such technologies creates the preconditions for scientifically grounded risk modelling based on empirical data, spatial analysis, and validated hypotheses. On this basis, an analytical risk model has been developed, and the hypothesis regarding the relationship between EH density and the nature of hostilities has been tested.

The model makes it possible to take into account not only the quantity of EH but also for the effectiveness of land clearance, which is critically important for assessing residual hazards and planning humanitarian demining operations. It also provides a basis for comparative regional analysis, serving as a tool for verifying the hypothesis

regarding the dependence of EH density on the intensity of hostilities.

To confirm this hypothesis, a comparative analysis of four regions of Ukraine with different levels of military activity was conducted. Table 1 presents data on the area cleared, the number of neutralized explosive hazards, contamination density, and the intensity of hostilities, which formed the basis for calculating the risk index. The obtained index values make it possible to assess the residual hazard, taking into account the clearance rates (Table 1).

The explosive hazard risk index demonstrates significant variability across regions of Ukraine, correlating with the intensity of hostilities and clearance rates. In comparison with international experience, Ukraine's EH density indicators are among the highest in the world, which underscores the critical need for a systematic approach to humanitarian demining.

The intra-regional analysis (Table 1), covering four regions of Ukraine, revealed significant differences. Chernihiv Region exhibits the highest intensity of hostilities (5 points) and the largest cleared area (45 thousand ha), resulting in a zero risk index – an example of effective response. Kharkiv Region, despite a similarly high intensity of hostilities (5 points), is characterized by the lowest clearance rate (0.333) and the highest EH density (2.40 units/ha), which generates a critically high risk index of 1.602. Sumy and Kyiv regions show intermediate values corresponding to

lower levels of hostilities (4 and 3 points, respectively) and moderate clearance rates. These results confirm the hypothesis that the intensity of hostilities directly influences EH density, while the clearance rate determines the level of residual risk.

A comparison of Ukrainian data with international experience indicates that EH density and residual risk in several regions, particularly Kharkiv Region, exceed those observed in countries that have experienced prolonged armed conflicts.

This confirms the unprecedented level of territorial contamination and the need for a strategic rethinking of humanitarian demining approaches.

In Vietnam, following the end of the war in 1975, mine density in the central provinces ranged from 1.0 to 1.5 units/ha, while low clearance rates resulted in a risk index exceeding 1.0, leading to long-term inaccessibility of agricultural land and a high level of casualties [41]. In Syria, EH density in the Aleppo and Homs regions was estimated at 1.2–1.8 units/ha, while fragmented clearance rates produced risk indices of 0.9–1.3 [42]. In the Republic of Korea, the Demilitarized Zone (DMZ) still contains more than one million mines, with a density reaching 1.0 units/ha; however, due to advanced technological methods and international support, the risk index has been reduced to 0.5–0.7 [43]. Cambodia exhibits mine density in rural areas of 0.5–1.0 units/ha, while low clearance rates result in a risk index of up to 0.7 [44].

Table 1 – Quantitative assessment of the impact of hostilities on explosive hazard density and clearance effectiveness

Region	Area cleared (thousand ha)	Neutralized EH (units)	EH density DD	Intensity of hostilities	Clearance rate CC	Risk index RR
Chernihiv	45	88	1,96	5	1	0
Sumy	38	72	1,89	4	0,84	0,29
Kyiv	22	41	1,86	3	0,49	0,95
Kharkiv	15	36	2,4	5	0,33	1,6

In Bosnia and Herzegovina, following the 1995 war, mine density in some regions exceeded 1.8 units/ha, while clearance rates of 0.4–0.6 produced a risk index of 0.7–1.1, which persisted for two decades [45]. Thus, in comparison with the above-mentioned countries, Ukraine currently faces a uniquely complex situation in which explosive hazard (EH) density in several regions exceeds even peak values observed in post-conflict zones in Asia and the Balkans. Particular attention should be paid to Chernihiv Region, which, despite the highest intensity of hostilities (5 points) during the first months of the full-scale invasion, demonstrates the highest clearance rate – 100% relative to other regions – resulting in a zero risk index. Such an outcome is an exception in the overall pattern and reflects the effective mobilization of resources, the coordinated work of demining units, and the prioritization of the region within the national security strategy.

The strategic location of Chernihiv Region as a border area adjacent to the aggressor state creates a persistent threat of recontamination. Military activity in the northern direction continues, and the risk of renewed mining, remote mining, or the presence of newly introduced EH following sabotage activities remains high. This implies that even under conditions of complete clearance, the region requires dynamic risk monitoring, repeated assessment of EH density, and the application of adaptive safety management models.

Unlike Vietnam or Syria, Ukraine has the potential for faster response due to its institutional capacity, international support, and technological resources. At the same time, the absence of a clear national strategy, prioritization of regions based on risk index, and integration of analytical models into demining planning may lead to a prolonged process lasting decades. Analytical forecasts suggest that, under current clearance rates, the complete neutralization of risk in the most contaminated regions, particularly Kharkiv Region, may take

more than 15 years. In contrast, the implementation of index-based models that take into account not only EH density but also geopolitical vulnerability would enable optimized resource allocation, reduced humanitarian losses, and accelerated return of territories to safe civilian use.

Chernihiv Region, previously identified as an example of effective clearance, simultaneously serves as an indicator of the need for continuous updating of risk assessments in border areas. Its geographical position results in increased vulnerability to recontamination, which require dynamic monitoring and analytical support.

To assess the relationship between the intensity of hostilities and explosive hazard density, a correlation analysis was conducted based on data from four regions. The visualization demonstrated a positive relationship: as the intensity of hostilities increases, EH density also rises. The highest values were recorded in Kharkiv Region (2.4 units/ha at intensity level 5), Chernihiv Region (1.96 at intensity level 5), and Kyiv Region (1.86 at intensity level 3). The calculation of Pearson's correlation coefficient ($r = 0.6$) confirmed the presence of a moderate positive relationship between military activity and the level of territorial contamination.

Thus, the hypothesis regarding the direct influence of the intensity of hostilities on EH density is supported by empirical data, which is consistent with international observations in Vietnam, Syria, Cambodia, and Bosnia and Herzegovina. The obtained results align with the findings of international authors [46] and domestic studies [42, pp. 5–7], confirming the validity of the model and its potential for scaling within the national mine action system. The model enables not only the assessment of overall risk levels but also the detailed characterization of the spatial structure of contamination at the level of land-use types, which is critically important for territorial recovery planning (Table 2).

Table 2 – Spatial distribution of explosive hazard (EH) contamination in Chernihiv Region by land-use types (average for 2023–2024)

Land-use type	Share of contamination (%)
Agricultural land	60
Forest areas	20
Water bodies	8
Recreational zones	7
Industrial areas	5

According to the data presented in Table 2, the analysis of land-use types in Chernihiv Region, which experienced intense hostilities in 2022, shows that agricultural land was the most affected, accounting for 60 % of the total contaminated area. This index is supported by data from the Department of Ecology of the Chernihiv Regional State Administration and statistical reports of the Main Department of Statistics in Chernihiv Region [47]. Forest areas account for 20 %, water bodies for 8 %, recreational zones for 7 %, and industrial areas for 5 %. This structure of contamination indicates a high vulnerability of the agricultural sector, posing a threat to food security and the economic viability of local communities.

In comparison with Sumy Region, where the share of contaminated agricultural land reaches approximately 50 % [48], Chernihiv Region demonstrates a higher concentration of risk in agricultural areas. In Kharkiv Region, according to EPL data [49], a significant part of contamination is concentrated in urban and industrial zones, which is due to the nature of hostilities within urban settlements. Kyiv Region, in contrast, exhibits a more balanced contamination structure, with a predominance of forest and recreational areas, which is explained by landscape characteristics and the directions of military advances in 2022 [50, p. 12].

In accordance with the methodology proposed in the works of Honcharuk [51, pp. 23–25] and

Lytvynenko [52, pp. 12–16], the risk index for Chernihiv Region was calculated. This approach allows to assess the residual hazard levels by considering EH density and clearance rates, integrating spatial and functional parameters into a unified analytical model.

$$R = D * (1 - C),$$

where R is the risk index, D is the explosive hazard (EH) density (units/ha), and C is the clearance rate (share of cleared area).

Next, we proceed to the available data. It is known that the potentially contaminated area is 350 thousand hectares, and the cleared area is 45 thousand hectares. The clearance rate is calculated as follows:

$$C=45000/350000=0,129.$$

At the same time, the EH density is 1.96 units/ha. Therefore, the risk index is calculated as follows:

$$R=1,96 \cdot (1-0,129)=1,70.$$

The obtained risk index value for Chernihiv Region $R=1.70$ indicates a high level of residual hazard that persists despite significant clearance efforts. The most critical areas were identified as the Snovska, Novhorod-Siverska, Nizhynska,

Horodnianska, and Koriukivska communities, selected based on a combination of three factors: low clearance rates, high EH density, and geostrategic location.

Koriukivska community, located in the northwestern part of the region, experienced intensive artillery shelling and sabotage activities in 2022–2023, which led to significant contamination of forested areas and agricultural land [53]. According to data from the Department of Ecology of the Chernihiv Regional State Administration (2024), the clearance rate in this area is less than 15 % of the potentially contaminated area – one of the lowest indicators in the region. The high forest cover further complicates demining operations and increases the risk of hidden contamination.

Taking the risk index into account makes it possible to optimize resource allocation and identify priority areas for demining, with regard to border status, economic significance, and the potential for re-contamination. Thus, the results of the study confirm the necessity of including the Snovska, Novhorod-Siverska, Nizhynska, Horodnianska, and Koriukivska communities in priority humanitarian demining plans, with the application of adaptive risk management models that consider not only technical parameters but also geopolitical vulnerability.

It is important to emphasize that the risk indices used for assessing explosive hazard contamination are based on internationally recognized IMAS (International Mine Action Standards) and are adapted to the Ukrainian context in accordance with the recommendations of the Geneva International Centre for Humanitarian Demining (GICHD) [3]. In Ukraine, these approaches are officially applied by a number of institutions that integrate the index-based model into mine action planning.

In particular, the National Institute for Strategic Studies (NISS) in the report “Economic Security of Ukraine under High Military Risks” [55] proposes an index-based approach for assessing land contamination that takes into account EH density, clearance rates, and the functional significance of

territories. The Dnipro State University of Internal Affairs, in the textbook “Identification of Explosive Hazards” [56, pp. 14–19], describes a risk assessment methodology used in the training of demining specialists. In addition, the Humanitarian Demining Center under the Ministry of Internal Affairs of Ukraine applies these models for operational planning of clearance activities, integrating geospatial data, land-use types, and socio-economic factors.

Thus, the EH risk index in Ukraine is a strategic management tool that combines international standards with national specificities and is actively used in the practice of both governmental and academic institutions.

This approach enables not only quantitatively assess hazard levels but also to develop a spatial model of clearance prioritization consistent with IMAS international standards and GICHD recommendations [3].

The methodological framework of the study includes the provisions of IMAS 08.10 (classification of explosive hazards), IMAS 08.30 (non-technical survey), IMAS 05.10 (quality management of clearance operations), and IMAS 09.20 (documentation of cleared areas), ensuring that the assessment complies with international protocols [57, pp. 22–45]. The use of the index-based approach recommended in the Ministry of Internal Affairs of Ukraine’s textbook “Identification of Explosive Hazards” [56, pp. 14–19] and in the report of the National Institute for Strategic Studies [55] enables to integrate spatial data into a risk management system and ensures a comprehensive analytical framework.

Thus, Chernihiv Region appears not only as an area of contamination but also as a representative model for testing national and international approaches to humanitarian demining, ecological restoration, and safe land use. Compared with neighboring regions – Sumy, Kharkiv, and Kyiv – Chernihiv Region demonstrates the highest concentration of contamination specifically on agricultural lands (Table 3), which is confirmed by data from the State GeoCadastre and regional environmental passports [54].

Table 3 – Explosive hazard risk index by land-use type in Chernihiv Region (average for 2023–2025)

Land-use type	Risk index
Agricultural land	1,02
Forest areas	0,34
Water bodies	0,14
Recreational zones	0,12
Industrial areas	0,09

In Sumy Region, according to the Environmental Protection Program [59, p. 47], the corresponding index for agricultural land is 0.87, in Kharkiv Region it is 0.76, and in Kyiv Region it is 0.65, which indicates a higher level of residual threat specifically in Chernihiv Region. This is due not only to the intensity of hostilities in 2022, but also to its border location, which increases the risk of re-contamination.

Thus, the study results confirm that the Snovska, Novhorod-Siverska, Nizhynska, Horodnianska, and Koriukivska communities should be included in priority humanitarian demining plans. Spatial ranking by land-use types makes it possible to further refine these priorities, while the methodological framework ensures their compliance with international standards. The Chernihiv region serves as a pilot area capable of setting standards for the entire country in the fields of humanitarian demining and environmental planning.

Conclusions and prospects for further research. The selection of Chernihiv Region as the study object is justified by a comprehensive analysis of its geostrategic position, the intensity of hostilities in February–March 2022, land-use patterns, and the dynamics of territory clearance. These factors make the region a representative case for testing the methodology of explosive hazard risk assessment, which can be further scaled to other border regions of Ukraine.

The study demonstrates that land contamination by explosive hazards resulting from the full-scale aggression has acquired a systemic nature, requiring not only operational response but also strategic planning based on scientifically validated

models. Chernihiv Region serves as a representative model for analyzing residual risk, assessing clearance effectiveness, and testing international IMAS standards and GICHD methodology adapted to the Ukrainian context.

As of October 2025, the risk index in Chernihiv Region is $R = 1.70$, indicating a critical level of residual hazard despite active clearance efforts in 2022–2024. Spatial analysis confirms that 60% of contaminated areas are agricultural lands, posing a direct threat to food security, the economic stability of local communities, and the ecological balance of the region. The Snovska, Novhorod-Siverska, Nizhynska, Horodnianska, and Koriukivska communities were identified as high-risk zones based on three criteria: low clearance rates, high EH density, and border location.

A comparative analysis of four regions (Chernihiv, Kharkiv, Kyiv, and Sumy) showed that Chernihiv Region has the highest EH density on agricultural land – 1.02 which is confirmed by data from the State GeoCadastre and regional environmental passports. Correlation analysis (Pearson's coefficient $r = 0.6$) confirmed the hypothesis of a relationship between EH density and the intensity of hostilities, consistent with international case studies (Vietnam, Syria, Bosnia).

The risk index as an analytical planning tool enables optimization of resource allocation, identification of priority clearance zones, and prevention of recontamination, in line with recommendations of Ukrainian researchers (Honcharuk, 2023; Lytvynenko, 2022).

Reference

1. Cabinet of Ministers of Ukraine (2024). Ukraine National Mine Action Strategy and its Operational Plan (2024–2033). Retrieved from: <https://surl.lt/ktzwvj> (accessed 28 October 2026) [in English].
2. Geneva International Centre for Humanitarian Demining (GICHD) (2022). Risk assessment methodology for landmine contamination. Retrieved from: <https://www.gichd.org> (accessed 24 October 2025) [in English].
3. Dudar V., Handzyura V., Romaniuk V., Berehulia R. (2023). Proposals for managing lands contaminated by explosive remnants of war. *Grail of Science*, no. 37. Retrieved from: <https://surl.lt/qhjnsd> (accessed 24 October 2025) [in English].
4. Geneva International Centre for Humanitarian Demining (GICHD) (2020). A guide to non-technical survey. Retrieved from: <https://surl.li/ajpfpg> (accessed 24 October 2025) [in English].
5. The HALO Trust. Ukraine: Surveying and clearing mines. Retrieved from: <https://surl.lu/qdbibp> (accessed 24 October 2025) [in English].
6. Humanity & Inclusion (2024). UXO impact on agriculture and rural livelihoods. Retrieved from: <https://www.hi.org> (accessed 24 October 2025) [in English].
7. Bazaluk O., Petlovanyi M., Sai K., Chebanov M., Lozynskiy V. (2024). Comprehensive assessment of the earth's surface state disturbed by mining and ways to improve the situation: case study of Kryvyi Rih Iron-ore Basin, Ukraine. *Frontiers in Environmental Science*, vol. 12. Retrieved from: <https://doi.org/10.3389/fenvs.2024.1480344> [accessed 24 October 2025] [in English].
8. Zaichenko S., Vovk O., Voitenko Yu., Li M. (2025). Analysis and Prospects for the Development of Humanitarian Demining Methods. *Systems, Decision and Control in Energy VII.*, vol. 2, pp. 817–841. Retrieved from: <https://surl.li/tomfvb> (accessed 28 October 2026) [in English].
9. United Nations Development Programme in Ukraine (2025). *Informuvannia naselennia shchodo minnoi nebezpeky: vyklyky ta rishennia* [Mine risk education for the population: challenges and solutions]. Retrieved from: <https://www.undp.org/uk/ukraine> [accessed 24 October 2025] [in Ukrainian].
10. UNMAS (2025). Ukraine: Mine contamination is lethal legacy of Russia's invasion. Retrieved from: <https://surl.li/aggtat> (accessed 24 October 2025) [in English].
11. Carter Center (2023). Landmine and UXO contamination in post-conflict zones. Retrieved from: <https://www.cartercenter.org> (accessed 24 October 2025) [in English].
12. World Bank (2025). Post-conflict land degradation and agricultural recovery. Retrieved from: <https://www.worldbank.org> (accessed 24 October 2025) [in English].
13. DSNS Ukrainy (2024). U DSNS nahadaly pro minnu nebezpeku na prykordonnykh i deokupovanykh terytoriiakh [State Emergency Service reminded about mine danger in border and de-occupied areas]. Retrieved from: <https://surl.li/pwuwuc> (accessed 24 October 2025) [in Ukrainian].
14. Chernihivska oblasna rada (2021). *Pohodzheno perelik pryrodookhoronnykh zakhodiv OFONPS na 2022 rik* [Approved list of nature protection measures of OFONPS for 2022]. Retrieved from: <https://surl.li/cnzmaq> (accessed 24 October 2025) [in Ukrainian].
15. Chernihivska ODA (2024). *Rozminuvannia Chernihivshchyny tryvaie: maizhe 40 tys. ha silhospuhid ochyshcheno vid vybukhonebezpechnykh predmetiv* [Demining of Chernihiv region continues: nearly 40 thousand hectares of farmland cleared of explosive objects]. Retrieved from: <https://surl.li/xvqqbx> (accessed 24 October 2025) [in Ukrainian].
16. Derzhheokadastr. *Struktura Derzhheokadastru* [Structure of the State Geocadastr]. Retrieved from: <https://surl.li/ryguah> (accessed 24 October 2025) [in Ukrainian].
17. Ministerstvo zakhystu dovykillia ta pryrodnykh resursiv Ukrainy. *Ekolohichni pasporty rehioniv Ukrainy* [Environmental passports of Ukrainian regions]. Retrieved from: <https://surl.li/cffgvj> (accessed 24 October 2025) [in Ukrainian].
18. Borznianska terytorialna hromada (2024). *Dotrymuiesia pravyl minnoi bezpeky!* [Follow

mine safety rules!]. Retrieved from: <https://surl.li/urebnw> (accessed 24 October 2025) [in Ukrainian].

19. Ministerstvo oborony Ukraine (2025). *Kompleksna systema zahalnykh tekhnichnykh vymoh do ozbroiennia ta viiskovoi tekhniky* [Comprehensive system of general technical requirements for weapons and military equipment]. Retrieved from: <https://surl.li/odrhxa> (accessed 24 October 2025) [in Ukrainian].

20. Ukrainska Pravda (2025). *Minoborony u kvitni dopustylo do viiska ponad 120 novykh vydiv ozbroiennia ta tekhniky* [Ministry of Defense approved over 120 new types of weapons and equipment in April]. Retrieved from: <https://www.pravda.com.ua/news/2025/05/2/7510260/> (accessed 24 October 2025) [in Ukrainian].

21. United Nations Mine Action Service (UNMAS) (2019). IMAS 08.10: Non-technical survey – Assessment of mine and explosive remnants of war (ERW) contamination. Retrieved <https://surl.li/pwiqcp> (accessed 24 October 2025) [in English].

22. Maestrovirtuale.com (2024). *Koefitsient koreliatsii Pirsona: shcho tse take ta yak yoho vykorystovuiut* [Pearson correlation coefficient: what it is and how it is used]. Retrieved from: <https://surl.cc/tpsnpo> (accessed 24 October 2025) [in Ukrainian].

23. Derzhheokadastr. *Publichna kadastrova karta Ukrainy* [Public cadastral map of Ukraine]. Retrieved from: <https://map.land.gov.ua> (accessed 23 October 2025) [in Ukrainian].

24. European Space Agency. Copernicus Open Access Hub. Retrieved from: <https://dataspace.copernicus.eu> (accessed 23 October 2025) [in English].

25. Sentinel Hub. Satellite data access and visualization platform. Retrieved from: <https://www.sentinel-hub.com> (accessed 23 October 2025) [in English].

26. QGIS Development Team. QGIS Geographic Information System (Version 3.28). Open Source Geospatial Foundation. Retrieved from: <https://qgis.org> (accessed 23 October 2025) [in English].

27. Esri Humanitarian Mine Action Solutions (2025). Retrieved from: <https://surl.li/buedyc> (23 October 2025) [in English].

28. MapScaping (NDVI). Retrieved from: <https://surl.li/hxxgvp> (accessed 28 October 2025) [in English].

29. Esri. Calculate Composite Index (Spatial Statistics) – ArcGIS Pro. Retrieved from: <https://surl.lt/otpucw> (accessed 24 October 2025) [in English].

30. Esri Newsroom (2024). Drones and GIS Transform Humanitarian Demining Efforts. Retrieved from: <https://surl.cc/vvkdgv> (accessed 24 October 2025) [in English].

31. Borznianska hromada (2024). *Tryvaiut roboty po rozminuvanniu terytorii oblasti* [Demining works continue in the region]. Retrieved from: <https://surl.cc/bbseld> (accessed 24 October 2025) [in Ukrainian].

32. Espresso (2024). *Ukrainska mashyna dlia rozminuvannia MV-4 otrymala sertyfikat vidpovidnosti: u chomu yii osoblyvosti* [Ukrainian demining machine MV-4 received a certificate of conformity: what makes it special]. Retrieved from: <https://surl.li/ewmpcb> (accessed 24 October 2025) [in Ukrainian].

33. Ministerstvo ekonomiky Ukrainy (2024). *Zibrana ta chastkovo lokalizovana v Ukraini vazhka mashyna dlia rozminuvannia DOK-ING MV-10 proishla vyprobuвання na polihoni* [The DOK-ING MV-10 heavy demining machine, partially localized in Ukraine, passed tests at the training ground]. Retrieved from: <https://surl.li/fdrdfl> (accessed 28 October 2025) [in Ukrainian].

34. ArmyInform (2025). *Biutsia z minamy zamist liudei: yak na Chernihivshchyni GCS-200 vyryvaiut zemliu z pastok smerti* [Fighting mines instead of people: how GCS-200 tears the ground from death traps in Chernihiv region]. Retrieved from: <https://surl.li/qyrgby> (accessed 24 October 2025) [in Ukrainian].

35. Ministerstvo oborony Ukraine (2025). *Vykorystannia BpLA ta suputnykovykh znmkiv dlia rozminuvannia zatverdzheno na rivni derzhstandartu* [Use of UAVs and satellite images for demining approved at the state standard level]. Retrieved from: <https://surl.li/zxvpur> (accessed 24 October 2025) [in Ukrainian].

36. Shynko A. (2021). *BpLA "Leleka-100" pryiniato na ozbroiennia ZSU* [UAV "Leleka-100" adopted by the Armed Forces of Ukraine]. *UkrMilitary*. Retrieved from: <https://surl.li/lwenhj> (accessed 24 October 2025) [in Ukrainian].
37. UKR-DRONE. *Profesiini kvadrokoptery* [Professional quadcopters]. Retrieved from: <https://surl.li/eyaznt> (accessed 24 October 2025) [in Ukrainian].
38. UKRAINEAIDMANUAL. *Dron Autel EVO II 640T Dual dlia ZSU* [Autel EVO II 640T Dual drone for the Armed Forces of Ukraine]. Retrieved from: <https://surl.li/avplcb> (accessed 24 October 2025) [in Ukrainian].
39. United Nations Development Programme (UNDP) (2022). *Proiekt protymynnoi diialnosti v Ukraini* [Humanitarian demining project in Ukraine]. Retrieved from: <https://surl.li/suxnic> (accessed 24 October 2025) [in Ukrainian].
40. Demining Solutions. *Holovna – Ukrainska* [Homepage – Ukrainian]. Retrieved from: <https://demining.solutions/> (accessed 24 October 2025) [in Ukrainian].
41. Ministerstvo ekonomiky Ukrainy (2021). *Ohliad torhovelnoi polityky Sotsialistychnoi Respubliky Vietnam* [Review of the trade policy of the Socialist Republic of Vietnam]. Retrieved from: <https://surl.li/dltcrm> (accessed 24 October 2025) [in Ukrainian].
42. Natsionalna akademiia nauk Ukrainy (2022). *Pro zakhody shchodo zabezpechennia natsionalnoi bezpeky Ukrainy v umovakh voiennoho stanu* [On measures to ensure the national security of Ukraine under martial law]. *Visnyk Natsionalnoi akademii nauk Ukrainy*, no. 2, pp. 3–11. DOI: <https://doi.org/10.15407/visn2022.02.003> [in Ukrainian].
43. United Nations Development Programme (2024). *Respublika Koreia vydiliaie UNDP 8 milioniv dolariv na humanitarne rozminuvannia Ukrainy* [Republic of Korea allocates 8 million USD to UNDP for humanitarian demining in Ukraine]. Retrieved from: <https://surl.li/yicutg> (accessed 24 October 2025) [in Ukrainian].
44. Radio Svoboda (2023). *Ukrainski sapery proishly navchannia z rozminuvannia v Kambodzhi* [Ukrainian sappers completed demining training in Cambodia]. Retrieved from: <https://lnk.ua/eD1RWw9Hb> (accessed 24 October 2025) [in Ukrainian].
45. EPL – Environment People Law (2022). *Dosvid Bosnii i Hertsehovyny u sferi ekolohichnoho upravlinnia* [Experience of Bosnia and Herzegovina in environmental governance]. Retrieved from: <https://lnk.ua/NWLoKvymC> (accessed 24 October 2025) [in Ukrainian].
46. Holovne upravlinnia statystyky u Chernihivskii oblasti (2024). *Navkolishnie seredovyshche: statystychni dani 2023–2024* [Environment: statistical data 2023–2024]. Retrieved from: <https://lnk.ua/GGMncRkDa> (accessed 24 October 2025) [in Ukrainian].
47. Ministerstvo ekonomiky Ukrainy (2023). *Humanitarne rozminuvannia: ochyshchaiemo ukrainsku zemliu* [Humanitarian demining: clearing Ukrainian land]. Retrieved from: <https://lnk.ua/yC6Z8aGTw> (accessed 24 October 2025) [in Ukrainian].
48. Eco.Rayon (2022). *Neprydatna zemlia, vyhorili lisy ta zabrudnena voda – ekolohichni naslidky okupatsii Kharkivshchyny* [Unsuitable land, burnt forests and polluted water – environmental consequences of the occupation of Kharkiv region]. Retrieved from: <https://lnk.ua/b8hKMZu7B> (accessed 24 October 2025) [in Ukrainian].
49. Derzhavne ahentstvo lisovykh resursiv Ukrainy (2022). *Publichnyi zvit holovy ahentstva za 2022 rik* [Public report of the head of the agency for 2022]. Retrieved from: <https://lnk.ua/mPbsHsjuk> (accessed 24 October 2025) [in Ukrainian].
50. Honcharuk O. V. (2023). *Obhruntuvannia hospodarskykh rishen i otsiniuvannia ryzykiv. Chastyna 2* [Substantiation of economic decisions and risk assessment. Part 2]. Rivne : Natsionalnyi universytet vodnoho hospodarstva ta pryrodokorystuvannia. Retrieved from: <http://ep3.nuwm.edu.ua/27535/> (accessed 28 October 2025) [in Ukrainian].
51. Lytvynenko I. V. (2022). *Otsiniuvannia ekonomichnykh ryzykiv* [Assessment of economic risks]. Berdiansk : Berdianskyi pedahohichniy universytet. Retrieved from: <https://lnk.ua/DxtZGvO5L> (accessed 24 October 2025) [in Ukrainian].

52. Intent (2023). *Yaki prohramy z humanitarnoho rozminuvannia dostupni dlia hromad* [What humanitarian demining programs are available for communities]. Retrieved from: <https://lnk.ua/tj34Nob99> (accessed 24 October 2025) [in Ukrainian].

53. Department ecolohii ta pryrodnyh resursiv Chernihivskoi oblasnoi administratsii (2024). *Ofitsiina informatsiia pro stan ekologichnoi bezpeky ta rozminuvannia v hromadakh oblasti* [Official information on the state of environmental safety and demining in communities of the region]. Retrieved from: <https://eco.cg.gov.ua/> (accessed 24 October 2025) [in Ukrainian].

54. Nationalnyi instytut stratehichnyh doslidzhen (NISD) (2025). *Ekonomichna bezpeka Ukrainy v umovakh vysokykh voennykh ryzykiv ta hlobalnoi nestabilnosti* [Economic security of Ukraine under high military risks and global instability]. Retrieved from: <https://lnk.ua/UfVHa0OM0> (accessed 24 October 2025) [in Ukrainian].

55. Fursa V., Pokaichuk V., Polyvaniuk V. (2024). *Identyfikatsiia vybukhonebezpechnykh predmetiv* [Identification of explosive objects]. Dnipro :

Dniprovskiy natsionalnyi universytet vnutrishnikh sprav. Retrieved from: <https://lnk.ua/ihaSheNvb> (accessed 24 October 2025) [in Ukrainian].

56. Geneva International Centre for Humanitarian Demining (2023). Land release and risk management guidelines. Geneva : GICHD. Retrieved from: <https://lnk.ua/5DBd9QYvD> (accessed 24 October 2025) [in English].

57. Holovne upravlinnia Derzhheokadastru u Chernihivskii oblasti (2024). *Zpochatku 2024 roku do bazy Derzhavnoho zemelnoho kadastru vneseni vidomosti pro normatyvnu hroshovu otsinku zemel 57 naselenykh punktiv Chernihivshchyny* [Since the beginning of 2024, data on the normative monetary valuation of land in 57 settlements of Chernihiv region have been entered into the State Land Cadastre]. Retrieved from: <https://surl.li/qxibje> (accessed 24 October 2025) [in Ukrainian].

58. Sumska miska rada (2024). *Prohrama okhorony navkolyshnoho pryrodnoho seredovyshcha Sumskoi miskoi terytorialnoi hromady* [Environmental protection program of the Sumy city territorial community]. Retrieved from: <https://lnk.ua/HouSg2IgE> (accessed 24 October 2025) [in Ukrainian].

Received / Стаття надійшла до редакції: 15.12.2025

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 27.01.2026

Published / Опубліковано: 30.06.2026

МОСКАЛЕЦЬ ВАЛЕНТИН ВІТАЛІЙОВИЧ

доктор сільськогосподарських наук, доцент,
викладач кафедри розвідки,
Київський інститут Національної гвардії України
<https://orcid.org/0000-0002-0831-056X>

СЕМЕНОВ МИКОЛА ВОЛОДИМИРОВИЧ

старший викладач кафедри бойового та логістичного забезпечення,
Київський інститут Національної гвардії України
<https://orcid.org/0009-0006-0543-204X>

ОЦІНЮВАННЯ РИЗИКУ ЗАБРУДНЕННЯ ЗЕМЕЛЬ ВИБУХОНЕБЕЗПЕЧНИМИ ПРЕДМЕТАМИ: ПРИКЛАД ЧЕРНІГІВСЬКОЇ ОБЛАСТІ

Досліджено проблему мінного та вибухонебезпечного забруднення територій України внаслідок збройної агресії російської федерації. Обґрунтовано актуальність оцінювання просторових ризиків для забезпечення гуманітарної безпеки, відновлення землекористування та стратегічного планування розмінування.

Об'єктом аналізу визначено Чернігівську область як репрезентативний прикордонний регіон з аграрною спеціалізацією та високою інтенсивністю бойових дій. У межах дослідження виконано просторово-функціональне зонування територій та ідентифіковано громади з підвищеним рівнем ризику: Сновську, Новгород-Сіверську, Городнянську, Ніжинську та Корюківську.

Запропонований підхід інтегрує статистичні дані та ймовірнісні характеристики у національну цифрову платформу моніторингу. Це забезпечує органи державної влади інструментарієм для прийняття обґрунтованих господарських рішень. Перспективним напрямом визначено розроблення аналітичних залежностей для математичного моделювання транспортних подій у зонах високої мінної небезпеки.

Ключові слова: оцінювання ризику; вибухонебезпечні предмети; Чернігівська область; землекористування; ГІС-технології; гуманітарне розмінування; математичне моделювання; національна безпека.



PAVLOV Yaroslav

*Candidate of Pedagogical Sciences, Associate Professor,
Head of the Educational and Scientific Institute of Logistics,
National Academy of the National Guard of Ukraine
<https://orcid.org/0000-0002-0852-5659>*



PISTRIAK Petro

*Candidate of Military Sciences, Associate Professor,
Deputy Head of the Educational and Scientific Institute of Logistics for Research –
Head of the Laboratory for Support of Service
and Combat Activities of the National Guard of Ukraine,
National Academy of the National Guard of Ukraine
<https://orcid.org/0000-0001-9161-5788>*

SPECIFIC FEATURES OF EXPERIMENTAL OPERATION OF CLOTHING AND EQUIPMENT UNDER REAL CONDITIONS

The paper presents the results and identifies the specific features of the experimental operation of clothing and equipment under three main conditions of their application: during intensive combat training, as well as in the course of performing service-combat and special combat tasks. It has been established that the results obtained during experimental operation differ significantly from those of standard testing defined by current military standards and regulatory documents. This is due to the impact of real operating conditions, intensity of use, and the combined influence of factors inherent to the combat environment. The study substantiates the necessity of improving approaches to evaluating the quality and effectiveness of clothing and equipment during their practical use. In particular, a methodological approach to calculating a generalized average score is proposed, both for individual characteristics and for their overall set, which enables a comprehensive assessment of the tested samples.

Special attention is given to the application of the weighted average method, which allows accounting for the priority of combat characteristics, minimizes the influence of secondary indicators on the final result, and enhances the objectivity of expert evaluation. Within the framework of the study, the definitions of "experimental operation" and "additional clothing and equipment" are introduced, contributing to the standardization of terminology in this field. The proposed approach can be applied in organizing and conducting experimental operation of new samples, as well as in supporting decision-making regarding their further implementation in the clothing and equipment supply system of the security and defense sector of Ukraine.

The purpose of the article is to develop proposals for improving the methodology of experimental operation of clothing and equipment and to generalize the results obtained under various conditions of their use.

The study employs empirical research methods, including observation, generalization of practical experience, and analysis of the obtained results.

Keywords: *experimental operation; additional clothing and equipment; testing; clothing and equipment; research group.*

Statement of the problem. Modern combat operations are characterized by high intensity, dynamism, and duration, accompanied by a substantial increase in the burden placed on the serviceman as the primary element of the combat system. Under combat conditions, a serviceman is required to carry significant amounts of weapons, ammunition, personal protective equipment, electronic warfare (EW) systems, various types of supplies, and other items, including clothing

property (CP). This creates the need to ensure an optimal balance between the weight of equipment and its functional capabilities. In this regard, particular importance for CP is attached to ergonomics, comfort during prolonged use, adaptability to various climatic conditions, and similar characteristics, which are verified and monitored by relevant units and supplier representatives before adoption for use [1–4]. Such verification is conducted through testing by



research institutions or designated military units under the supervision of the same research institutions using standard methodologies, generally in laboratory settings or under predetermined conditions of routine activity in strict compliance with operating rules [3]. The purpose of such testing is to confirm the technical characteristics and safety of CP items. At the same time, the established testing methodologies allow only certain physical-mechanical and technical characteristics of materials and products to be determined, which do not always account for the complex influence of factors inherent in the real combat environment. Prolonged wearing of CP items, the combination of static and dynamic loads, changing weather conditions, intensity of use, deviations from prescribed operating rules, and other factors corresponding to current realities of warfare may significantly alter their operational properties.

In this connection, particular significance is attached to conducting studies based on an empirical approach and involving the assessment of the properties and characteristics of CP directly under conditions of its real operation: combat training sessions, tactical exercises with live firing, the performance of service-combat tasks, and combat (special) actions. Such studies make it possible to account for the maximum number of interrelated factors and to obtain more objective results compared with laboratory testing conducted under research institution conditions.

Analysis of recent researchs and publications.

References [1, 2] establish general rules for State and departmental testing of weapons and military equipment. However, such approaches cannot be fully applied to the testing of clothing property.

The procedure for organizing and conducting military experimental testing of CP items is specified in [3]. Its essence consists of:

- establishing research and control groups of servicemen equipped with experimental and, respectively, standard CP samples;
- obtaining the results of experimental testing;
- comparing the characteristics of CP samples during and after operation under routine military activity conditions.

The purpose of experimental testing is to verify the compliance of a sample with established technical requirements, standards, and regulatory documents.

However, this document contains several controversial issues and does not reflect the specific features of testing CP samples under real

conditions, nor does it account for certain operational peculiarities under special combat and service-combat conditions.

Reference [4] proposes a structural-functional model for implementing the methodology of testing the quality of flight-technical clothing, reflecting the purpose, components of the process, and principles of its implementation; however, it is based on laboratory studies of each indicator. At the same time, the scientific literature does not address the specific features, methodologies, or results of conducting the experimental operation (EO) of clothing property under real complicated conditions.

Therefore, the issue of conducting the experimental operation of clothing property under conditions close to real ones remains relevant and requires further research.

The purpose of the article is to develop proposals regarding the methodology for conducting the experimental operation of clothing property and to generalize the results of operating experimental samples.

Presentation of the main material. Along with the main elements of clothing property (CP), in order to achieve greater efficiency in the performance of service-combat (combat) tasks, units and individual servicemen use additional CP elements, including load-bearing vests, backpacks, bags, pouches, etc. Such property is usually purchased with additional funds or provided by volunteer organizations. It is not included in the established clothing supply norms and may be issued in excess of these norms [5–8]. At the same time, such CP items may either have analogues among property provided under supply norms or may have no such analogues. Proceeding from this, it is advisable to distinguish such property as a separate type of CP and define it as additional clothing property (ACP). The study of the suitability of ACP for use is an important issue, since there is a need to substantiate its use within the Defense Forces [9,10].

As noted in the analysis of publications, the procedure for organizing and conducting military experimental testing of CP items is defined in [3]. At the same time, present-day requirements indicate the need to study both basic CP and ACP under more complicated real conditions of use (RCU) – namely, during intensified combat training (CT), the performance of service-combat tasks (SCT), and combat special tasks (CST), including consideration of their suitability for use under specific conditions.

The peculiarity of property operation under RCU is associated with the emergence of a greater number of factors influencing this process:

- rapid changes in conditions and methods of use;
- complex operational situations and stressful circumstances;
- living conditions, etc., which significantly violate the prescribed operating procedures for products and affect their operational characteristics.

Thus, the essence of this type of research differs somewhat and consists in studying the operational, technical, ergonomic, and physical-mechanical properties of clothing property samples specifically under RCU.

The purpose of the experimental operation (EO) of CP is to obtain practical results concerning the expediency, effectiveness, and specific features of using CP samples under real service-combat and combat conditions. EO of CP may be conducted both as a primary and as a supplementary type of research to experimental testing and may complement its results.

In accordance with a memorandum of cooperation with a foreign company manufacturing military property and equipment, the staff of the Educational and Scientific Institute of Logistics of the National Academy of the NGU organized the EO of ACP elements, namely military and assault backpacks.

The studies were conducted with the following objectives:

- verification and analysis of the compliance of ergonomic, operational, and other properties and their indicators declared by the manufacturer under RCU, and assessment of their functional capabilities;
- assessment of product compatibility with other CP items, equipment, weapons, etc.;
- determination of the expediency of use and adoption into supply entitlement norms;
- assessment of suitability for use and possible improvements to the military property under study.

The objects selected for the EO of ACP were a 30–40 L military backpack (MB-30) and a 30 L assault backpack (AB-30). All products complied with basic international standards [6].

The studies were conducted sequentially over a four-month autumn-winter period. Considering weather conditions, this period is among the most extreme for performing SCT and conducting combat operations. Given the absence of analogous objects of study within the relevant entitlement norms of the research units and the fact that the

products had been developed and supplied by a foreign company, EO was conducted unilaterally (without comparison with control samples). Therefore, no control group was formed in this study. For EO, three research groups were formed for each ACP sample under three principal operating modes: during intensified combat training activities (tactical exercises with live firing), during the performance of service-combat tasks (service at block posts and checkpoints), and during combat operations directly at squad and platoon positions. The number of personnel involved in testing within each research group amounted to 12–14 servicemen. Such a number of respondents makes it possible to obtain a sufficient volume of expert assessments for the statistical generalization of results [3].

The EO of ACP under each operational reality was conducted over one month and consisted of four stages (weeks) of operation: Stage 1 – trial period of operation; Stage 2 – initial period (after light repair, cleaning, and washing); Stage 3 – main period (after repair involving replacement of damaged elements, washing, cleaning, etc.); Stage 4 – final stage of operation. For the research groups, servicemen with experience in performing SCT (including CST) were selected. In accordance with medical commission conclusions, they were healthy, without physical impairments, aged 21–26 years, with an average body weight of 65–75 kg, equipped with standard gear including weapons and personal protective equipment, and wearing clothing corresponding to seasonal supply norms [5].

During the experimental operation, the following property characteristics were identified and evaluated:

1) *Compliance with declared characteristics and intended purpose*: compliance of the product with its functional purpose; compliance of indicators with manufacturer-declared characteristics; maintenance of core functions throughout the entire EO period; compliance with declared capacity, etc.

2) *Reliability*: overall operational reliability; wear resistance; endurance during prolonged carrying under maximum combat load; resistance to mechanical obstacles and other external factors, etc.

3) *Strength*: overall structural strength of the product; strength of straps and handles under mechanical loads (no delamination or tearing during prolonged use); seam strength (withstanding dynamic loads and sudden movements); reliability and durability of fittings (resistance to breakage and climatic influences).

4) *Protection against external and internal factors*: water resistance; dust protection; fire resistance; wind protection; color fastness to abrasion; resistance to chemical exposure.

5) *Ergonomics and comfort*: possibility of optimal load distribution; convenience during movement and maneuvering; comfort for the torso; absence of chafing from straps; back ventilation; adjustability of straps; presence of a quick-release system.

6) *Functionality*: possibility of using the product fully for its intended purpose; access to compartments with and without removing the product; convenience of access to additional pockets and attached equipment; compatibility with the MOLLE system; compatibility with equipment and weapons.

7) *Mobility and camouflage*: noise level during movement; tendency to snag on obstacles; level of visual detectability (camouflage); reduction of detectability in the infrared spectrum.

8) *Resistance to operating conditions and possibility of self-maintenance*: possibility of independent maintenance (cleaning from dirt, etc.); possibility of eliminating minor damage in field conditions; preservation of appearance and shape; preservation of functionality after exposure to adverse climatic conditions, falls, etc.

9) *Tactical suitability*: product safety; compatibility with body armor and personal protective equipment; compatibility with weapons; compatibility with other equipment elements; influence of the product on firing position and freedom of movement, etc.

Determining the compliance of the specified product properties was carried out by the personnel who directly operated them under the defined conditions using an online questionnaire. The results were recorded using a three-point scale: 3 points – “fully compliant”; 2 points – “partially compliant”; 1 point – “non-compliant.” The three-point scale makes it possible to simplify the assessment process in field conditions and ensure unambiguous interpretation of responses.

To unify the analysis, the assessment results were summarized using two integral indicators:

1. Positive indicator (R_{pi}) – determined as the percentage share of ratings “fully compliant” and “partially compliant” out of the total number of assessments for each i -th characteristic:

$$R_{pi} = \frac{N_3 + N_2}{N_{tot}} \cdot 100\% \quad (1)$$

where: N_3 – number of “fully compliant” ratings; N_2 – number of “partially compliant” ratings; N_{tot} – total number of ratings.

Accordingly, the negative indicator (R_{ni}) was determined as the percentage share of “non-compliant” ratings:

$$R_{pi} = \frac{N_1}{N_{tot}} \cdot 100\% \quad (2)$$

where: N_1 – number of “non-compliant” ratings.

It should be noted that formulas (1) and (2) are used when there is a need to determine the positive and negative indicators of a product. They may be applied for further improvement of the tested product with respect to each characteristic individually.

For quantitative generalization of survey results, the average score for the indicator of the i -th property was determined:

$$\overline{R_{sri}} = \frac{3N_3 + 2N_2 + 1N_1}{N_{tot}} \quad (3)$$

where: $\overline{R_{sri}}$ – average score for the indicator of the i -th property.

For a comprehensive product assessment, the generalized average score across all properties was calculated:

$$\bar{X} = \frac{\sum_{i=1}^K \overline{R_{sri}}}{K} \quad (4)$$

where: K – number of properties; average score across all properties; $\bar{X}$ – average score across all properties.

At the same time, the variation in assessments obtained from respondents was insignificant, indicating sufficient consistency of expert evaluations and allowing the obtained results to be considered representative for further generalization.

For interpretation of the results of the experimental operation, the following values were adopted: 2.50–3.00 (85–100%) – the product generally complies with established requirements; 1.75–2.49 (65–84%) – the product partially complies with requirements and requires improvement; 1.00–1.74 (less than 65%) – the product does not comply with established requirements. Threshold values were refined by the commission according to the intended purpose and properties of the products.

In order to account for the priority of combat characteristics, minimize the influence of secondary indicators on the final result, and improve the objectivity of the expert conclusion, the weighted average score method was also applied. For this purpose, personnel of the research

groups were asked to determine a weight coefficient W_i for each product property, reflecting its significance for defensive operations, assault operations, marches, and temporary operation. The weighting coefficients were normalized according to the following condition:

$$\sum_{i=1}^k W_i = 1 \quad (5)$$

The weighting coefficients were determined through expert judgment based on the aggregation of evaluations provided by the personnel of the research groups. To reduce the influence of individual subjectivity, averaging of the values proposed by experts was applied, after which the obtained coefficients were normalized so that their sum equaled unity.

Then, the comprehensive product assessment considering weighting coefficients was determined using the formula:

$$\bar{X}_{weighted} = \sum_{i=1}^k W_i \cdot \bar{X}_i \quad (6)$$

where: $\bar{X}_{weighted}$ – weighted average product score.

The comprehensive assessment of the products based on the survey results of group personnel (respondents) after completion of the experimental operation of the backpacks (MR-30 and AB-30) is presented in Fig. 1. The weighted average score of the products, considering the priority of characteristics for combat operations, is presented in Fig. 2.

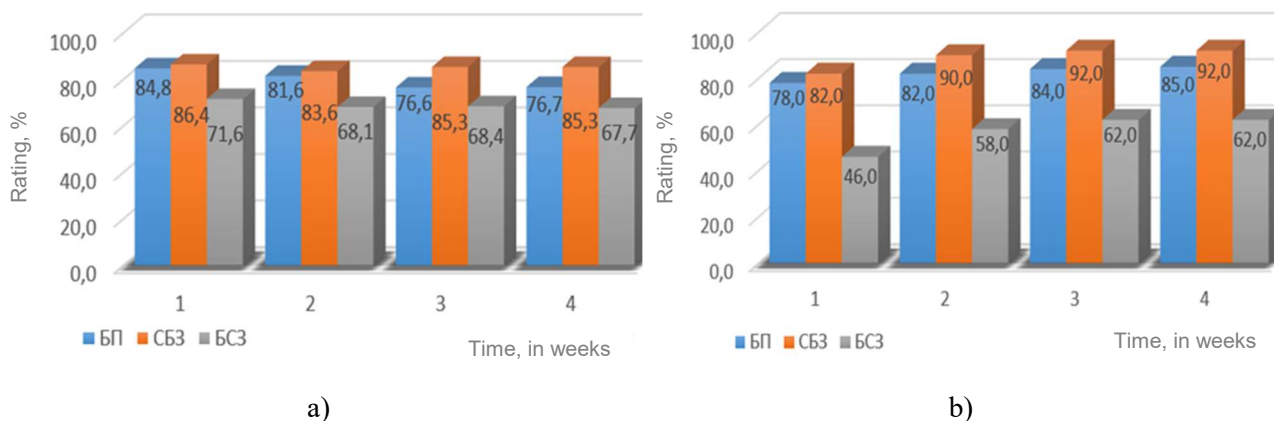


Figure 1 – Weekly assessment indicators of backpacks under three operating conditions:
a) – MR-30; b) – AB-30.

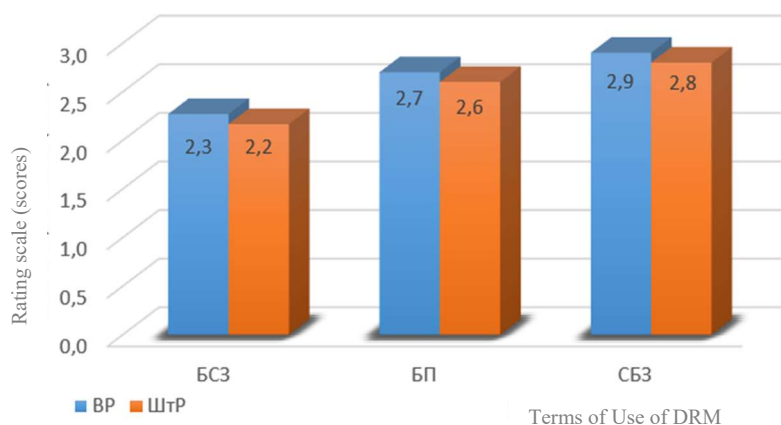


Figure 2 – Weighted average score of the products considering the priority of combat characteristics

Analysis of the obtained results showed that the products (MR-30 and AB-30) generally complied with the established requirements throughout the entire period in most cases under combat training (CT) and service-combat task (SCT) conditions. Under combat special task (CST) conditions, the AB-30 product did not comply with the established requirements, while the MR-30 product was at the lower limit of the “partially compliant” range and required further improvement. The weighted average score also confirmed this trend.

Conclusions and prospects for further research. Considering the weekly assessment indicators of the backpacks in three different operational realities, conclusions can be drawn regarding the conduct of testing and experimental operation.

1. In order to determine the suitability of clothing and equipment property (CEP) and the possibility of its acceptance for use, it is advisable to supplement standard testing with, or separately conduct, its experimental operation, which takes into account various conditions and realities of use.

2. The duration of experimental operation should be determined individually for each sample; however, as the research results demonstrate, during the 3rd and 4th weeks the results do not change significantly. Therefore, the optimal duration of experimental operation should be determined within 2–3 weeks.

3. For evaluating products, it is advisable to use a generalized average score for each individual characteristic as well as for all characteristics collectively. If there is a need to account for the priority of characteristics, it is also advisable to apply the weighted average score method, which additionally minimizes the influence of secondary indicators on the final result and increases the objectivity of the expert conclusion.

4. Analysis of the evaluation results showed that the highest assessment of the additional clothing and equipment property (ACEP) objects was assigned by the research group operating under service-combat task conditions, somewhat lower under combat training conditions, and the lowest under combat conditions. Thus, the assessments differ significantly, indicating both the relevance of conducting such studies and the difference between

these results and those of conventional CEP experimental testing. Such assessments may be explained by the intensity of product use and the specific operational conditions in each of the indicated modes.

5. The proposed methodology may be used during the organization of the experimental operation of new and additional samples of clothing and equipment property within units of the National Guard and other security structures, as well as during decision-making regarding their further implementation into the clothing and equipment support system.

6. Based on the results of the experimental operation, generalized conclusions were formulated, in which, alongside quantitative evaluation indicators, the principal advantages and disadvantages of the products were identified both overall and considering the priority of their combat characteristics. In addition, the expert conclusions of the research groups, containing assessments of shortcomings, advantages, and recommendations for product improvement, were analyzed and generalized. Such conclusions were developed for each product under study.

References

1. *Nakaz Ministerstva oborony Ukrainy "Instruktsiia z orhanizatsii provedennia vyprobuvan zrazkiv ozbroiennia ta viiskovoi tekhniki" № 576/2024* [Order of the Ministry of Defence of Ukraine "Instruction on organizing testing of weapons and military equipment samples" activity no. 576/2024]. (2024, August 27). *Zakonodavstvo Ukrainy*. Retrieved from: <https://surl.li/crpnar> (accessed 20 January 2026) [in Ukrainian].
2. *Postanova Kabinetu Ministriv Ukrainy "Poriadok provedennia vyprobuvan zrazkiv ozbroiennia ta viiskovoi tekhniki" № 159/2021* [Resolution of the Cabinet of Ministers of Ukraine "Procedure for testing weapons and military equipment samples" activity no. 159/2021]. (2021, February 17). *Zakonodavstvo Ukrainy*. Retrieved from: <https://surl.li/xvfmgl> (accessed 20 January 2026) [in Ukrainian].
3. Ministerstvo oborony Ukrainy (2009). *Orhanizatsiia ta provedennia viiskovykh (doslidnykh)*

vyprobuvan predmetiv rechovoho maina. Osnovni polozhennia (zi zminamy) : VST 01.301.002–2009 (01) [Organization and conduct of military (research) testing of clothing property items. Basic provisions (with amendments)]. Kyiv. Retrieved from: <https://surl.li/fdpcyd> (accessed 20 January 2026) [in Ukrainian].

4. Kamak Yu., Pantielieieva N., Khutorna M., Cherednikov O., Andriienko O. (2023). *Mekhanizm realizatsii metodolohii vyprobuvan yakosti lotno-tekhnichnoho obmundryuvannia* [Mechanism for implementing the methodology for testing the quality of flight technical uniforms]. *Zbirnyk naukovykh prats Natsionalnoi akademii Derzhavnoi prykordonnoi sluzhby Ukrainy. Seriia: viiskovi nauky*, vol. 2 (91), pp. 162–172 [in Ukrainian].

5. *Nakaz Ministerstva vnutrishnikh sprav Ukrainy "Normy zabezpechennia rechovym mainom viiskovosluzhbovtiv ta pratsivnykiv Natsionalnoi hvardii Ukrainy v myrnyi chas ta osoblyvyi period" № 475/2017* [Order of the Ministry of Internal Affairs of Ukraine "Standards for provision of clothing property for servicemen and employees of the National Guard of Ukraine in peacetime and special period" activity no. 475/2017]. (2017, June 7). *Zakonodavstvo Ukrainy*. Retrieved from: <https://surl.li/byllgq> (accessed 20 January 2026) [in Ukrainian].

6. *DSTU ISO 9001-2015. Systemy upravlinnia yakistiu. Vymohy* [State Standard ISO 9001-2015. Quality Management Systems. Requirements]. (2016). Kyiv : Derzhstandart Ukraine [in Ukrainian].

7. *Nakaz Ministerstva oborony Ukrainy "Pro rechove zabezpechennia viiskovosluzhbovtiv*

Zbroinykh Syl Ukrainy ta Derzhavnoi spetsialnoi sluzhby transportu" № 232/2016 [Order of the Ministry of Defence of Ukraine "On clothing support of servicemen of the Armed Forces of Ukraine and the State Special Transport Service" activity no. 332/2016]. (2016, April 29). *Zakonodavstvo Ukrainy*. Retrieved from: <https://surli.cc/fdxzak> (accessed 20 January 2026) [in Ukrainian].

8. *Postanova Kabinetu Ministriv Ukrainy "Pro rechove zabezpechennia viiskovosluzhbovtiv Zbroinykh Syl ta inshykh viiskovykh formuvan u myrnyi chas" № 1444/2004* [Resolution of the Cabinet of Ministers of Ukraine "On clothing support of servicemen of the Armed Forces and other military formations in peacetime" activity no. 1444/2004]. (2004, October 28). *Zakonodavstvo Ukrainy*. Retrieved from: <https://surl.li/hmjtgn> (accessed 20 January 2026) [in Ukrainian].

9. Yurova T. M. (2017). *Volonterska dopomoha v obmundryuvanni biitsiv ZS Ukrainy ta udoskonalennia polovoho odnostroiu i ekipiruvannia v khodi ATO* [Volunteer assistance in equipping Ukrainian Armed Forces soldiers and improvement of field uniform and equipment during the ATO]. *Viiskovo-naukovi visnyk*, no. 28, pp. 228–239 [in Ukrainian].

10. Shepielieva A. (2016). *Aptechky ta patrony. Shcho voziat volonter na front na tretomu rotsi viiny* [First-aid kits and ammunition: What volunteers deliver to the front in the third year of the war]. *Ukrainska Pravda*. Retrieved from: <https://surli.cc/vzfwos> (accessed 15 January 2026). [in Ukrainian].

Received / Стаття надійшла до редакції: 06.02.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 28.02.2026

Published / Опубліковано: 30.06.2026

ПАВЛОВ ЯРОСЛАВ ВОЛОДИМИРОВИЧ

*кандидат педагогічних наук, доцент,
начальник навчально-наукового інституту логістики,
Національна академія Національної гвардії України
<https://orcid.org/0000-0002-0852-5659>*

ПІСТРЯК ПЕТРО ВАСИЛЬОВИЧ

*кандидат військових наук, доцент,
заступник начальника навчально-наукового інституту логістики
з наукової роботи – начальник науково-дослідної лабораторії
забезпечення службово-бойової діяльності НГУ,
Національна академія Національної гвардії України
<https://orcid.org/0000-0001-9161-5788>*

ОСОБЛИВОСТІ ПРОВЕДЕННЯ ДОСЛІДНИЦЬКОЇ ЕКСПЛУАТАЦІЇ РЕЧОВОГО МАЙНА В РЕАЛЬНИХ УМОВАХ

Наведено результати й особливості дослідницької експлуатації речового майна у трьох основних умовах застосування: посилена бойова підготовка, виконання службово-бойових завдань і бойових спеціальних завдань. Показано, що результати дослідницької експлуатації речового майна у зазначених умовах суттєво відрізняються від результатів дослідницьких випробувань, передбачених військовими стандартами.

Для оцінювання виробів під час дослідницької експлуатації речового майна запропоновано підхід до розрахунку узагальненого середнього бала як за окремими властивостями, так і за сукупністю всіх властивостей. Обґрунтовано також застосування методу зваженого середнього бала для врахування пріоритетності бойових властивостей, що дає змогу мінімізувати вплив другорядних показників на кінцевий результат і підвищити об'єктивність експертного висновку.

Запроваджено визначення понять «дослідницька експлуатація» та «додаткове речове майно».

Ключові слова: дослідницька експлуатація; додаткове речове майно; дослідницькі випробування; речове майно; дослідницька група.



PAVLENKO SERHII

*Candidate of Military Sciences, Associate Professor,
Head of the Department of Tactics
of the Educational and Scientific Institute of Professional Training,
National Academy of the National Guard of Ukraine
<https://orcid.org/0000-0001-5944-8107>*



SUKONKO SERHII

*PhD, Head of the Department of Tactics
of the Educational and Scientific Institute for Ensuring State Security,
National Academy of the National Guard of Ukraine
<https://orcid.org/0000-0003-2224-4068>*



LUNOV OLEKSII

*Candidate of Military Sciences, Associate Professor,
Head of the Training Department by Appointment of the Training Section (J7),
Eastern Kharkiv Territorial Administration of the National Guard of Ukraine
<https://orcid.org/0000-0002-6599-5331>*

APPROACHES TO FORMING A LIST OF ELEMENTS OF MATERIAL AND FOOD SUPPLY FOR A MILITARY SERVICEMAN OF THE NATIONAL GUARD OF UKRAINE FOR THE QUALITY PERFORMANCE OF HIS ASSIGNED TASKS

The article analyzes scientific approaches to the development of a military serviceman's combat equipment system and establishes that existing approaches are predominantly oriented toward combat operations and do not fully take into account the specific nature of performing assigned tasks by units of the National Guard of Ukraine outside their permanent deployment locations. The peculiarities of forming a list of clothing and food supply elements for a serviceman depending on the nature, duration, and conditions of task performance are examined. Based on an expert approach, lists of clothing and food supply elements recommended for a serviceman of the National Guard of Ukraine for the effective performance of assigned tasks are proposed. The obtained results may be used in military units and subdivisions of the National Guard of Ukraine during the training of servicemen, planning of supply support, and formation of emergency property reserves.

Keywords: *clothing supply; food supply; combat equipment system; assigned tasks; serviceman; special operation.*

Statement of the problem. In accordance with the law [1, Art. 2], twenty primary and three temporary functions are assigned to military units and subdivisions of the National Guard of Ukraine (NGU). Most tasks, in accordance with these functions, may be performed by military units (subdivisions) outside their permanent deployment locations [2, p. 7, Table 1]. For this purpose, it is necessary to have an appropriate combat equipment system (CES), as well as clothing and food support

for the serviceman, the availability of which will increase the effectiveness of performing assigned tasks individually and as part of a unit outside the permanent (temporary) deployment location of the subdivision, military unit, or formation. Such support includes a set of items required in addition to seasonal uniforms and equipment which, in accordance with governing documents, a serviceman must obligatorily wear. This set of items should be permanently stored within the military



unit (subdivision), correspond to the purpose of a specific task, and function as an untouchable reserve of the serviceman until its use (deployment of the serviceman for the performance of a specific assigned task). At present, governing documents regulating clothing and food support for servicemen of the National Guard of Ukraine do not address this issue at all. Since 2014, and particularly following the beginning of the full-scale invasion by the troops of the Russian Federation, the work of most researchers and military personnel has been focused on improving combat equipment systems for combat operations. However, the list of elements of such systems may be applied only to certain assigned tasks of NGU military units (subdivisions). Furthermore, prior to February 2022, NGU military units used the concept of an “emergency bag,” whose contents were determined by the order of the unit commander or the head of the operational-territorial association. However, this configuration was usually limited to a general list of property, identical for all categories of servicemen, and most items from this list might be unnecessary during the execution of particular assigned tasks.

Considering the above, as well as the fact that a certain number of factors influence the list of clothing and food support elements recommended for a serviceman to ensure the high-quality performance of assigned tasks [3, p. 9, Table 1], it is necessary to determine new approaches to defining the specified list of clothing and food support elements.

Analysis of recent research and publications.

The development of the serviceman’s combat equipment system has been addressed in a number of domestic and foreign studies. Thus, the direction of development of equipment for United States servicemen is defined by the U.S. Armed Forces concept known as *Future Force Warrior* [4]. Article [5] reveals the essence of the project entitled *Future Integrated Soldier Technology* (FIST), devoted to the development of combat equipment for British servicemen. Approaches to the development of personal equipment for German servicemen are presented in [6]. Concept [7] outlines directions for the creation of combat equipment systems for servicemen of the Armed Forces of Ukraine. In publications [8]–[11], the authors identify directions for improving clothing and food support within the combat equipment system and bringing it into line with current requirements. However, these studies [4]–[11] define approaches to the development and

improvement of combat equipment systems only for the conduct of combat operations by servicemen, which is insufficient for NGU structural subdivisions.

Article [12] presents the methodological aspects, while [13] provides the methodology itself for the echelonment of clothing and food support items within the combat equipment system of a serviceman of the National Guard of Ukraine. These works [12], [13] establish, as one of the stages, the determination of the set of necessary clothing and food support elements selected from their full list for the execution of a specific assigned task. However, the actual list of these elements is not disclosed in these studies.

Therefore, based on the conducted analysis of articles devoted to the development of the serviceman’s combat equipment system, it may be concluded that, at present, the list of clothing and food support elements necessary for an NGU serviceman to perform assigned tasks with high quality has not been determined.

Therefore, **the purpose of the article** is to develop a list of clothing and food support elements for a serviceman of the National Guard of Ukraine to ensure the high-quality performance of assigned tasks.

Presentation of the main material. In accordance with their functions and tasks, NGU military units participate in special operations in the event of emergencies and the introduction of a state of emergency, as well as in repelling armed aggression against Ukraine and eliminating armed conflict through combat (military) operations and carrying out territorial defense tasks. Accordingly, the main activities performed outside permanent deployment locations have been identified, during which a serviceman must possess additional clothing and food support items to ensure life support and high-quality task execution, namely:

- repelling armed aggression against Ukraine and eliminating armed conflict through military (combat) operations;
- suppressing armed conflicts and other provocations at the state border;
- special operation to eliminate or apprehend armed criminals;
- special hostage-rescue operation;
- special operation to detect, suppress activities of, and detain (neutralize) sabotage and reconnaissance forces;
- special operation to suppress the activities of illegal militarized or armed formations (groups), organized groups, and criminal organizations within the territory of Ukraine;

- special operation to search for and apprehend persons taken into custody or sentenced to imprisonment or arrest who have escaped from custody;
- special operation to eliminate man-made and natural emergencies;
- ensuring quarantine measures;
- anti-terrorist operation;
- special operation to suppress mass disturbances;
- prevention of mass crossing of the state border from the territory of neighboring states.

The formation of lists of clothing and food support items for servicemen to perform the above activities was carried out on the basis of expert evaluation results, the methodological framework of which is presented in [14]. This work provides the composition of the expert group, evaluation criteria, the procedure for processing expert

assessments, and the evaluation results presented in Tables 3 and 4 [14]. Generalization of these results made it possible to develop and systematize lists of clothing and food support elements according to specific types of assigned tasks.

Repelling armed aggression against Ukraine and eliminating armed conflict through military (combat) operations involves the execution of tasks over a prolonged period. Moreover, during the performance of these tasks, servicemen may leave the boundaries of the permanent deployment location of the subdivision for periods ranging from 1 to 5 days. Accordingly, the clothing and food support elements recommended for a serviceman to ensure the high-quality performance of tasks during the repulsion of armed aggression against Ukraine and the elimination of armed conflict through military (combat) operations are specified in Table 1.

Table 1 – List of clothing and food support elements recommended for a serviceman to ensure the high-quality performance of tasks during the repulsion of armed aggression against Ukraine and the elimination of armed conflict through military (combat) operations

№	Name of Clothing and Food Supply Items
1	2
General List of Clothing and Food Supply Elements	
<i>General Kit</i>	
1.	Field uniform (additional set)
2.	Men's underwear or women's underwear and top (2–3 spare items or sets)
3.	Seasonal socks (additional 4–5 pairs)
4.	Seasonal boots (1 additional pair)
5.	Undershirt (additional)
6.	Insoles (spare)
7.	Bags with footwear-drying mixture
8.	Rubber boots (seasonal)
9.	Membrane rain gear (pants, jacket)
10.	Barracks slippers
11.	Seasonal sleeping bag
12.	Field insulating sleeping mat
13.	Field insulating seat pad
14.	Ballistic protective (tactical) glasses
15.	Special (active) headphones
16.	Individual camp knife
17.	Individual field flashlight
18.	Paracord (30–50 m)
19.	Adhesive tape
20.	Drinking water hydration system (canteen)
21.	Wet wipes
22.	Dry shower kit

Continuation of Table 1

№	Name of Clothing and Food Supply Items
1	2
23.	Toilet paper
24.	Personal hygiene items
25.	Army mess kit or eating utensils + mug
26.	Dry ration (daily set)
27.	Water purification tablets or device (filter)
28.	Waterproof matches
29.	Solid fuel tablets (dry alcohol)
30.	Power bank
31.	Spare batteries (accumulators) for electrical devices
32.	Permanent markers, 1–2 pcs.
33.	Waterproof notebook
<i>Additional Kit for Winter and Cold Weather</i>	
1.	Winter wind- and moisture-protective trousers (insulated field trousers)
2.	Seasonal gloves and/or mittens (additional pair)
3.	Balaclava (special mask)
4.	Seasonal tube scarf
5.	Seasonal underwear (additional)
6.	Thermal underwear (additional)
7.	Individual heating devices
8.	Heated insoles
9.	Insulated overshoes
<i>Additional Kit for Summer</i>	
1.	Mosquito net
2.	Mosquito net canopy (for a squad)
3.	Mosquito repellent
4.	Universal field tarp
5.	Drinking water up to 1.5 L (additional to hydration system or canteen)
In Case of Task Performance Outside the Unit's Permanent Location for a Duration of One to Five Days	
<i>General Kit</i>	
1.	Men's underwear or women's underwear and top (2–3 spare items or sets)
2.	Seasonal socks (additional 4–5 pairs)
3.	Insoles (spare)
4.	Bags with footwear-drying mixture
5.	Membrane rain gear (pants, jacket)
6.	Seasonal sleeping bag
7.	Field insulating sleeping mat or field insulating seat pad
8.	Ballistic protective (tactical) glasses
9.	Individual camp knife
10.	Individual field flashlight
11.	Paracord (30–50 m)
12.	Drinking water hydration system (canteen)
13.	Wet wipes
14.	Dry shower kit
15.	Toilet paper

End of Table 1

№	Name of Clothing and Food Supply Items
1	2
16.	Army mess kit or eating utensils + mug
17.	Dry ration (daily set)
18.	Water purification tablets or device (filter)
19.	Waterproof matches
20.	Solid fuel tablets (dry alcohol)
21.	Power bank
22.	Spare batteries (accumulators) for electrical devices
23.	Permanent markers, 1–2 pcs.
24.	Waterproof notebook
<i>Additional Kit for Winter and Cold Weather</i>	
1.	Winter wind- and moisture-protective trousers (insulated field trousers)
2.	Seasonal gloves and/or mittens (additional pair)
3.	Balaclava (special mask)
4.	Seasonal tube scarf
5.	Seasonal underwear (additional)
6.	Individual heating devices
7.	Heated insoles
<i>Additional Kit for Summer</i>	
1.	Mosquito net
2.	Mosquito repellent
3.	Drinking water up to 1.5 L (additional to hydration system or canteen)
In Case of Combat Mission Performance Outside the Unit's Permanent Location for a Duration of Up to One Day	
1.	Membrane rain gear (pants, jacket)
2.	Field insulating sleeping mat or field insulating seat pad
3.	Ballistic protective (tactical) glasses
4.	Individual camp knife
5.	Individual field flashlight
6.	Paracord (30–50 m)
7.	Drinking water hydration system (canteen)
8.	Wet wipes
9.	Toilet paper
10.	Army mess kit or eating utensils + mug
11.	Dry ration (one or two meals depending on duration)
12.	Waterproof matches
13.	Solid fuel tablets (dry alcohol)
14.	Power bank
15.	Spare batteries (accumulators) for electrical devices
16.	Permanent markers, 1–2 pcs.
17.	Waterproof notebook
<i>Additional Kit for Winter and Cold Weather</i>	
1.	Individual heating devices
2.	Heated insoles
3.	Insulated overshoes
<i>Additional Kit for Summer</i>	
1.	Mosquito net
2.	Mosquito repellent

Source: developed by the authors.

Measures aimed at suppressing armed conflicts and other provocations at the state border may last for an indefinite period, at least from one day and longer. Since the duration of these measures is uncertain, it is proposed that the clothing and food support elements recommended for a serviceman be determined with consideration for prolonged deployment duration (Table 2).

A special operation to eliminate or apprehend

armed criminals involves the short-term execution of tasks (up to one day). Taking this into account, the list of clothing and food support elements for a serviceman specified in Table 3 is proposed.

In turn, a special hostage-rescue operation is usually conducted within a short period (up to 8 hours), and accordingly, the list of clothing and food support elements for a serviceman is proposed in Table 4.

Table 2 – List of clothing and food support elements recommended for a serviceman to ensure the high-quality performance of tasks during measures aimed at suppressing armed conflicts and other provocations at the state border

№	Name of Clothing and Food Supply Items
1	2
<i>General Kit</i>	
1.	Field uniform (additional set)
2.	Men's underwear or women's underwear and top (2–3 spare items or sets)
3.	Seasonal socks (additional 4–5 pairs)
4.	Seasonal boots (1 additional pair)
5.	Undershirt (additional)
6.	Insoles (spare)
7.	Bags with footwear-drying mixture
8.	Rubber boots (seasonal)
9.	Membrane rain gear (pants, jacket)
10.	Barracks slippers
11.	Seasonal sleeping bag
12.	Field insulating sleeping mat
13.	Field insulating seat pad
14.	Ballistic protective (tactical) glasses
15.	Special (active) headphones
16.	Individual camp knife
17.	Individual field flashlight
18.	Paracord (30–50 m)
19.	Adhesive tape
20.	Drinking water hydration system (canteen)
21.	Wet wipes
22.	Dry shower kit
23.	Toilet paper
24.	Personal hygiene items
25.	Army mess kit or eating utensils + mug
26.	Dry ration (daily set)
27.	Water purification tablets or device (filter)
28.	Waterproof matches

End of Table 1

№	Name of Clothing and Food Supply Items
1	2
29.	Solid fuel tablets (dry alcohol)
30.	Power bank
31.	Spare batteries (accumulators) for electrical devices
32.	Permanent markers (1–2 pcs.)
33.	Waterproof notebook
<i>Additional Kit for Winter and Cold Weather</i>	
1.	Winter wind- and moisture-protective trousers (insulated field trousers)
2.	Seasonal gloves and/or mittens (additional pair)
3.	Balaclava (special mask)
4.	Seasonal tube scarf
5.	Seasonal underwear (additional)
6.	Thermal underwear (additional)
7.	Individual heating devices
8.	Heated insoles
9.	Insulated overshoes
<i>Additional Kit for Summer</i>	
1.	Mosquito net
2.	Mosquito net canopy (for a squad)
3.	Mosquito repellent
4.	Universal field tarp
5.	Drinking water up to 1.5 L (additional to hydration system or canteen)

Source: developed by the authors.

Table 3 – List of clothing and food support elements recommended for a serviceman to ensure the high-quality performance of tasks during a special operation to eliminate or apprehend armed criminals

№	Name of Clothing and Food Supply Items
1	2
<i>General Kit</i>	
1.	Membrane rain gear (pants, jacket)
2.	Seasonal sleeping bag
3.	Field insulating sleeping mat or field insulating seat pad
4.	Individual camp knife
5.	Individual field flashlight
6.	Drinking water hydration system (canteen)
7.	Wet wipes
8.	Toilet paper
9.	Army mess kit or eating utensils + mug
10.	Dry ration (two meals)
11.	Power bank
12.	Permanent markers (1–2 pcs.)
13.	Waterproof notebook

End of Table 1

№	Name of Clothing and Food Supply Items
1	2
<i>Additional Kit for Winter and Cold Weather</i>	
1.	Seasonal gloves and/or mittens (additional pair)
2.	Balaclava (special mask)
3.	Seasonal tube scarf
4.	Individual heating devices
5.	Heated insoles
<i>Additional Kit for Summer</i>	
1.	Mosquito repellent
2.	Drinking water up to 1.5 L (additional to hydration system or canteen)

Source: developed by the authors.

Table 4 – List of clothing and food support elements recommended for a serviceman to ensure the high-quality performance of tasks during a special hostage-rescue operation

№	Name of Clothing and Food Supply Items
1	2
<i>General Kit</i>	
1.	Membrane rain gear (pants, jacket)
2.	Field insulating sleeping mat or field insulating seat pad
3.	Individual camp knife
4.	Individual field flashlight
5.	Drinking water hydration system (canteen)
6.	Wet wipes
7.	Toilet paper
8.	Army mess kit or eating utensils + mug
9.	Dry ration (one meal)
10.	Power bank
11.	Permanent markers (1–2 pcs.)
12.	Waterproof notebook
<i>Additional Kit for Winter and Cold Weather</i>	
1.	Seasonal gloves and/or mittens (additional pair)
2.	Balaclava (special mask)
3.	Seasonal tube scarf
4.	Heated insoles
<i>Additional Kit for Summer</i>	
1.	Mosquito repellent

Source: developed by the authors.

The list of clothing and food support elements for a serviceman during a special operation to detect, suppress the activities of, and detain (neutralize) sabotage and reconnaissance forces will coincide with the list used during a special operation

to suppress the activities of illegal militarized or armed formations (groups), organized groups, and criminal organizations within the territory of Ukraine. The specified list is proposed in Table 5.

Table 5 – List of clothing and food support elements recommended for a serviceman to ensure the high-quality performance of tasks during special operations: to detect, suppress activities of, and detain (neutralize) sabotage and reconnaissance forces; and to suppress the activities of illegal militarized or armed formations (groups), organized groups, and criminal organizations within the territory of Ukraine

№	Name of Clothing and Food Supply Items
1	2
<i>General Kit</i>	
1.	Men's underwear or women's underwear and top (2–3 spare items or sets)
2.	Seasonal socks (additional 4–5 pairs)
3.	Undershirt (additional)
4.	Insoles (spare)
5.	Bags with footwear-drying mixture
6.	Membrane rain gear (pants, jacket)
7.	Seasonal sleeping bag
8.	Field insulating sleeping mat
9.	Field insulating seat pad
10.	Ballistic protective (tactical) glasses
11.	Individual camp knife
12.	Individual field flashlight
13.	Paracord (30–50 m)
14.	Drinking water hydration system (canteen)
15.	Wet wipes
16.	Dry shower kit
17.	Toilet paper
18.	Personal hygiene items
19.	Army mess kit or eating utensils + mug
20.	Dry ration (daily set)
21.	Water purification tablets or device (filter)
22.	Waterproof matches
23.	Solid fuel tablets (dry alcohol)
24.	Power bank
25.	Spare batteries (accumulators) for electrical devices
26.	Permanent markers (1–2 pcs.)
27.	Waterproof notebook
<i>Additional Kit for Winter and Cold Weather</i>	
1.	Winter wind- and moisture-protective trousers (insulated field trousers)
2.	Seasonal gloves and/or mittens (additional pair)
3.	Balaclava (special mask)
4.	Seasonal tube scarf
5.	Seasonal underwear (additional)
6.	Individual heating devices
7.	Heated insoles
<i>Additional Kit for Summer</i>	
1.	Mosquito net
2.	Mosquito repellent
3.	Drinking water up to 1.5 L (additional to hydration system or canteen)

Source: developed by the authors.

The duration of a special operation to search for and apprehend persons taken into custody, persons sentenced to imprisonment or arrest who have escaped from custody, usually ranges from one to five days. Accordingly, a list of clothing and food support elements defined in Table 6 is proposed.

Special operations to eliminate man-made and natural emergencies, as well as measures to ensure quarantine restrictions, usually last five days or longer. Therefore, the list of clothing and food support elements should be provided based on a duration exceeding five days (see Tables 7 and 8).

Table 6 – List of clothing and food support elements recommended for a serviceman to ensure the high-quality performance of tasks during a special operation to search for and apprehend persons taken into custody, persons sentenced to imprisonment or arrest who escaped from custody

№	Name of Clothing and Food Supply Items
1	2
<i>General Kit</i>	
1.	Men's underwear or women's underwear and top (2–3 spare items or sets)
2.	Seasonal socks (additional 4–5 pairs)
3.	Undershirt (additional)
4.	Insoles (spare)
5.	Shoe-drying packets with drying compound
6.	Membrane rain suit (trousers, jacket)
7.	Seasonal sleeping bag
8.	Insulated field sleeping mat
9.	Ballistic protective (tactical) goggles
10.	Individual camp knife
11.	Individual field flashlight
12.	Drinking water hydration system (canteen)
13.	Wet wipes
14.	Dry shower
15.	Toilet paper
16.	Army mess tin or eating utensils + mug
17.	Dry ration (daily ration set)
18.	Moisture-resistant matches
19.	Solid fuel tablets (dry alcohol)
20.	Power bank
21.	Spare accumulators (batteries) for electrical devices
22.	Permanent markers (1–2 pcs.)
23.	Waterproof notebook
<i>Additional Kit for Winter and Cold Weather</i>	
1.	Winter wind- and moisture-protective trousers (insulated field trousers)
2.	Gloves and/or mittens according to season (additional pair)
3.	Balaclava (special mask)
4.	Seasonal tube scarf (neck gaiter)
5.	Seasonal underwear (additional)
6.	Individual heating devices
7.	Heated insoles
<i>Additional Kit for Summer</i>	
1.	Mosquito repellent
2.	Drinking water up to 1.5 L (additional to hydration system or canteen)

Source: developed by the authors.

Table 7 – List of clothing and food support elements recommended for a serviceman to ensure the high-quality performance of tasks during a special operation to eliminate man-made and natural emergencies

№	Name of Clothing and Food Supply Items
1	2
General Kit	
1.	Men's underwear or women's underwear and top (2–3 spare items or sets)
2.	Seasonal socks (additional 4–5 pairs)
3.	Undershirt (additional)
4.	Shoe-drying packets with drying compound
5.	Membrane rain suit (trousers, jacket)
6.	Barracks slippers
7.	Seasonal sleeping bag
8.	Individual camp knife
9.	Individual field flashlight
10.	Drinking water hydration system (canteen)
11.	Wet wipes
12.	Dry shower
13.	Toilet paper
14.	Personal hygiene items
15.	Army mess tin or eating utensils + mug
16.	Dry ration (daily ration set)
17.	Power bank
18.	Spare accumulators (batteries) for electrical devices
19.	Permanent markers (1–2 pcs.)
20.	Waterproof notebook
21.	Bedding set
Additional Kit for Winter and Cold Weather	
1.	Winter wind- and moisture-protective trousers (insulated field trousers)
2.	Gloves and/or mittens according to season (additional pair)
3.	Balaclava (special mask)
4.	Seasonal tube scarf (neck gaiter)
5.	Seasonal underwear (additional)
6.	Thermal underwear (additional)
Additional Kit for Summer	
1.	Mosquito repellent
2.	Drinking water up to 1.5 L (additional to hydration system or canteen)

Source: developed by the authors.

Table 8 – List of clothing and food support elements recommended for a serviceman to ensure the high-quality performance of tasks during the implementation of quarantine measures.

№	Name of Clothing and Food Supply Items
1	2
<i>General Kit</i>	
1.	Men's underwear or women's underwear and top (2–3 spare items or sets)
2.	Seasonal socks (additional 4–5 pairs)
3.	Undershirt (additional)
4.	Shoe-drying packets with drying compound
5.	Membrane rain suit (trousers, jacket)
6.	Barracks slippers
7.	Seasonal sleeping bag
8.	Individual camp knife
9.	Individual field flashlight
10.	Drinking water hydration system (canteen)
11.	Wet wipes
12.	Dry shower
13.	Toilet paper
14.	Personal hygiene items
15.	Army mess tin or eating utensils + mug
16.	Dry ration (daily ration set)
17.	Power bank
18.	Spare accumulators (batteries) for electrical devices
19.	Permanent markers (1–2 pcs.)
20.	Waterproof notebook
21.	Bedding set
<i>Additional Kit for Winter and Cold Weather</i>	
22.	Winter wind- and moisture-protective trousers (insulated field trousers)
23.	Gloves and/or mittens according to season (additional pair)
24.	Balaclava (special mask)
25.	Seasonal tube scarf (neck gaiter)
26.	Seasonal underwear (additional)
27.	Thermal underwear (additional)
28.	Individual heating devices
29.	Heated insoles
<i>Additional Kit for Summer</i>	
1.	Mosquito repellent
2.	Drinking water up to 1.5 L (additional to hydration system or canteen)

Source: developed by the authors.

An anti-terrorist operation is usually conducted over a short period and may be compared to a hostage-rescue operation. However, based on the experience of the Anti-Terrorist Operation (ATO) in eastern Ukraine, which lasted more than four years, it may also be long-term. Therefore, lists of clothing and food support elements are proposed both for a short-term operation, corresponding to the list used during a special hostage-rescue

operation (see Table 4), and for a long-term operation, corresponding to the list used during the repulsion of armed aggression against Ukraine and elimination of armed conflict through combat operations (see Table 2).

Mass disturbances usually arise during public events, for example during sporting events and particularly during various political mass events such as rallies, pickets, demonstrations, and others.

If mass disturbances arise as a result of sporting events, the special operation to suppress mass disturbances is generally short-term. Accordingly, the list of clothing and food support elements corresponds to that used during a hostage-rescue operation. At the same time, practical experience indicates that mass disturbances arising during political mass events are of a prolonged nature. Therefore, a separate list of clothing and food support elements recommended for a serviceman to

ensure the high-quality performance of tasks during a special operation to suppress mass disturbances is proposed and presented in Table 9.

Measures aimed at preventing the mass crossing of the state border from the territory of neighboring states usually involve the deployment of military personnel to state border areas, with servicemen remaining there for periods exceeding one day. Therefore, for this task, a list of clothing and food support elements specified in Table 10 is proposed.

Table 9 – List of clothing and food support elements recommended for a serviceman to ensure the high-quality performance of tasks during a special operation to suppress mass disturbances

№	Name of Clothing and Food Supply Items
1	2
<i>General Kit</i>	
1.	Field uniform (additional set)
2.	Men's underwear or women's underwear and top (2–3 spare items or sets)
3.	Seasonal socks (additional 4–5 pairs)
4.	Undershirt (additional)
5.	Shoe-drying packets with drying compound
6.	Membrane rain suit (trousers, jacket)
7.	Barracks slippers
8.	Seasonal sleeping bag
9.	Individual camp knife
10.	Individual field flashlight
11.	Drinking water hydration system (canteen)
12.	Wet wipes
13.	Dry shower
14.	Toilet paper
15.	Personal hygiene items
16.	Army mess tin or eating utensils + mug
17.	Dry ration (daily ration set)
18.	Power bank
19.	Bedding set
<i>Additional Kit for Winter and Cold Weather</i>	
20.	Winter wind- and moisture-protective trousers (insulated field trousers)
21.	Gloves and/or mittens according to season (additional pair)
22.	Balaclava (special mask)
23.	Seasonal tube scarf (neck gaiter)
24.	Seasonal underwear (additional)
25.	Thermal underwear (additional)
26.	Individual heating devices
27.	Heated insoles
<i>Additional Kit for Summer</i>	
28.	Drinking water up to 1.5 L (additional to hydration system or canteen)

Source: developed by the authors.

Table 10 – List of clothing and food support elements recommended for a serviceman to ensure the high-quality performance of tasks during measures aimed at preventing the mass crossing of the state border from the territory of neighboring states

№	Name of Clothing and Food Supply Items
1	2
<i>General Kit</i>	
1.	Field uniform (additional set)
2.	Men's underwear or women's underwear and top (2–3 spare items or sets)
3.	Seasonal socks (additional 4–5 pairs)
4.	Seasonal boots (additional 1 pair)
5.	Undershirt (additional)
6.	Insoles (spare)
7.	Shoe-drying packets with drying compound
8.	Membrane rain suit (trousers, jacket)
9.	Barracks slippers
10.	Seasonal sleeping bag
11.	Insulated field sleeping mat
12.	Individual camp knife
13.	Individual field flashlight
14.	Paracord (30–50 m)
15.	Adhesive tape
16.	Drinking water hydration system (canteen)
17.	Wet wipes
18.	Dry shower
19.	Toilet paper
20.	Personal hygiene items
21.	Army mess tin or eating utensils + mug
22.	Dry ration (daily ration set)
23.	Moisture-resistant matches
24.	Solid fuel tablets (dry alcohol)
25.	Power bank
26.	Spare accumulators (batteries) for electrical devices
27.	Permanent markers (1–2 pcs.)
28.	Waterproof notebook
<i>Additional Kit for Winter and Cold Weather</i>	
1.	Winter wind- and moisture-protective trousers (insulated field trousers)
2.	Gloves and/or mittens according to season (additional pair)
3.	Balaclava (special mask)
4.	Seasonal tube scarf (neck gaiter)
5.	Seasonal underwear (additional)
6.	Thermal underwear (additional)
7.	Individual heating devices
8.	Heated insoles
9.	Insulated overshoes
<i>Additional Kit for Summer</i>	
1.	Mosquito repellent
2.	Universal field tarp
3.	Drinking water up to 1.5 L (additional to hydration system or canteen)

Source: developed by the authors.

Thus, the conducted research confirmed the expediency of a differentiated approach to forming the list of clothing and food support elements for a serviceman of the National Guard of Ukraine depending on the content, duration, and conditions of assigned task performance. The developed and systematized lists make it possible to specify the composition of necessary support elements for particular types of service and combat activities and may be used as a practical basis for decision-making in the areas of servicemen training, support planning, and the improvement of relevant organizational approaches.

Conclusions and prospects for further research. Thus, the article develops and systematizes lists of clothing and food support elements for a serviceman of the National Guard of Ukraine to ensure the high-quality performance of assigned tasks, specifically during: the repulsion of armed aggression against Ukraine and elimination of armed conflict through military (combat) operations; suppression of armed conflicts and other provocations at the state border; special operations to eliminate or apprehend armed criminals; special hostage-rescue operations; special operations to detect, suppress activities of, and detain (neutralize) sabotage and reconnaissance forces; special operations to suppress the activities of illegal militarized or armed formations (groups), organized groups, and criminal organizations within the territory of Ukraine; special operations to search for and apprehend persons taken into custody or persons sentenced to imprisonment or arrest who escaped from custody; special operations to eliminate man-made and natural emergencies; quarantine enforcement measures; anti-terrorist operations; special operations to suppress mass disturbances; and measures aimed at preventing the mass crossing of the state border from the territory of neighboring states.

The developed lists of clothing and food support elements may be applied within NGU military units (subdivisions) as recommendations for servicemen who do not have prior experience participating in the specified activities.

Further scientific research will be directed toward improving the means of transporting the developed lists of clothing and food support elements depending on the specific features of assigned task execution.

References

1. *Zakon Ukrainy "Pro Natsionalnu hvardiiu Ukrainy"* № 2469-VIII [Law of Ukraine about the National Guard of Ukraine activity no. 2469-VIII]. (2022, 15 June). Retrieved from: <https://zakon.rada.gov.ua/laws/show/876-18#Text> (accessed 27 March 2026) [in Ukrainian].
2. Alboshchii O. V., Sukonko S. M., Pavlenko S. O. (2023). *Zadacha rozpodilu predmetiv rechovoho maina ta prodovolchoho zabezpechennia v elementakh kompleksu boiovoho ekipiruvannia viiskovosluzhbovtisia Natsionalnoi hvardii Ukrainy* [The task of distributing items of material property and food supply in the elements of the complex of combat equipment of a serviceman of the National Guard of Ukraine]. *Zbirnyk naukovykh prats Natsionalnoi akademii Natsionalnoi hvardii Ukrainy*. Kharkiv : NA NHU, vol. 1 (41), pp. 5–13 [in Ukrainian].
3. Alboshchii O. V., Sukonko S. M., Pavlenko S. O., Lunov O. Yu. (2024). *Metodychni aspekty eshelonuvannia predmetiv rechovoho ta prodovolchoho zabezpechennia u skladi kompleksu boiovoho ekipiruvannia viiskovosluzhbovtisia Natsionalnoi hvardii Ukrainy* [Methodological aspects of the echeloning of items of material and food support as part of the combat equipment complex of a serviceman of the National Guard of Ukraine]. *Zbirnyk naukovykh prats Natsionalnoi akademii Natsionalnoi hvardii Ukrainy*. Kharkiv : NA NHU, vol. 1 (43), pp. 5–16 [in Ukrainian].
4. Howstuffworks (2024). *How the Future Force Warrior Will Work*. Retrieved from: <https://surl.lu/curbqa> (accessed 28 May 2026) [in English].
5. Army Technology (2006). *FIST – Future Infantry Soldier Technology System*. Retrieved from: <https://surl.li/jokaub> (accessed 28 May 2026) [in English].
6. *Neue persönliche Ausrüstung und Bekleidung – für alle in der Bundeswehr*. Retrieved from: <https://surli.cc/bcyryy> (accessed 28 May 2026) [in English].
7. *Nakaz Ministerstva oborony Ukrainy "Pro zatverdzhennia Kontseptsii stvorennia kompleksu boiovoho ekipiruvannia viiskovosluzhbovtisia Zbroinykh Syl Ukrainy"* № 876 [Order of the Ministry of Defense of Ukraine "On approval of the Concept for creating a complex of combat equipment for a serviceman in the Armed Forces of

Ukraine" activity no. 512]. (2014, 10 January) [in Ukrainian].

8. Alboshchii O. V., Sukonko S. M., Pavlenko S. O. (2023). *Udoskonalennia rechovoho ta prodovolchoho zabezpechennia u skladi kompleksu boiovoho ekipiruvannia viiskovosluzhbovtisia Natsionalnoi hvardii Ukrainy* [Improving material and food supplies as part of the combat equipment of a serviceman of the National Guard of Ukraine]. *Zbirnyk naukovykh prats Natsionalnoi akademii Natsionalnoi hvardii Ukrainy*. Kharkiv : NA NHU, vol. 2 (42), pp. 5–14 [in Ukrainian].

9. Durach V. M., Malynevskiy V. V., Tkachuk P. V., Nikolaichuk L. H. (2021). *Osnovni vymohy do viiskovoi formy ta shliakhy pokrashchennia yii vlastyvostei v aspekti pidvyshchennia zakhystu voyniv* [The basic requirements for military form and the ways to improve these properties in terms of improving the quality of soldiers]. *Visnyk Lvivskoho torhovelno-ekonomichnoho universytetu. Seriya: tekhnichni nauky*, vol. 27, pp. 22–26 [in Ukrainian].

10. Honcharuk A. A., Oleniev V. M., Radimushkin V. B., Shlapak V. O. (2017). *Osnovni pryntsypy pobudovy kompleksu boiovoho ekipiruvannia viiskovosluzhbovtisia* [Basic principles of the formation of the military equipment complex of the military service]. *Ukrainian Military Pages*. Retrieved from: <https://surli.cc/rulgfc> (accessed 28 March 2025) [in Ukrainian].

11. Honcharuk A. A., Bieliakov Yu. V., Oleniev V. M., Shlapak V. O., Hamaniuk L. O. (2020). *Napriamy rozvytku systemy zhyttiezabezpechennia kompleksu boiovoho ekipiruvannia viiskovosluzhbovtisia z vykorystanniam dosvidu providnykh krain svitu* [Directions for the development of the life support system of a military serviceman's combat equipment complex using the experience of leading countries of the world]. *Zbirnyk naukovykh prats Viiskovoi akademii (m. Odesa)*. Odesa, vol. 1 (13), part I, pp. 244–252 [in Ukrainian].

12. Alboshchii O. V., Sukonko S. M., Pavlenko S. O., Lunov O. Yu. (2024). *Metodychni aspekty eshelonuvannia predmetiv rechovoho ta prodovolchoho zabezpechennia u skladi kompleksu boiovoho ekipiruvannia viiskovosluzhbovtisia Natsionalnoi hvardii Ukrainy* [Methodological aspects of echeloning of items of speech and food security at the warehouse of the complex of combat equipment of the National Guard of Ukraine]. *Zbirnyk naukovykh prats Natsionalnoi akademii Natsionalnoi hvardii Ukrainy*. Kharkiv : NA NHU, vol. 1 (43), pp. 5–16 [in Ukrainian].

13. Alboshchii O. V., Sukonko S. M., Pavlenko S. O. (2024). *Metodyka eshelonuvannia predmetiv rechovoho ta prodovolchoho zabezpechennia u skladi kompleksu boiovoho ekipiruvannia viiskovosluzhbovtisia Natsionalnoi hvardii Ukrainy* [Method of echeloning of items of speech and food security in the warehouse of the complex of combat equipment of the National Guard of Ukraine]. *Zbirnyk naukovykh prats Natsionalnoi akademii Natsionalnoi hvardii Ukrainy*. Kharkiv : NA NHU, vol. 2 (44), pp. 5–14 [in Ukrainian].

14. Alboshchii O. V., Sukonko S. M., Pavlenko S. O. (2025). *Rekomendatsii shchodo zastosuvannia metody eshelonuvannia kompleksu boiovoho ekipiruvannia (za elementamy rechovoho ta prodovolchoho zabezpechennia) viiskovosluzhbovtisia Natsionalnoi hvardii Ukrainy v zalezhnosti vid kharakteru sluzhbovykh (boiovykh) zavdan* [The recommendation was to use the method of echeloning the complex of combat equipment (behind elements of speech and food security) of the military personnel of the National Guard of Ukraine depending on the nature of the service (combat) tasks]. *Zbirnyk naukovykh prats Natsionalnoi akademii Natsionalnoi hvardii Ukrainy*. Kharkiv : NA NHU, vol. 1 (45), pp. 5–16 [in Ukrainian].

Received / Стаття надійшла до редакції: 30.03.2025

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 20.04.2026

Published / Опубліковано: 30.06.2026

ПАВЛЕНКО СЕРГІЙ ОЛЕКСАНДРОВИЧ

*кандидат військових наук, доцент,
начальник кафедри тактики
навчально-наукового інституту професійної підготовки,
Національна академія Національної гвардії України
<https://orcid.org/0000-0001-5944-8107>*

СУКОНЬКО СЕРГІЙ МИКОЛАЙОВИЧ

*доктор філософії, начальник кафедри тактики
навчально-наукового інституту забезпечення державної безпеки,
Національна академія Національної гвардії України
<https://orcid.org/0000-0003-2224-4068>*

ЛУНЬОВ ОЛЕКСІЙ ЮРІЙОВИЧ

*кандидат військових наук, доцент,
начальник відділу підготовки за призначенням секції підготовки (J7),
Східне Харківське територіальне управління Національної гвардії України
<https://orcid.org/0000-0002-6599-5331>*

**ФОРМУВАННЯ ПЕРЕЛІКУ ЕЛЕМЕНТІВ РЕЧОВОГО
ТА ПРОДОВОЛЬЧОГО ЗАБЕЗПЕЧЕННЯ ВІЙСЬКОВОСЛУЖБОВЦЯ НАЦІОНАЛЬНОЇ
ГВАРДІЇ УКРАЇНИ ДЛЯ ЯКІСНОГО ВИКОНАННЯ НИМ ЗАВДАНЬ ЗА ПРИЗНАЧЕННЯМ**

Проаналізовано підходи до розвитку комплексу бойового екіпірування військовослужбовця. Це спорядження обмежувалося лише загальним переліком майна, однаковим для всіх категорій військовослужбовців, і більша частина цього переліку могла не знадобитися при виконанні певних завдань за призначенням.

Установлено, що чинні підходи переважно орієнтовані на ведення бойових дій і не повною мірою враховують специфіку виконання завдань за призначенням підрозділами Національної гвардії України за межами пункту постійної дислокації.

Досліджено особливості формування переліку елементів речового та продовольчого забезпечення військовослужбовця залежно від характеру, тривалості та умов виконання завдань. На основі експертного підходу запропоновано переліки елементів речового і продовольчого забезпечення, рекомендованих військовослужбовцеві Національної гвардії України для якісного виконання завдань за призначенням.

Сформовано переліки елементів матеріального та продовольчого забезпечення, які можуть бути використані у військових частинах (підрозділах) Національної гвардії як рекомендації для військовослужбовців без досвіду виконання завдань за призначенням.

***Ключові слова:** речове забезпечення; продовольче забезпечення; комплекс бойового екіпірування; завдання за призначенням; військовослужбовець; спеціальна операція.*



POLUNINA LILIIA

*Candidate of Legal Sciences, Associate Professor,
Professor of the Department of Legal Support and Law Enforcement Activities,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0000-0002-8898-2162>*

CRIMINALISTIC SIGNIFICANCE OF MEDIA COVERAGE OF WAR CRIMES COMMITTED ON THE TERRITORY OF UKRAINE

The article examines the forensic significance of informational coverage in the mass media of war crimes committed on the territory of Ukraine in the context of the full-scale armed aggression of the Russian Federation. The relevance of the topic is driven by the mass scale of war crimes, the widespread use of digital technologies and open-source information (OSINT), as well as the role of the media as an important channel for recording, disseminating, and documenting evidence of war crimes.

The purpose of the article is a comprehensive study of the significance of informational coverage in the mass media of facts of war crimes, aimed at substantiating its role as an independent source of forensically significant information and developing scientifically grounded recommendations on the effective use of media materials in the processes of detection, recording, documentation, and proving war crimes.

The study analyzes how prompt media coverage of events in traditional and digital mass media, social networks, video materials, eyewitness testimonies, and journalistic investigations forms criminally significant information about the commission of war crimes. It has been established that such information contributes to: the detection and fixation of traces of crimes; establishing the circumstances of the event (time, place, method of commission); identifying persons involved in the crimes (both perpetrators and organizers); and forming an evidentiary base for pre-trial investigation, subsequent court proceedings, and the punishment of guilty persons.

The article examines the criminalistic significance of media coverage of war crimes committed on the territory of Ukraine under the conditions of the full-scale armed aggression of the Russian Federation. The relevance of the topic is determined by the massive nature of war crimes, the widespread use of digital technologies and open-source information (OSINT), as well as the role of the media as an important channel for recording, disseminating, and documenting evidence of war crimes.

Keywords: war crimes; crime recording; criminalistics approach; digital evidence; pre-trial investigation; media coverage.

Problem of the statement. The Russian Federation's full-scale armed aggression against Ukraine is accompanied by the widespread commission of war crimes, which are systematic in nature and extend to both occupied and frontline territories, as well as to relatively safe regions of Ukraine. In such circumstances, effective pre-trial investigation and subsequent prosecution of the perpetrators depend to a large extent on the prompt identification, recording and documentation of evidence of these crimes. Today, one of the key sources of criminally significant information is media coverage of war crimes, which includes traditional media, digital platforms, social media, video footage, eyewitness accounts and journalistic investigations.

The relevance of the topic stems from the mass nature of war crimes, the widespread use of digital technologies and open-source intelligence (OSINT), as well as the role of the media as a vital channel for recording, disseminating and documenting evidence of war crimes. Prompt media coverage of events creates a unique body of data that can be used to establish the circumstances of the crimes, identify those involved and build a case. At the same time, the forensic potential of such information, its reliability, the mechanisms for recording evidence, and the possibilities for integrating it into criminal proceedings remain insufficiently studied in forensic science.

Thus, the problem lies in the need for a scientific justification of the forensic significance of media coverage of war crimes as an independent



© L. Polunina, 2026

© Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine, 2026

source of evidential information in the context of modern hybrid warfare.

Analysis of recent research and publications.

Recent publications by both Ukrainian and international researchers demonstrate a steady growth in interest in the forensic potential of media coverage of war crimes in the press, on social media and in open digital sources. The topic is primarily examined through the prism of digital forensics, OSINT (Open Source Intelligence) and the admissibility of digital evidence in legal proceedings. Ukrainian scholars focus on national criminal procedure, issues of verification and legalisation of media materials, whilst foreign scholars concentrate on the international evidential framework for the International Criminal Court (hereinafter – ICC), universal jurisdiction and global standards (Berkeley Protocol).

Among Ukrainian researchers, the contribution of D. V. Lisnichenko is undeniable; he has comprehensively analysed the theoretical and practical foundations for the use of media publications, eyewitness video recordings, journalistic investigations and social media as sources of criminologically significant information. The author emphasises that, in conditions of occupation and hostilities, such materials become particularly valuable for recording traces of crimes, establishing circumstances (time, place, method) and identifying individuals. At the same time, the author notes the absence of specific provisions in the Criminal Procedure Code of Ukraine (hereinafter – the CPC of Ukraine) regarding OSINT, which highlights the need for regulatory clarification of the criteria for admissibility, the “chain of custody” and authentication. It is explicitly stated that media data “...has forensic significance and high informational value” provided it is verified [1].

Sergeeva D. B. examines in detail the role of computer-technical, telecommunications and video-audio expertise in verifying the authenticity of audiovisual media materials documenting war crimes. She emphasises that digital traces from media (metadata, geolocation, recovery of deleted data) are becoming a key element of evidence, ensuring causal links and admissibility in national and international justice [2].

The collective monograph “Innovative Methods and Digital Technologies in Forensic Science and Judicial Expertise” (ed. V. Yu. Shepitko) devotes separate chapters to the development of digital forensics, the role of innovative approaches, and the prospects for introducing the latest scientific -

technical means and information technologies in the practical activities of pre-trial investigation bodies (courts) and the conduct of forensic examinations, as well as the possibilities for using digital information (digital evidence) and artificial intelligence systems in criminal proceedings [3].

Foreign studies focus on the global dimension. The RUSI commentary “Puzzling Pieces: OSINT and War Crime Accountability in Ukraine” analyses a network of OSINT organisations (Bellingcat, Molnar, Berkeley Human Rights Investigations Lab, etc.), which have transformed media materials into a tool for international accountability. It highlights the role of journalistic investigations and social media in building a case for the International Criminal Court (hereinafter ICC) and national courts [4].

In the article “The War on Open-Source Intelligence”, T. Colley examines OSINT as a global tool for exposing war crimes. The author highlights the challenges posed by disinformation and the need to develop standards for verifying information [5].

The Berkeley Protocol on Investigations Using Open-Source Digital Data (Berkeley Protocol), which has been actively applied in Ukraine since 2022 and has formed the basis for many works, sets out standards for the collection and verification of open-source digital data (including media) for the investigation of violations of international humanitarian law [6].

At the same time, issues such as the criteria for the forensic assessment of media content as an independent source of evidence; the psychological and ethical aspects of the media’s influence on witnesses; and standardised methodologies for integrating journalistic materials into pre-trial investigations remain under-researched. It is precisely these gaps that justify the relevance of further research.

The purpose of the article a comprehensive study of the significance of media coverage of war crimes committed on Ukrainian territory during the Russian Federation’s full-scale armed aggression, with the aim of substantiating its role as an independent source of criminologically significant information and developing scientifically grounded recommendations on the effective use of media materials in the process of identifying, recording, documenting and proving war crimes.

Presentation of the main material. The military history of humanity is inextricably linked to numerous armed conflicts, during which the rules of war are invariably violated and war crimes and crimes against humanity are committed. Such acts are brought before national and international

courts. On 24 February 2022, the Russian Federation launched a full-scale armed invasion of Ukraine, accompanied by systematic violations of international humanitarian law.

As of March 2026, the Office of the Prosecutor General had recorded over 240,000 instances of war crimes committed by Russian military personnel [7].

War crimes are serious violations of the 1949 Geneva Conventions and other serious violations of the laws and customs of war, as defined in Article 8 of the Rome Statute. They constitute one of the international crimes (crimes under general international law), which also include the crime of genocide, crimes against humanity and the crime of aggression [8, p. 29].

War crimes can broadly be divided into two categories:

a) serious violations of the 1949 Geneva Conventions, namely intentional killing, torture, infliction of suffering, deportation of the population, taking of hostages, etc.;

b) other serious violations of the laws and customs of war (deliberate attacks on the civilian population and civilian objects, humanitarian personnel and transport, the killing and wounding of combatants who have laid down their arms, the improper use of the enemy's flag, deliberate attacks on religious, cultural and historical sites, hospitals, declarations that there will be no quarter, the pillaging of towns, etc.) (Article 8 of the Statute of the International Criminal Court) [7].

Here are some examples of common war crimes, but it is worth noting that this list is not exhaustive:

- injury/death of civilians as a result of the use of weapons;
- torture, physical violence, inhuman treatment of civilians or deprivation of their liberty;
- taking civilians hostage;
- damage or destruction of civilian infrastructure that was not a military target;
- deliberate attacks on personnel, vehicles or facilities involved in the provision of humanitarian aid;
- placement and use of military equipment in residential areas of settlements, conduct of hostilities by the occupier in residential areas of settlements;
- deliberate damage/destruction of religious buildings (temple, mosque, synagogue, etc.), educational, scientific, artistic institutions, historical monuments that were not a military target;

– violence against medical personnel, damage to medical transport, hospital premises and medical equipment that were not a military target;

– use by the occupier of the uniform and insignia of the Armed Forces of Ukraine, emblems of humanitarian and medical institutions during military operations;

– use of civilian infrastructure facilities and civilians to cover the Russian military;

– deliberate actions aimed at creating obstacles to providing assistance to the civilian population [7].

Various media outlets are actively covering the consequences of missile and artillery strikes on civilian settlements, drone attacks on critical infrastructure, and other war crimes committed by the Russian military. Such crimes require effective recording and documentation to collect proper, admissible, and reliable evidence. Measures to record military evidence can be divided into two types: procedural and non-procedural. Procedural measures are carried out by authorized law enforcement officials and consist of conducting primary investigative (search) actions and operational measures. Non-procedural measures are carried out by representatives of the media (journalistic investigations), war correspondents, public organizations, etc. and consist of covering certain events and giving them public publicity. Of course, not every piece of information should be covered, as in an armed conflict it can be used by the enemy, so filtering information is necessary. But obvious facts of war crimes should be documented and made public.

Media coverage performs several forensically significant functions: 1) recording and documentation – video recordings, photographs, eyewitness accounts recorded by journalists become primary sources of information about the scene, time, and consequences; 2) establishing the circumstances of the crime – media materials help to establish the method of committing the crime (for example, the use of cluster munitions, missile strikes on civilian objects); 3) identification of individuals – video geolocation, facial recognition via OSINT, and analysis of social networks allow us to establish the involvement of specific Russian servicemen; 4) formation of an evidence base – verified media materials can be attached to the materials of criminal proceedings as electronic evidence (in accordance with the Budapest Convention and the norms of the Code of Criminal Procedure of Ukraine).

Modern technologies (satellite imagery, geo-OSINT, artificial intelligence for big data analysis)

significantly enhance this role. Journalistic investigations (Bellingcat and others) have repeatedly helped to identify the Russian military units involved in the crimes in Bucha, Izyum and many other cities.

However, despite its positive role, the coverage of war crimes in the media has a number of challenges:

- reliability of information - not all materials undergo proper verification. Some publications contain errors due to the lack of consultations with forensic experts;

- disinformation - Russia actively uses information warfare, spreading fakes through controlled media;

- verification of digital evidence - the need to record metadata, hash values, prevent editing. OSINT methodologies and forensic photography and video technology specialists come to the rescue here;

- source safety – journalists and witnesses risk their lives while working in occupied territories or in a combat zone.

The forensic approach to working with media materials involves their review, recording in the protocols of investigative (search) actions, preliminary research (similar to forensic photography) and integration into a single evidence base.

In addition, in our opinion, in order to effectively include materials of information coverage of war crimes in the media (video recordings, publications, eyewitness testimonies, journalistic investigations, data from social networks, etc.) and OSINT data in the materials of criminal proceedings as full-fledged evidence, it is necessary to amend a number of articles of the current Criminal Procedure Code of Ukraine (hereinafter referred to as the CPC of Ukraine). Currently, the current legislation does not contain special norms on the recognition of OSINT materials and media data as a separate type of evidence. They are integrated only through general institutions of criminal procedure (Article 99 of the CPC of Ukraine) [9], which creates problems of admissibility, verification, compliance with the chain of custody and protection against falsifications (in particular, deepfake). This is especially critical in the context of war crimes, where traditional investigative (search) actions are limited to combat operations, occupation or destruction of evidence.

In addition, it is necessary to supplement the list of sources of evidence (Article 84 of the Code of Criminal Procedure of Ukraine) [9]. Accordingly,

Part 2 of Article 84 should be worded as follows: “Procedural sources of evidence are testimonies, material evidence, documents, expert opinions and electronic evidence”.

Add a new paragraph 6 to Chapter 4 of the Code of Criminal Procedure of Ukraine “OSINT report”. Where to define an OSINT report as an analytical document prepared by a specialist (or group of specialists) in the field of open sources of information, containing generalized factual data obtained in a legal manner from publicly available digital resources, with mandatory recording of sources, access time, digital identifiers, technical conditions of collection, verification methods and hash values of files. And establish procedural requirements for such a document - mandatory compliance with the chain of custody, the possibility of submission by both the prosecution and the defense; mandatory expert verification of authenticity (computer-technical, video-audio examination).

Also, Article 84 of the Code of Criminal Procedure of Ukraine (Evidence) [9] needs to be supplemented with a new Part 3 – “Electronic evidence is any information generated, stored or transmitted in digital form that may be needed to confirm or refute a fact disputed within the proceedings (including text documents, graphic images, photographs, video and sound recordings, websites (pages), messages on social networks, metadata, satellite images and other data in electronic form obtained as a result of intelligence based on open sources (OSINT))”.

Establish OSINT as a method of conducting investigative (search) actions (Article 237 of the Code of Criminal Procedure of Ukraine (Review)). Clause 1 of Part 2 of Art. 237 to be worded as follows: “The examination of computer data is carried out by an investigator, a prosecutor through intelligence based on open sources (OSINT) and the information they contain is reflected in the examination protocol in a form suitable for perceiving their content (using electronic means, photography, video recording, screen capture, etc. or in paper form)”.

To ensure the admissibility of such evidence, additionally supplement Article 99 of the Code of Criminal Procedure of Ukraine (Documents) with a provision stating that media and OSINT materials recorded in the examination protocol or OSINT report are considered documents provided that they are verified in accordance with the requirements of the Berkeley Protocol.

In Article 242 of the Code of Criminal Procedure of Ukraine (Grounds for conducting an examination) and Article 69 of the Code of Criminal Procedure (Expert), establish the mandatory participation of a specialist/expert in digital forensics for the authentication of media materials (metadata verification, lack of editing, geolocation).

In the section on evidence (Articles 85-86 of the Criminal Procedure Code), add criteria for evaluating electronic evidence: relevance, admissibility, reliability and sufficiency, taking into account the risks of disinformation.

In our opinion, the proposed changes will eliminate the legal gap indicated by modern research and will allow for the prompt inclusion of media materials (videos of war crimes, eyewitness publications, journalistic investigations) in criminal proceedings as electronic evidence; form an evidentiary base for national and international justice (ICC, universal jurisdiction, Special Tribunal); increase the efficiency of war crimes investigations in the context of hybrid warfare, where OSINT and the media are becoming one of the main sources of evidence.

The implementation of these norms (through the adoption of a separate bill or amendments to existing regulatory legal acts on the digitalization of criminal proceedings) will significantly enhance the forensic significance of media coverage of war crimes and turn it into a full-fledged evidence tool.

Conclusions and prospects for further research. Media coverage of war crimes committed by Russia on the territory of Ukraine is of significant forensic importance. It complements traditional procedural measures, accelerates documentation, contributes to the identification of perpetrators and the formation of an evidentiary base for national and international justice.

Prompt information coverage of events in traditional and digital media, social networks, eyewitness videos and journalistic investigations forms a powerful array of forensically significant information. Such information contributes to: 1) identifying and recording traces of war crimes; 2) establishing the circumstances of their commission (time, place, method, scale of damage caused); 3) identifying perpetrators, commanders and organizers of crimes; 4) formation of an evidentiary base suitable for use both in national

pre-trial investigation and trial, and in international justice (International Criminal Court, universal jurisdiction, Special Tribunal for the Crime of Aggression).

Of particular importance is the synergy of media materials with OSINT methods, which in the conditions of hybrid warfare and limited access to places where war crimes were committed become one of the main sources of primary data. An analysis of the latest scientific publications by Ukrainian and foreign authors confirms that the digitalization of forensics transforms the media and open sources from a publicity tool into a full-fledged forensic resource that meets modern international standards (Berkeley Protocol, etc.).

At the same time, the study revealed a number of significant problems: the lack of special regulatory regulation of the status of OSINT materials and media data in the Criminal Procedure Code of Ukraine, the risks of falsification (in particular, deepfake), the difficulties of ensuring chain of custody, verification and authentication of digital evidence. This creates obstacles to their full inclusion in the materials of criminal proceedings and use in court.

To overcome these problems, the need to make targeted amendments to the Criminal Procedure Code of Ukraine is justified.

The implementation of the proposed changes will significantly increase the efficiency of war crimes investigations, ensure the proper quality of evidence in national courts, and strengthen Ukraine's position in international justice.

Thus, information coverage of war crimes in the media is not only an important social and preventive factor, but also a powerful forensic tool of modern digital warfare. The introduction of a forensic approach to information coverage will allow to increase the level of reliability and objectivity of media materials, which is an important contribution to the fight against impunity for war crimes and the restoration of justice. Its scientifically based use will contribute to the principle of the inevitability of punishment, the restoration of justice for the victims of aggression.

Further research should be directed at the development of standardized methods of forensic assessment of media content, improving the interaction of law enforcement agencies with journalists and public OSINT organizations, as well

as studying the psychological and ethical aspects of the impact of media coverage on the process of evidence.

References

1. Lisnichenko D. V. (2025). *Vykorystannia danykh z media ta vidkrytykh dzherel (OSINT) u protsesi dokazuvannia u kryminalnykh provadzhenniakh* [Use of media and open source (OSINT) data in the process of proving in criminal proceedings]. *Pravo ta derzhavne upravlinnia*, no. 1, pp. 234–239. DOI: <https://doi.org/10.32782/pdu.2025.1.32> [in Ukrainian].
2. Serhieieva D. B. (2025). *Vykorystannia spetsialnykh znan u rozsliduvanni voiennykh zlochyniv i zlochyniv proty liudianosti: protsesualni aspekty, ekspertna vzaiemodiia ta tsyfrova kryminalistyka* [Use of special knowledge in the investigation of war crimes and crimes against humanity: Procedural aspects, expert interaction and digital forensics]. *Analitichno-porivnialne pravoznavstvo*, no. 6, vol. 3, pp. 234–247. DOI: <https://doi.org/10.24144/2788-6018.2025.06.3.36> [in Ukrainian].
3. Shepitko V. Yu., Avdieieva H. K., Shevchuk V., Nehrebetskyi V. V., Kapustina M. V., Yaremchuk V. O., Sokolenko M. O., NDI vyvchennia problem zlochynnosti im. akad. V. V. Stashysa Natsionalnoi akademii pravovykh nauk Ukrainy (2024). *Innovatsiini metody ta tsyfrovi tekhnologii v kryminalistytsi y sudovii ekspertyzi* [Innovative Methods and Digital Technologies in Criminalistics and Forensic Science]. Kharkiv : Pravo [in Ukrainian].
4. Ricci, A., Crawford, J. (2024). Puzzling Pieces: OSINT and War Crime Accountability in Ukraine. *RUSI*. Retrieved from: <https://surl.li/pvzdxt> (accessed 20 March 2026) [in English].
5. Colley, T., & Dylan, H. (2025). The war on open-source intelligence. *The Washington Quarterly*, vol. 48. DOI: <https://doi.org/10.1080/0163660X.2025.2554477> [in English].
6. Berkeley Protocol on Digital Open Source Investigations (2022). Office of the United Nations High Commissioner for Human Rights & Human Rights Center, University of California, Berkeley. Retrieved from: <https://surl.li/cujwwp> (accessed 20 March 2026) [in English].
7. Ofis Heneralnoho prokurora (n. d.). *Pytannia ta vidpovidi* [Questions and answers]. Retrieved from: <https://warcrimes.gov.ua/qa.html> (accessed 20 March 2026) [in Ukrainian].
8. Voluiko O. M., Polunina L. V. (2024). *Terminolohichniy slovnyk mizhnarodnoho humanitarnoho prava* [Terminological dictionary of international humanitarian law]. Kyiv : KI NHU [in Ukrainian].
9. *Kryminalnyi protsesualnyi kodeks Ukrainy № 4651-VI* [Criminal Procedure Code of Ukraine activity no. 4651-VI]. (2012, April 13). Retrieved from: <https://surl.li/dbfwaa> (accessed 20 March 2026) [in Ukrainian].
10. Kudinov S. S., Shekhavtsov R. M. (2025). *Pravove rehuliuvannia vykorystannia OSINT ta yoho rezultatyv pid chas vstanovlennia obstavyn kryminalnykh pravoporushen* [Legal regulation of the use of OSINT and its results in establishing the circumstances of criminal offenses]. *Naukovyi visnyk Lvivskoho derzhavnoho universytetu vnutrishnikh sprav. Seriia yurydychna*, no. 3, pp. 126–133 [in Ukrainian].

Received / Стаття надійшла до редакції: 14.04.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 12.05.2026

Published / Опубліковано: 30.06.2026

ПОЛУНІНА ЛІЛІЯ ВАЛЕНТИНІВНА

*кандидат юридичних наук, доцент,
професор кафедри правового забезпечення та правоохоронної діяльності,
Київський інститут Національної гвардії України
<https://orcid.org/0000-0002-8898-2162>*

КРИМІНАЛІСТИЧНЕ ЗНАЧЕННЯ ІНФОРМАЦІЙНОГО ВИСВІТЛЕННЯ У ЗАСОБАХ МАСОВОЇ ІНФОРМАЦІЇ ФАКТІВ ВОЄННИХ ЗЛОЧИНІВ НА ТЕРИТОРІЇ УКРАЇНИ

Досліджено криміналістичне значення інформаційного висвітлення у засобах масової інформації фактів воєнних злочинів, вчинених на території України в умовах повномасштабної збройної агресії російської федерації. Актуальність теми зумовлена масовим характером воєнних злочинів, широким використанням цифрових технологій і відкритих джерел інформації (OSINT), а також роллю медіа як важливого каналу фіксації, поширення та документування доказів воєнних злочинів.

Проаналізовано, як оперативне інформаційне висвітлення подій у традиційних і цифрових засобах масової інформації, соціальних мережах, відеоматеріалах, свідченнях очевидців та журналістських розслідуваннях формує криміналістично значущу інформацію про вчинення воєнних злочинів. Констатовано, що така інформація сприяє: виявленню та фіксації слідів злочинів; установленню обставин події (часу, місця, способу вчинення); ідентифікації осіб, причетних до злочинів (як виконавців, так і організаторів); формуванню доказової бази для досудового розслідування та подальшого судового розгляду і покаранню винних осіб.

Ключові слова: *воєнні злочини; фіксування злочинів; криміналістичний підхід; цифрові докази; досудове розслідування; інформаційне висвітлення.*



POSMITNA VIKTORIIA

*Candidate of Philological Sciences, Associate Professor,
Professor at the Department of Philology and Military Translation,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0000-0001-8719-1767>*



BORYSOV NAZAR

*Cadet,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0009-0005-9686-0498>*

CIVIL–MILITARY COOPERATION IN THE ACTIVITIES OF THE NATIONAL GUARD OF UKRAINE: LINGUISTIC AND COMMUNICATIVE FACTORS OF THE IMPLEMENTATION OF PROFESSIONAL TASKS IN NEGOTIATIONS

This study clarifies the content, principles, and tasks of civil–military cooperation, its regulatory and legal framework, and the specific features of its implementation under current conditions.

The purpose of the study is to identify the linguistic and communicative factors involved in the implementation of professional tasks of the National Guard of Ukraine in negotiations with civilian actors within civil–military cooperation, to substantiate appropriate communicative strategies and types of linguistic influence for each stage of negotiations, and to develop recommendations for their application. The relevance of the research topic is determined by the need to define linguistic and communicative tools for the effective implementation of military professional tasks in communication with civilian actors, as well as by the focus of modern communicative linguistics on the theoretical understanding of domain-specific communication and the development of practical recommendations for its effectiveness.

Using targeted sampling, generalisation and systematisation of theoretical material, and the descriptive method, the study identifies and analyses the goals, principles, and structure of negotiations in civil–military cooperation within the National Guard of Ukraine under current conditions, and specifies the structure of the negotiation process in this field.

Through classification methods and discourse analysis, the study proposes, for the first time, the application of specific communicative strategies and types of linguistic influence as linguistic and communicative factors of negotiation effectiveness at each stage of the negotiation process within civil–military cooperation; inappropriate and unacceptable strategies are also identified. Standardised linguistic formulas for implementing the defined communicative strategies in specific situations are formulated and recommended. The communicative strategy of interaction is defined as the main factor in negotiation effectiveness.

Mastering the set of linguistic and communicative factors of negotiation effectiveness proposed in the study will help representatives of the National Guard of Ukraine and other security structures fulfil their professional tasks and enhance their linguistic and communicative competence in negotiations with civilian actors.

Keywords: *civil–military cooperation; professional communication; negotiation process; communicative strategies; types of linguistic influence; implementation of professional military tasks of the National Guard of Ukraine.*



© V. Posmitna, N. Borysov, 2026

© Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine, 2026

Problem of the statement. In the face of today's unprecedented challenges to national security, the role of the National Guard of Ukraine (NGU) in maintaining public order and protecting the state and its citizens has grown significantly. The effectiveness with which the NGU carries out its assigned tasks depends to a large extent on well-coordinated interaction with civil society organisations.

An important tool for ensuring effective coordination of actions between military structures and the civilian sector is the civil-military cooperation (CIMIC) system. One of the key elements of this system is the negotiation process. Negotiations enable compromises to be reached, conflicts to be prevented and effective cooperation to be ensured, provided that language and communication tools appropriate to each specific situation are employed.

The relevance of this research topic stems from the need to identify linguistic and communicative factors capable of assisting in the fulfilment of the National Guard of Ukraine's military-professional tasks at each stage of negotiations with civilian entities. This issue takes on particular significance in the context of the focus of contemporary communicative linguistics on the theoretical understanding of the characteristics of sector-specific communication and the development of practical recommendations for its effectiveness.

Analysis of recent research and publications. Researchers are currently actively investigating the organisation and areas of CIMIC, and defining the objectives and principles of civil-military interaction [1; 6; 7; 8; 14; 15 et al.]. Communicative linguistics proposes communicative strategies and types of linguistic influence to achieve effective communication in various types of discourse, including military discourse [9; 11; 12; 17 et al.]. However, the issue of linguistic and communicative factors affecting the effectiveness of negotiations as a specific form of communication within security agencies in the process of CIMIC remains overlooked by researchers.

The purpose of the article is to identify the linguistic and communicative factors involved in the National Guard of Ukraine's professional tasks when negotiating with civilian entities within the framework of civil-military cooperation; to justify the communicative strategies and forms of linguistic influence appropriate for each stage of the negotiations; and to develop recommendations for their application.

Presentation of the main material. In international practice, civil-military cooperation (CIMIC) is regarded as a set of coordinated measures aimed at ensuring effective interaction between military units and civilian structures in the areas of planning, conducting operations, infrastructure reconstruction and humanitarian support [14; 16].

Under Ukrainian law, CIMIC is defined as 'a set of measures by the Armed Forces of Ukraine and other military formations established in accordance with the laws of Ukraine, regarding coordination and interaction with executive authorities, local self-government bodies, public associations, organisations and citizens with the aim of creating favourable conditions for the Armed Forces of Ukraine to carry out the tasks and functions assigned to them' [13].

In the academic literature, CIMIC is defined as a form of activity by military formations aimed at establishing mutual understanding with the population, authorities and international organisations to ensure stability, security and the restoration of social infrastructure in the conflict zone [1; 6; 14]. This approach emphasises the humanitarian dimension of CIMIC, where the individual is the central element.

In accordance with the National Guard of Ukraine's Doctrine of 22 December 2023, CIMIC activities within the National Guard of Ukraine 'are aimed at ensuring the effectiveness of coordination and interaction processes between National Guard units and civil society actors' with the aim of 'ensuring the fulfilment of operational and combat tasks, creating favourable conditions for the fulfilment of tasks, and facilitating the work of state authorities' [3, p. 26].

At the regulatory level, civil-military cooperation activities within the National Guard of Ukraine are aligned with the provisions of the Armed Forces of Ukraine's 'Civil-Military Cooperation' Doctrine, which sets out the following fundamental principles: legality; transparency; systematic approach; and effectiveness [4, p. 9]. Adherence to these principles is a prerequisite for establishing an effective system of interaction in CIMIC.

The CIMIC system comprises four subsystems: 1) civil-military interaction (CMD); 2) troop support; 3) civilian environment support; 4) civilian environment assessment [6, p. 35]. In the context of the study of negotiations, the most important subsystem is civil-military interaction, which involves: coexistence; consultation; conflict

resolution; coordination of actions; and cooperation [6, p. 39].

An analysis of the content of CMI allows us to recognise interaction as a key factor in achieving the effective fulfilment of CIMIC tasks, since the effectiveness of CIMIC depends precisely on the effectiveness of this interaction. This, in turn, allows us to identify negotiations as the primary form of communication in CIMIC, since it is in negotiations that the principle of collective interaction is realised to the greatest extent.

In a broad sense, negotiation is '1. A conversation or discussion aimed at exchanging views or reaching an agreement with someone' [2, p. 721]. In a narrow sense, it is '2. A discussion aimed at ascertaining the views and attitudes of the parties or concluding an agreement' [ibid.]. For the purposes of this study, we adopt the second definition, as it is more specific and corresponds to the objectives of professional communication.

The objectives of negotiations in both academic and practical contexts are defined as reaching agreements acceptable to all participants, who often have differing interests but must reach a consensus during the negotiation process [10; 17].

The main principles of the negotiation process are legality, neutrality, humanism, adaptability and transparency [7]. In the context of full-scale war, negotiations have become an important communication mechanism for coordinating interaction, as well as for building trust between military structures and the civilian population.

Language-related factors in the achievement of professional objectives in negotiations. CIMIC takes place at the level of language-related communication. Language-related communication is always subordinate to the objectives of the activity within which it occurs [4; 10]. The factor on which linguistic communication is based is linguistic influence.

We consider linguistic influence (LI) to be the conscious or unconscious causing of changes in the behaviour, emotional state, and consciousness of the recipient, which occurs during the process of linguistic communication [9]. The outcome of communication, and consequently of the entire activity, depends to a large extent on the type of LI chosen by the subject. LI is classified according to various criteria. Let us identify the main ones [10, p. 24]:

- By the main purpose of the influence: informing; persuading; suggestion; command; incitement to action; coercion; request; forming certain assessments and feelings; forming a mental

image of an object; justifying propositions; persuasion.

- By effectiveness: successful (effective) and unsuccessful (ineffective).

- By conformity to the moral norms of society: destructive (negative) and non-destructive (positive, constructive).

- By the criterion of openness: open and covert (manipulative).

Manipulative influence is a covert form of linguistic and psychological influence aimed at arousing intentions in the recipient that correspond to the communicative intentions of the subject. The most dangerous form is destructive manipulative influence, which disregards the recipient's interests.

- By awareness: conscious MI and unconscious (accidental). The latter has unpredictable consequences, so it is important to plan MI [10, pp. 25–26].

A communicative strategy (CS) is understood as the primary approach to realising a communicative intention (goal), as a set of linguistic actions aimed at solving a general communicative task [9]. CS can be characterised as cooperative or non-cooperative, depending on whether the focus is on cooperation or on winning at any cost. There is no single typology of CS. The communicator themselves determines the CS strategy to achieve the goals of communication [10, pp. 24–28].

CS and types of LI are linguistic-communicative factors; the effectiveness of communication in general and negotiations in particular, and consequently the effectiveness of performing professional tasks, depends to a large extent on the correct choice of these factors.

In determining the appropriateness of applying linguistic and communicative factors in negotiations conducted by representatives of the National Guard of Ukraine in the process of CIMIC, it is necessary to take into account: the goals and objectives of CIMIC; the conditions of martial law; the requirements of Ukrainian legislation and the guiding documents of the security ministries and agencies; the specific features of conducting negotiations in CIMIC within a particular communicative situation at each stage of the negotiations.

We will define a CS and types of LI, the application of which contributes to effective communication at each stage of CIMIC negotiations, and justify their appropriateness.

In CIMIC practice, a three-stage negotiation structure is used:

1) the information phase – initial analysis of the situation, data collection, and the formulation of objectives and a negotiating position;

2) the trust-building phase – establishing contacts, setting up communication channels, determining the format of negotiations, and identifying the venue, time and representatives;

3) the agreement phase – clearly recording decisions in the presence of neutral observers) [15; 16]. An analysis of CIMIC tasks allows this structure to be supplemented by dividing the third phase into two stages, each with its own communication objectives:

a) the direct interaction stage – the actual conduct of negotiations, communicating with the aim of reaching a mutually beneficial solution;

b) the stage of recording agreements – documenting agreements, specifying the terms and proposals for joint activities, and recording the decisions taken.

This structure will allow us to focus on the main communicative phase of the negotiations and to develop, in greater detail and with greater focus, recommendations regarding the choice of CS and types of LI by representatives of the National Guard of Ukraine at each of the stages.

According to the Concept for the Development of CIMIC [5], its organisation is based on the principles of mutual understanding, mutual respect, and ‘unity and consistency of positions’. Accordingly, we consider it appropriate to recommend, as the basis for negotiations in CIMIC, a communicative strategy of interaction which can be expressed in the formula ‘together, by helping one another, we will be able to resolve all problems’.

In addition to the main CS for engagement, we will propose supporting communication strategies and the most appropriate forms of linguistic influence for each phase of the negotiations.

1. The information phase – the initial phase of negotiations, which involves preparing for direct contact between military and civilian personnel.

We will specify the CS for interaction in this phase in the following areas: CS for interaction with other military and law enforcement units, which can be summarised as ‘we are working towards a common goal and must provide each other with all relevant information’; CS for interaction with the civilian population, with the implementation formula “we must act together and assist one another with the necessary information”.

Interaction in both areas is aimed at gathering information from various sources to ensure its

objectivity, and at gauging attitudes and readiness for cooperation.

As supporting communication strategies, it is advisable to consistently apply: CS for analysing and summarising information, with possible implementation formulas such as ‘let us analyse the facts presented’ and ‘so, what does this mean for us’; CS for formulating negotiation objectives and positions, which involve using the information gathered to define professional objectives and strategies for their implementation in negotiations; we can specify this in the phrase ‘based on the data obtained, let us define the objectives of the negotiations and our positions’.

If manipulative behaviour on the part of civilian actors is detected, in particular the withholding of information or the provision of knowingly false data, it is advisable to apply a CS to counteract the manipulation, which at this stage may involve thoroughly verifying the information provided, identifying the reasons for the manipulation, and openly discussing the incident with a view to future engagement.

We propose the following types of verbal influence that are most appropriate for National Guard personnel to use during this phase of negotiations: providing information, as interaction at this stage can only take the form of a mutual exchange of information; it is important to provide details about oneself and the general positive objectives of one’s activities, whilst naturally avoiding specific details (“we are members of the National Guard, we will help and protect you”), as this encourages civilians to provide information to the National Guard; requests to provide information, as it is necessary to take into account the level of willingness to engage and, at the same time, to foster such willingness.

We consider the following types of LI to be unacceptable: coercion or orders to provide information, as this will lead to the breakdown of further communication. Coercion contradicts ethical standards and, consequently, the strategy of interaction. Orders are generally intended for use in combat situations or in preparation for them and are permissible only in communication between a commander and subordinates.

Oleksandr Kutkov, Head of the Central Civil-Military Cooperation Directorate of the General Staff of the Armed Forces of Ukraine, emphasised the need to maintain constant communication – both in terms of gathering information on the needs of civilians and providing vital information from the military to civilians. He also assessed the Civil-Military Cooperation Service’s launch of the

Armed Forces of Ukraine website 'On the Line' as an effective step towards achieving cooperation [22].

The findings of the Razumkov Centre's research on CIMIC demonstrate the importance of military authorities issuing alerts and providing reliable information on the situation, dangers, evacuation conditions, etc. [23, p. 43]; the need for ongoing public awareness work by the military with the population of frontline regions has been identified [23, p. 46], and insufficient communication with the population has been cited as the primary reason for frequent refusals to evacuate from these areas [23, p. 38]. Overall, according to experts at the analytical centre, misunderstandings and conflicts within the CIMIC framework are primarily due to the lack of centrally developed rules and procedures for warning, evacuation and other types of CIMIC [23, p. 49], which once again highlights the need to develop recommendations for communication within the civil protection system.

Therefore, during the information phase of negotiations, one should adopt communication strategies and forms of verbal influence aimed at establishing interaction and at gathering and analysing information.

2. The trust-building phase involves creating a safe environment for communication. This primarily involves establishing contacts with representatives of the authorities, communities and missions with the aim of establishing communication channels.

At this stage, it is most appropriate, alongside the main CS for interaction, to also apply the following as supplementary strategies: a CS for building trust, which can be expressed in phrases such as: 'we are on the same side', 'despite possible uncertainty, we must learn to trust one another', as only by establishing trust can we coexist fully; a CS of courtesy, which can be expressed in the phrase "we must show respect for one another, no matter how difficult the circumstances may be"; a CS to build a positive image of the National Guard, fostering the perception of National Guard members as true defenders, combat-ready and loyal to their duty; this communication strategy can be expressed by the formula 'we are capable and ready to protect you'; a CS of mutual understanding, which can be expressed in the phrase 'we understand your problems' and is put into practice by demonstrating an understanding of the affected population's needs for water, food, electricity, medical care, the right to education and housing, and so on; a CS of readiness to help, expressed as

'we will always help you when you need it', which is realised through a willingness to provide military and humanitarian aid, to assist in infrastructure reconstruction, and to implement measures to restore public safety and order; a CS of openness, which can be expressed in the phrase 'we are open to providing and receiving information', as information exchange is necessary for building trust.

At the same time, communication strategies based on intimidation or coercion are unacceptable, as they inevitably lead to negative and unpredictable consequences.

If manipulative behaviour on the part of civilian actors is detected – in particular, attempts to project openness, a willingness to cooperate and trust whilst communication is characterised by underlying tension and suspicion – a communication strategy to counter manipulation should be employed. At this stage, this will primarily involve identifying the causes of mistrust, and in the gradual and controlled overcoming of barriers, taking into account potential threats.

Of the various forms of LI, we consider the following to be the most effective for use by representatives of the National Guard of Ukraine during this phase of negotiations: providing information, since a lack of information – about the other side, its aims and objectives, the key principles governing its behaviour, and the boundaries of what is permitted and prohibited during coexistence – breeds mistrust and fear; representatives of law enforcement agencies should provide relevant information on their part, bearing in mind, of course, that the disclosure of certain information may pose a threat to national security or to the safety of an individual or group; shaping a certain perception of the subject, in this case – of themselves, their organisation, fostering positive public opinion and transparency regarding the actions of the troops. It is important to understand that the general perception of the organisation and its overall image will influence attitudes towards each individual representative, and towards everything that representative communicates, proposes or prohibits.

We consider coercion or orders to be unacceptable forms of linguistic influence in this phase, as in the previous one, since trust is still only just being formed, and therefore linguistic influence involving pressure may lead to misunderstandings and conflicts.

The officers of the Joint Forces Operation themselves attest to the need for communication

efforts to build trust, foster a positive image of the army, and promote openness and mutual understanding, in order to ensure the effective execution of both combat missions in the region and assistance to CIMIC. In particular, they emphasise the importance of establishing effective communication, addressing citizens' mistrust and fears, making efforts to shape the image of the Ukrainian soldier as a defender rather than a threat, the essential need to understand the needs of CIMIC, and the conviction and demonstration of a willingness to help – were highlighted by Serhiy Huty, an officer of the 175th Separate Heavy Mechanised Brigade, drawing on his extensive experience [19].

Therefore, during the trust-building phase of negotiations, one should choose communicative strategies and forms of linguistic influence that help bring the parties closer together and convey a sense of openness regarding their intentions.

3. Let us identify the linguistic and communicative factors for the successful implementation of the negotiation phase of agreements at the CIMIC of the National Guard of Ukraine

3a. The stage of direct interaction. At this stage, direct contact between the parties takes place, agreements are discussed, advice is given, and compromises are reached. Let us examine this stage in more detail, as the most critical one, taking into account typical scenarios for the development of communication.

- At the start of this stage, in addition to the basic CS of interaction, we propose applying the following communicative strategies: the CS of establishing rules, which, when combined with the communicative strategy of interaction, can be expressed as 'let us establish common rules that are binding'; 'let us define the boundaries of what is permissible and impermissible in communication'; a CS for forecasting possible developments, which is specified in the formula 'facts and experience indicate the likelihood of such consequences:...', which involves taking into account all possible scenarios, based on the information received and taking into account the conditions of war; in this context, it is important to ensure the objectivity of the information; a CS for analysing and discussing

threats and challenges, with the implementation formula "we must discuss all likely threats in order to be prepared to neutralise them"; this is applied consistently, following the previous communication strategy; that is, having identified possible scenarios, we identify the threats within them and develop a plan to neutralise them.

At the same time, the following CS are unacceptable: manipulating information (concealing or distorting it), downplaying the threat, and avoiding problem-solving.

Types of LI appropriate for this stage of negotiations: justifying one's own actions and decisions – by the requirements of the law and governing documents; justifying (with facts and current legislation) the reality of certain threats and the course of action to neutralise them; informing – about possible options, causes and consequences; persuading – presenting arguments in favour of what and how best to proceed in order to achieve positive outcomes.

Let us consider typical scenarios for communication during the stage of direct interaction in negotiations:

- Direct interaction can take the form of coordinating actions.

For effective coordination of actions, we suggest, alongside the main communication strategy for interaction, applying: a CS of clarification, expressed in the phrase 'we are ready to explain all our actions', which is advisable to use to avoid misunderstandings; a CS focused on coordinating actions, which is effective for the distribution of duties and responsibilities in joint activities, and for streamlining the system of interaction; implementation formulas – "let's allocate who does what and is responsible for what in a specific situation", "let's coordinate our interaction"; a CS for planning joint actions, used to determine the structure and content of future joint activities, taking into account the capabilities and positions of each party; implementation formula – "we propose a plan for future activities that is acceptable to all of us".

Types of LI effective in coordinating actions: providing information on the reasons for one's actions, as well as on future plans and intentions; demonstrating the openness of intentions, the

appropriateness of certain plans, and the consideration of all participants' positions; justifying one's position, actions and plans with current legislation, guiding documents and indisputable facts.

- Direct interaction in negotiations can also take the form of cooperation (cooperation is defined as a component of CIMIC [6, p. 39]). For this form of direct interaction, we propose: a CS of openness to cooperation, with the implementation formula 'we are ready to cooperate and speak openly about it'; a CS of support, which can be implemented with the formula 'we understand how difficult it is for you, but action is needed'; a CS of readiness to help, with the formula 'speak openly about your problems, we will help you'; a CS of taking the parties' interests into account, with the formula 'we take your interests into account'.

Unacceptable in this context are CS that involve concealing problems and plans, as well as strategies that coerce others into complying with one's own decisions.

Types of LI recommended for cooperation: informing – establishing and maintaining a system for the exchange of information and notification; persuasion – logical arguments in favour of a particular decision in joint planning and in the organisation of joint activities. Manipulative (covert) linguistic influence is unacceptable.

We will demonstrate the effectiveness of applying, at this stage, a CS based on consideration of interests, a willingness to help, support, and openness to cooperation, as well as the effectiveness of persuasion when this form of LI is implemented within the framework of these strategies. CIMIC specialists managed to persuade citizens to evacuate by consistently applying persuasive logical and psychological arguments: 1) Is the problem the cat? – We'll take the cat; 2) special needs? – we are ready to provide a medical examination and suitable conditions; 3) still unsure? – we'll ring your granddaughter, who is worried about you [21]. Of course, one should only promise what one is able to deliver; otherwise, all further communication efforts will be in vain.

- Direct interaction can also take place in the context of conflict resolution, where military

command and the relevant civilian bodies seek to avoid direct interference in each other's activities.

In conflict resolution, the choice of CS depends on the type of conflict, its causes and circumstances: a CS of compliance with the law, aimed at justifying the legality of one's own actions and preventing unlawful actions by the other party, can be expressed in phrases such as 'we act in accordance with the law', 'we are all equal before the law and we must all obey the law', 'do not commit unlawful acts'; a CS of constructive proposals, which can be expressed by the phrase 'we propose specific steps', whilst also indicating the possible consequences; a problem-solving CS, expressed as 'we identify the causes of the problem and solve it together', which involves not ignoring the problem's existence but discussing it; a CS of taking each other's interests into account, which can be expressed as 'we take your interests into account and expect the same from you'; a CS of politeness, expressed in the formula 'we respect your feelings and experience; please allow us to carry out our task', including a CS of cold politeness, with the formula 'sorry, we are obliged to act in this way, even if you object'; a CS of adhering to corporate behavioural stereotypes, with the following phrases: 'we are acting in the interests of national security', 'we are upholding public order', 'we, as representatives of the state and the law...', designed to help National Guard representatives act without succumbing to emotion in complex, including extreme, situations; a CS for outlining prospects for cooperation, which consists of demonstrating the positive prospects of interaction, with the phrase "if we act together, it will be better for all of us". A CS of domination, which at this stage takes the form of "because I said so", is unacceptable.

Types of LI recommended for resolving conflict situations during negotiations: convincing the other party of the legitimacy and lawfulness of one's actions and intentions, whereby arguments may be presented on both logical and psychological grounds, taking into account the potential emotional tension among the parties to the conflict; coercion, which, however, is permissible only in the event of a threat to life and health or in the event of a threat to national security; informing the other

party of one's positive intentions and the legitimacy of one's demands; requesting information or access to troop deployment locations and areas of military operations.

The need for courtesy, patient and tolerant explanation and justification in negotiations with compatriots who 'do not want to listen', and the mandatory consideration of opinions and feelings in CIMIC communication was emphasised in 2023 by Volodymyr Lyamzin, then Head of the CIMIC Centre of the General Staff of the Armed Forces of Ukraine, drawing on several years of practical experience [20].

Experience of CIMIC in conducting negotiations with the population regarding evacuation measures, in particular the evacuation of children, demonstrates the ineffectiveness of persuasion and the necessity, in the event that persuasion proves ineffective, to apply coercion, especially if parents repeatedly express a categorical refusal; as well as the need to be prepared for manipulation (concealment of information, provision of false testimony), and to be able to detect it in order to promptly determine further communication steps within the framework of the chosen CS of cold politeness and corporate behavioural stereotypes – for the effectiveness of communication, and thus the effectiveness of the operation itself [18].

3b. The decision-finalisation stage. The second part of the agreement phase in negotiations. At this stage, the results of direct interaction are summarised and the agreements are formalised.

For this stage, in addition to the basic CS of interaction, we propose the following auxiliary communicative strategies: the CS of decision alignment, which consists of confirming and formalising the agreements reached and is expressed in the phrase 'therefore, our actions must now be in line with these agreements'; a CS of courtesy, which involves showing respect for the other party's position and expressing gratitude for their understanding and concessions; this strategy is expressed in the phrase 'we are grateful to you for your understanding and for taking our position into account'; a CS of specifying further actions and defining responsibilities, aimed at clarifying specific next steps and the responsibility for

carrying them out, and expressed in the phrases 'so, from tomorrow we will begin...', 'you are now responsible for these steps, whilst we are responsible for these', 'we, for our part, undertake to... and you, in turn, must...'; a CS for coordinating actions in carrying out joint activities, aimed at agreeing on the further regulation of joint actions and setting the tone for future cooperation, which can be expressed in phrases such as 'from now on, we will definitely coordinate all our actions and any possible changes'; a CS of empathy in the event that interlocutors abandon their previous convictions, which may take the form of "we understand how difficult it was for you to change your decision/make up your mind".

Types of LI recommended for the stage of formalising agreements: providing information – on the next steps and responsibilities, on the willingness to support and the ability to assist in implementing these steps, and on the consequences of breaching the agreements; persuasion – regarding the importance of adhering to the decisions made, the unacceptability of breaching them, and highlighting the positive prospects should the agreed terms be upheld; **assessment** – evaluating the decisions made as beneficial to both parties and necessary for implementation; and assessing potential breaches as negative and unacceptable; justification – confirming the agreed course of action in accordance with current legislation and the agreements reached.

We consider the following CS to be unacceptable and unconstructive at this stage, as indeed in negotiations in general: a CS of domination ('after all, we have defeated you and won the argument'); a CS of confrontation ('who are you to contradict us?'); a CS of intimidation ("sign this, or things will get worse"). We consider the following forms of linguistic influence to be inappropriate: ordering the signing of agreements; coercing parties into signing; and manipulating information regarding the content of governing documents or the consequences of further actions.

The effectiveness of the CS employed at this stage – based on engagement, courtesy, empathy and the specification of next steps—can be seen in the agreements reached regarding the evacuation from Kostiantynivka. In the video report, we see a

willingness to listen to citizens' concerns, take their situation into account and acknowledge their emotions – without objections, without lecturing, and without attempting to 'correct' their views or their use of the Russian language [24].

Therefore, to successfully achieve the objectives of negotiations at the agreement stage (direct interaction and formalisation of decisions), it is advisable to employ strategies focused on building rapport, demonstrating respect for the interests and positions of the parties, confirming a willingness to cooperate, substantiating decisions with objective information, and upholding the law. Accordingly, among the types of linguistic influence, persuasion, information provision and justification are the most appropriate.

If, however, manipulation on the part of the other party is detected during the negotiation phase – in particular, the distortion of facts, ambiguous wording, false generalisations, or attempts to restrict the representatives of the National Guard of Ukraine in terms of time or options for resolving issues – a CS to neutralise manipulation should be applied, which at this stage is best implemented primarily through supporting CS such as cold politeness (emphasised formality), a CS to maintain control of the situation, and a CS to expose the manipulator; and if these tactics prove ineffective – the CS of terminating communication.

Conclusions and prospects for further research. An analysis of the objectives and principles of the National Guard of Ukraine's negotiations within the framework of civil-military cooperation has enabled us to identify and recommend linguistic and communicative factors which, depending on their characteristics, are capable of ensuring the effectiveness of negotiations at each of the identified stages.

We identify a communicative strategy of interaction as fundamental to all phases of CIMIC negotiations, since only by establishing genuine interaction can the objectives of professional activity be achieved, provided that other actors are involved.

Of the identified and recommended additional CS that specify the strategy of interaction at each stage of negotiations, the most effective are as follows: formulating negotiation objectives and positions;

building trust; politeness (in particular, cold politeness); clarification; building a positive image of the National Guard of Ukraine; analysing and discussing threats and challenges; establishing rules; focusing on the coordination of actions and decisions; support; constructive proposals; compliance with the law; problem-solving orientation; taking each other's interests into account; outlining prospects for cooperation; coordinating further actions and defining responsibilities.

Communication strategies involving intimidation, domination, confrontation, downplaying of threats, and avoidance of problem-solving are unacceptable, as they hinder cooperation and do not contribute to positive outcomes.

The main types of linguistic influence that contribute to the effectiveness of each stage of negotiations are: informing; forming assessments (of events, joint activities, proposed solutions); persuasion (using logical and psychological arguments); and justification (using indisputable facts and guiding documents).

We define manipulative (i.e. covert) influence as an unacceptable form of linguistic influence in negotiations; and orders as ineffective in communication with civilians. Coercion as a form of influence is permissible only in the event of a threat to state security, or to the life and health of civilians or military personnel.

Mastery of the proposed arsenal of linguistic and communicative factors for negotiation effectiveness will assist representatives of the National Guard of Ukraine, as well as other law enforcement agencies, in fulfilling their professional duties, and will contribute to enhancing the level of linguistic and communicative professional competence in conducting negotiations within the framework of civil-military cooperation. We define the prospect of this study as identifying the linguistic and communicative factors of effectiveness in other forms of professional communication by representatives of the National Guard of Ukraine within the framework of CIMIC.

References

1. Bielai S. V., Mynko V. O. (2019). *Etychni aspekty rozvytku systemy tsyvilno-viiskovoho*

spivrobitnytstva u formuvanniakh NHU [Ethical aspects of development of the civil-military cooperation system in NGU formations]. *Chest i zakon*, no. 4 (71), pp. 55–63 [in Ukrainian].

2. Busel V. T. (ed.) (2003). *Velykyi tlumachnyi slovnyk suchasnoi ukrainskoi movy* [Large explanatory dictionary of the modern Ukrainian language]. Kyiv; Irpin : Perun [in Ukrainian].

3. *Nakaz Komanduvacha Natsionalnoi hvardii Ukrainy "Pro zatverdzhennia Doktryny diialnosti Natsionalnoi hvardii Ukrainy" № 1097* [Order of the Commander of the National Guard of Ukraine "On approval of the Doctrine of Activity of the National Guard of Ukraine" activity no. 1097]. (2023, December 22). Kyiv : Holovne upravlinnia NHU [in Ukrainian].

4. *Nakaz Holovnokomanduvacha Zbroinykh Syl Ukrainy Pro zatverdzhennia Doktryny "Tsyvilno-viiskove spivrobitnytstvo" № 5138/NVHSh* [Order of the Commander-in-Chief of the Armed Forces of Ukraine on approval of the Doctrine "Civil-Military Cooperation" activity no. 5138/NVHSh]. (2025, October 4). Kyiv : Heneralnyi shtab ZSU [in Ukrainian].

5. *Nakaz Heneralnoho shtabu Zbroinykh Syl Ukrainy "Pro zatverdzhennia Kontseptsii rozvytku tsyvilno-viiskovoho spivrobitnytstva Zbroinykh Syl Ukrainy" № 411* [Order of the General Staff of the Armed Forces of Ukraine "On approval of the Concept of Development of Civil-Military Cooperation of the Armed Forces of Ukraine" activity no. 411]. (2016, November 8) [in Ukrainian].

6. Kutkov O. O. (2025). *Mekhanizmy derzhavnoho rehuliuвання tsyvilno-viiskovoho spivrobitnytstva v umovakh zminy voienno-politychnoi obstanovky* [Mechanisms of state regulation of civil-military cooperation under changes in the military-political situation]. (PhD thesis). Kharkiv : Natsionalnyi universytet tsyvilnoho zakhystu Ukrainy, p. 36 [in Ukrainian].

7. Mynko O. V. (2020). *Teoretyko-metodychni zasady formuvannia systemy CVS u formuvanniakh Natsionalnoi hvardii Ukrainy* [Theoretical and methodological principles of forming the CIMIC system in the formations of the National Guard of Ukraine]. *Chest i zakon*, no. 2 (73), pp. 74–82 [in Ukrainian].

8. Morokhovskiy M. L., Hryhorenko Ye. I., Kurtov A. I., Kurtov D. A. (2024). *Orhanizatsiino-pravovi zasady sluzhbovo-boiovoi diialnosti ta tsyvilno-viiskovoho spivrobitnytstva Natsionalnoi hvardii Ukrainy* [Organizational and legal principles of service-combat activity and civil-military cooperation of the National Guard of Ukraine]. *Yurydychnyi naukovyi elektronnyi zhurnal*, no. 10, pp. 544–546. DOI: <https://doi.org/10.32782/2524-0374/2024-10/127> [in Ukrainian].

9. Pelepeichenko L. M., Posmitna V. V. (2014). *Movnyi vplyv u viiskovomu dyskursi* [Linguistic influence in military discourse]. Kharkiv : NA NHU [in Ukrainian].

10. Posmitna V. V. (2023). *Movna komunikatsiia u profesiinii diialnosti* [Language communication in professional activity]. Kyiv : KI NHU [in Ukrainian].

11. Posmitna V. V. (2023). *Pidhotovka viiskovosluzhbovtiv NHU do komunikativnoi vzaємodii z media ta hromadskistiu v suchasnykh umovakh informatsiinoi viiny* [Training of NGU servicemen for communicative interaction with media and the public in modern conditions of information warfare]. Proceedings of the round table "Rol i mistse sotsialno-humanitarnykh ta pravovykh dysyplin v systemi pidhotovky viiskovosluzhbovtiv Natsionalnoi hvardii Ukrainy" (Kyiv, November 30, 2023). Kyiv : KI NHU, pp. 123–125 [in Ukrainian].

12. Posmitna V. V. (2025). *Priorytetnist kooperativnykh komunikativnykh stratehii ta osoblyvosti yikh movnoi realizatsii u profesiinii komunikatsii predstavnykiv sektoru bezpeky ta oborony* [Priority of cooperative communicative strategies and features of their linguistic implementation in professional communication of security and defense sector representatives]. *Vcheni zapysky Tavriiskoho natsionalnoho universytetu imeni V. I. Vernadskoho. Seriia: filolohiia. Sotsialni komunikatsii*, vol. 36 (75), no. 1, p. 2, pp. 185–189. DOI: <https://doi.org/10.32782/2710-4656/2025.1.2/29> [in Ukrainian].

13. *Zakon Ukrainy "Pro vnesennia zmin do deiakyykh zakoniv Ukrainy u sferi natsionalnoi bezpeky i oborony shchodo nadannia dopomohy na dohospitalnomu etapi ta zdiisnennia tsyvilno-*

viiskovoho spivrobitnytstva" № 4068-IX [Law of Ukraine on amendments to certain laws of Ukraine in the field of national security and defense regarding pre-hospital care and civil-military cooperation activity no. № 4068-IX]. (2024, 20 February). *Vidomosti Verkhovnoi Rady Ukrainy*, no. 17, art. 44 [in Ukrainian].

14. Puzyrov M. S., Romanyshyn V. M. (2025). *Teoretychni zasady stanovlennia y rozvytku tsyvilno-viiskovoho spivrobitnytstva* [Theoretical foundations of formation and development of civil-military cooperation]. *Bezpeka derzhavy*, no. 1 (5), pp. 115–120 [in Ukrainian].

15. Sytnyk H. P., Klymenko N. H. (2024). *Tsyvilno-viiskovi vidnosyny* [Civil-military relations]. Kyiv : Akadempres [in Ukrainian].

16. NATO CIMIC Centre of Excellence (CCOE) (2025). Case study: Ukraine – initial study (on CIMIC doctrine and practice in Ukraine). Retrieved from: <https://www.cimic-coe.org> (accessed 5 March 2026) [in English].

17. Fisher, R., Ury, W., Patton, B. (2011). *Getting to Yes: Negotiating Agreement Without Giving In*. Penguin Books [in English].

18. TSN (2023). *"Vyidu, koly nadumaiu": viiskovi vmovliaiut batkiv evakuuvaty ditei z-pid obstriliv* ["I will leave when I decide": the military persuades are urging parents to evacuate children from the shooting]. Retrieved from: <https://surl.li/msiszw> (accessed 5 March 2026) [in Ukrainian].

19. EspressoTV (2025). *Zaporizkyi napriamok palaie: KABy rf i misiia ofitseriv TsVS – detali sytuatsii na fronti* [The Zaporizhzhia direction is

burning: ussian glide bombs and the mission of CIMIC officers – details of the frontline situation]. Retrieved from: <https://surl.li/uuwsfx> (accessed 5 March 2026) [in Ukrainian].

20. Armiia – Media Ukrainskoho viiska (2023). *Persha struktura za standartom NATO. Yaki zavdannia u pidrozdiliv tsyvilno-viiskovoho spivrobitnytstva* [The first structure according to NATO standards. Tasks of civil-military cooperation units]. Retrieved from: <https://surl.li/mrhpiv> (accessed 5 March 2026) [in Ukrainian].

21. 5 Kanal (2025). *"Pokrovsk vyhlidaie hirshe, nizh ranishe": tsyvilni vidmovliaiutsia vid evakuatsii* ["Pokrovsk looks worse than before": civilians refuse evacuation]. Retrieved from: <https://surl.li/acrqmi> (accessed 5 March 2026) [in Ukrainian].

22. Zakhysnyky Nezalezhnosti (2025). *Sluzhba TsVS – sekretna "zbroia" ukrainskoi armii* [The CIMIC service – the "secret weapon" of the Ukrainian army]. Retrieved from: <https://surl.li/ijcrxf> (accessed 5 March 2026) [in Ukrainian].

23. Tsentrazumkova (2023). *Tsyvilno-viiskove spivrobitnytstvo u zakhysti naseleння pid chas viiny v Ukraini* [Civil-military cooperation in protecting the population during the war in Ukraine]. Kyiv. Retrieved from: <https://surl.li/mucsmv> (accessed 5 March 2026) [in Ukrainian].

24. Dailymotion (2025). *Ukraine Evacuates Kostiantynivka. Civilians Flee as Russian Forces Advance*. Retrieved from: <https://surl.li/nitxts> (accessed 6 March 2026) [in English].

Received / Стаття надійшла до редакції: 12.03.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 03.04.2026

Published / Опубліковано: 30.06.2026

ПОСМІТНА ВІКТОРІЯ ВІТАЛІЇВНА

*кандидат філологічних наук, доцент,
професор кафедри філології та військового перекладу,
Київський інститут Національної гвардії України
<https://orcid.org/0000-0001-8719-1767>*

БОРИСОВ НАЗАР МИХАЙЛОВИЧ

*здобувач вищої освіти,
Київський інститут Національної гвардії України
<https://orcid.org/0009-0005-9686-0498>*

ЦИВІЛЬНО-ВІЙСЬКОВЕ СПІВРОБІТНИЦТВО У ДІЯЛЬНОСТІ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ: МОВНОКОМУНІКАТИВНІ ЧИННИКИ РЕАЛІЗАЦІЇ ПРОФЕСІЙНИХ ЗАВДАНЬ У ПЕРЕГОВОРАХ

У дослідженні з'ясовано цілі та принципи переговорів у цивільно-військовому співробітництві Національної гвардії України в сучасних умовах, конкретизовано їх структуру.

Уперше запропоновано застосування конкретних комунікативних стратегій і видів мовного впливу як мовнокомунікативних чинників ефективності переговорів на кожному етапі переговорного процесу в межах цивільно-військового співробітництва, а також виокремлено недоцільні й неприпустимі комунікативні стратегії. Сформульовано та рекомендовано формули мовної реалізації визначених комунікативних стратегій. Основним чинником ефективності переговорів визначена комунікативна стратегія взаємодії.

Ключові слова: *цивільно-військове співробітництво; професійна комунікація; переговорний процес; комунікативні стратегії; види мовного впливу; реалізація військово-професійних завдань Національної гвардії України.*



ROSLIAKOV OLEKSII

*Adjunct of Doctoral and Postgraduate Studies,
National Academy of the National Guard of Ukraine
<https://orcid.org/0000-0001-9211-562X>*

METHOD FOR CALCULATING THE STABILITY OF DEFENSE OF NUCLEAR INSTALLATIONS BY UNITS OF THE NATIONAL GUARD OF UKRAINE

The article considers the problem of ensuring the stability of the defense of nuclear installations in the conditions of intensification of hostilities and limited resource capabilities of the units of the National Guard of Ukraine. The relevance of the study is due to the growth of military threats to critical infrastructure facilities, in particular nuclear power plants, and the need to quantitatively substantiate the sufficiency of forces and means for their defense.

The purpose of the article is to develop a method for calculating the stability of the defense of a nuclear installation by National Guard of Ukraine units, which determines the minimum sufficient defense resource to simultaneously achieve the directive established probability of successfully repelling the first enemy attack and ensuring the maintenance of defense until the given time of arrival of reinforcement forces.

The method for calculating the stability of the defense of a nuclear installation by National Guard of Ukraine units consists of a formalized procedure for determining the initial defense resource based on the balance distribution of forces and means of the military unit for the protection of an important state facility, the procedure for assessing the sufficiency of the resource according to probabilistic and time criteria, and determining the minimum sufficient defense resource.

The research used methods of system analysis, formalization of combat processes, probabilistic approach to assessing the first combat encounter and stochastic modeling of small-unit firefight. The method is implemented in the form of an algorithm that combines three partial models: a balance model for determining the defense resource, a probabilistic model for assessing the first attack repulsion and a model for determining the generalized defense holding time before losing combat capability. The resource sufficiency is checked according to two directive criteria – the minimum permissible probability of success of the first encounter and the required defense holding time.

The result of the work is a formalized method for calculating the defense stability of a nuclear installation, which provides integration of resource, probabilistic and time components into a single calculation procedure. The method allows you to determine the minimum sufficient defense resource or establish the fact of its shortage within the available reserves. The results obtained create a scientific and methodological basis for substantiating decisions on the required amount of defense reinforcement, redistribution of reserves, and determination of the boundary conditions for maintaining the combat capability of National Guard of Ukraine units while performing tasks for the defense of nuclear installations.

Keywords: *assessment method; nuclear installation; defense stability; defense resource; algorithm; important state facility; probability of repelling the first attack; defense holding time.*

Problem Statement. The armed aggression of the Russian Federation against Ukraine has created fundamentally new conditions for the operation of nuclear facilities, which have acquired the characteristics of objects of increased military and technological hazard. Nuclear installations (NIs), in particular nuclear power plants (NPPs), are now regarded by the adversary as potential targets for achieving military-political, psychological, and environmental effects. Civilian nuclear facilities – including the Chornobyl exclusion zone and the Zaporizhzhia NPP – have found themselves in combat zones, being subjected to shelling, air

strikes, and the risk of damage to critical infrastructure [1, 2]. This has significantly increased the requirements for organizing their protection and defense by units of the National Guard of Ukraine (NGU).

NGU units tasked with the protection of NIs operate under strict constraints in terms of personnel, armament, response time, and the ability to maneuver reserves. In the event of an armed attack on a nuclear facility, the key factor is not only the repulsion of the initial assault but also the units' ability to sustain the defense of the facility for a specified period until reinforcements arrive or

other defense forces are deployed. Thus, the main characteristic of NI defense is its resilience, i.e., the ability of defending units to maintain combat effectiveness and their capacity to accomplish assigned tasks under conditions of prolonged enemy fire and maneuver impact.

An analysis of the practice of organizing NPP defense and the corresponding scientific and methodological support [3] indicates a mismatch between the nature of modern threats and the existing approaches to the quantitative assessment of NGU units capabilities. This necessitates the development of a scientific and methodological framework for assessing the capabilities of NGU units, in particular through the development of a method for calculating the resilience of NI defense as a tool for verifying the sufficiency of NGU units' forces and means.

Analysis of Recent Research and Publications. Issues related to the protection of nuclear installations (NIs) and critical infrastructure (CI) in the context of armed conflicts have seen significant development in scientific publications since 2022. An analysis of these sources makes it possible to identify several main research directions [4-13] relevant to the resilience of NI defense.

The authors [4, 5] examine the legal, regulatory, and organizational frameworks for ensuring the physical protection of Ukraine's NIs under martial law. They analyze the transformation of NPP security regimes, the evolving role of security and defense sector forces, and changes in the regulatory framework governing the physical protection of nuclear facilities during 2022–2024. However, these works lack a quantitative framework for assessing the capabilities of units responsible for NI defense.

The article [6] proposes a threat model for Ukraine's critical infrastructure, taking into account military and hybrid influences. The study formalizes types of threats and their implementation scenarios, which is an important prerequisite for developing CI defense models. At the same time, the author does not proceed to assess the capabilities of specific defense forces to counter these threats and does not introduce indicators of the resilience of facility defense.

In the research [7], the concept of resilience in nuclear energy is examined from the perspective of the operational safety of NIs. The author formulates a conceptual definition of resilience and analyzes the factors that ensure it. However, the research focuses on engineering, technical, and organizational safety and does not account combat

operations as an influencing factor, which limits the applicability of the proposed approaches to the tasks of defending NIs by NGU units.

The authors [8] propose an engineering-based calculation approach to the protection of critical infrastructure from the effects of modern means of attack. They employ quantitative indicators of the resilience of protective structures; however, they do not consider the combat actions of defense units as a dynamic process involving losses and time constraints.

The paper [9] presents an optimization-based mathematical model of combat dynamics that combines Lanchester equations with dynamic programming, enabling the justification of reallocating combat resources and reserves among engagement areas to maximize enemy losses. At the same time, the model is of a generalized nature and does not account for the specific features of defending stationary critical facilities, in particular indicators related to maintaining the combat effectiveness of defense units over time.

In the study [10], the protection of critical infrastructure under conditions of modern armed conflicts is examined. The work is applied in nature and includes an analysis of real threats; however, it does not propose a formalized method for assessing defense resilience.

The authors [11, 12] propose mathematical models and an organizational-technical method for assessing the combat capabilities of military units. They introduce a system of quantitative indicators that take into account the level of armament, technical condition, personnel training, and available resources, as well as algorithms for managing the process of assessing combat capability. These approaches provide a theoretical foundation for forming the resource component of defense; however, they do not address the specifics of performing defense tasks for stationary facilities, nor do they consider the temporal aspect of sustaining defense.

In the study [13], an improved methodology for assessing the combat capabilities of artillery units is proposed, based on a system of quantitative indicators of the composition and technical condition of artillery assets. This methodology is suitable for evaluating the combat capabilities of units of a single branch of troops and does not provide for the integrated consideration of heterogeneous forces and means.

Thus, the analysis of scientific sources [4–13] has shown that modern research offers a well-developed framework for the quantitative assessment of unit combat capabilities and

mathematical modeling of combat. At the same time, existing works lack a comprehensive approach to assessing the resilience of critical infrastructure defense that would integrate unit resource capabilities, the probability of repelling an attack, and the temporal parameters of holding a facility within a single calculation procedure. This determines the need for further research aimed at assessing the capabilities of NGU units in defending nuclear installations.

The purpose of this article is to develop a method for calculating the defense resilience of nuclear installations by NGU units, which determines the minimum sufficient defense resources required to simultaneously achieve a directive-defined probability of successfully repelling the initial enemy attack and to ensure the sustained defense of the facility until the specified arrival time of reinforcement forces.

Presentation of the main material. Ensuring the resilient defense of nuclear installations by NGU units under conditions of armed aggression requires a formalized quantitative approach to assessing their capabilities. The practice of modern combat operations shows that even when the initial enemy attack is successfully repelled, the subsequent course of defense typically takes the form of prolonged fire engagement, associated with the gradual combat attrition of personnel, the limited simultaneous participation of forces in fire contacts, and the variable intensity of enemy combat impact [14, 15]. Under such conditions, the determining factor is not merely the presence of a unit in position, but its ability to maintain combat effectiveness over time and to ensure the accomplishment of the defense mission until the directive-established moment or until the arrival of Territorial Defense Forces (TDF) of the Armed Forces of Ukraine (AFU).

In this study, the resilience of NI defense is understood as the ability of defense forces, formed from NGU units with a defined set of defense resources, to ensure simultaneously the achievement of a directive-established minimum probability of successfully repelling the initial enemy attack and the preservation of combat effectiveness until the directive-specified arrival time of the TDF of the AFU. At the same time, the temporal characteristics of defense within the method are used in a generalized form to verify the sufficiency of resources according to the time criterion, without explicit detailing of the scenario structure of combat operations.

The basic component of the method is the defense resource of the unit (R), which is understood as a quantitatively defined volume of

forces and means formed from the actually available personnel and armament of the military unit responsible for the protection of critically important facilities, as well as the forces and means of reserves of the corresponding operational-territorial grouping (OTG), which can be directly employed or incrementally engaged to accomplish the task of defending a nuclear installation.

The algorithmic implementation of the method for calculating the resilience of NI defense by NGU units is presented in the form of a flowchart (Fig. 1).

At the first stage of the algorithm (blocks 1–4), the input data, constraints, and resource initialization are formed. In block 2 of the algorithm, the initial tactical situation is defined and a complete set of input data is established, including:

- the actual forces and means of the military unit responsible for the protection of critically important facilities;
- the parameters of the enemy battalion tactical group (BTG) (composition, strength, firepower capabilities, rate of advance, etc.);
- characteristics of the area of operations, weather conditions, etc.;
- directive values of the minimum probability of successfully repelling the enemy attack (P_{succ}^{est}) and the arrival time of the Territorial Defense Forces of the AFU (T_{TDF}), by which the defense must be ensured;
- the upper limit of the total defense resource (R_{max}), which corresponds to the maximum possible employment of available forces and means of the military unit responsible for facility protection and the accessible reserves of the respective OTA of the NGU.

In block 3 of the algorithm, the initial (actually available) resource R_{start} of the NI defense unit, provided by the military unit responsible for the protection of critically important facilities, is determined. This involves the use of a model for identifying the forces and means of the facility protection unit that can be allocated to the defense of the nuclear installation, based on a balanced distribution of available resources between mandatory functional tasks and defense tasks.

The initial resource R_{start} . The initial resource is defined as the maximum possible amount of personnel, weapons, and military equipment (WME) that can be allocated for conducting defense operations without violating the established security regime of the facility and the functioning of the command and control and support systems.

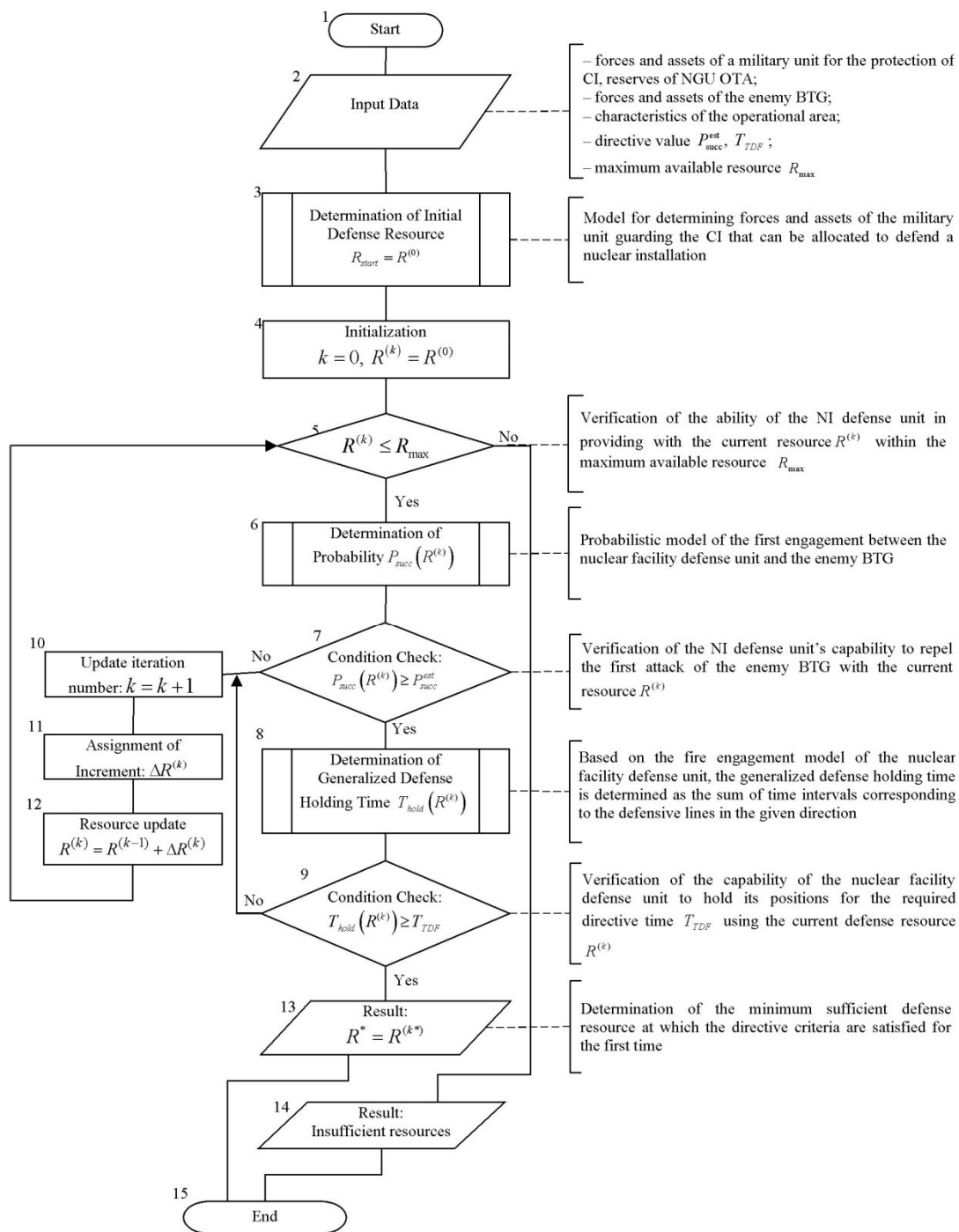


Figure 1 – Flowchart of the algorithm for the method of calculating the resilience of nuclear facility defense by units of the National Guard of Ukraine

Source: developed by the authors

The calculation R_{start} is carried out based on the balance principle as the difference between the total available forces and assets of the military unit and the portion allocated to the execution of mandatory functional tasks:

$$R_{start} = R_{total} - R_{funct}, \quad (1)$$

where R_{total} – the total available resources of the military unit (personnel and weapons and military equipment by specified categories);

R_{funct} – the resources engaged in performing object protection tasks (taking into account the required reinforcement and the assignment of additional objects under protection), as well as command and support functions.

The calculation is performed separately for each category of personnel and WME, followed by the formation of the aggregated defense resource. The obtained value serves as an input parameter for the subsequent assessment of defense resilience and determines the limiting capabilities of the nuclear facility defense unit at the initial stage of repelling an attack.

Next, in Block 4, the evaluation procedure is initialized for the first resource step $R^{(0)}$. The result of the first stage (Blocks 1–4) is a prepared set of initial data on the basis of which further assessment is carried out.

The second stage of the algorithm (Blocks 5–9) is intended to assess the capabilities of the nuclear facility defense unit at the current value of the defense resource $R^{(k)}$ at the k step of the evaluation procedure. In Block 5, a check is performed to determine whether the current resource $R^{(k)}$ can be ensured within the upper limit of the total resource R_{max} . If this condition is not satisfied $R^{(k)} > R_{max}$, further increase of the resource becomes impossible, and the algorithm proceeds to Block 14, where it terminates with the result “insufficient resources.” This reflects the inability to accomplish the combat mission of defending the nuclear facility with the available forces, assets, and reserves of military units within the respective territorial operational association of the National Guard of Ukraine.

If the admissibility condition is satisfied, in Block 6 the probability of repelling the first attack $P_{succ}(R^{(k)})$ at the current resource level $R^{(k)}$ is determined. This probability is calculated based on a probabilistic model of the first engagement

between the nuclear facility defense unit and BTG. The outcome of the first engagement is determined by the ratio of the combat capabilities of the opposing sides, as it is this ratio that defines the ability of the defense unit to disrupt the initial offensive and prevent the enemy from breaking through to the defended line. To provide a formalized description of this outcome, using the approach [16], the probability of successfully repelling the enemy’s first attack $P_{succ}(R^{(k)})$ is determined by the following expression:

$$P_{succ}(R^{(k)}) = \frac{B_{def} \cdot N_{pers}^{def}}{B_{def} \cdot N_{pers}^{def} + N_{pers}^{BTG}}, \quad (2)$$

where B_{def} – the combat superiority parameter of the first side (the nuclear facility defense unit from the military unit responsible for guarding a critical state facility) over the second side (the enemy BTG);

N_{pers}^{def} – the total number of personnel of the military unit responsible for guarding a critical state facility that can be allocated to the direct execution of the nuclear facility defense mission at the current resource level $R^{(k)}$;

N_{pers}^{BTG} – the total number of personnel of the enemy BTG.

The combat superiority parameter B_{def} of the nuclear facility defense unit is calculated as the product of three components according to the following expression:

$$B_{def} = R_{def} \cdot M_{def} \cdot K_{fort}, \quad (3)$$

where $R_{def} > 0$ – the technological superiority parameter of the first side over the second;

$M_{def} > 0$ – the moral superiority parameter of the first side over the second;

K_{fort} – the fortification influence coefficient (engineering preparation of positions – strongpoints and defensive lines – of the nuclear facility defense unit).

Next, a check is performed to verify whether the condition for repelling the first attack is satisfied (Block 7):

$$P_{succ}(R^{(k)}) \geq P_{succ}^{est}, \quad (4)$$

If the condition is not met $P_{succ}(R^{(k)}) < P_{succ}^{est}$,

the current resource $R^{(k)}$ is insufficient, and the nuclear facility defense unit is unable to accomplish the combat mission. In this case, the procedure proceeds to the third stage of the method – resource augmentation (Blocks 10–12) – followed by a return to Block 5 for repeated calculation.

If the probabilistic criterion is satisfied, in Block 8 the generalized time of defense holding $T_{hold}(R^{(k)})$ until the loss of combat capability at the current resource level $R^{(k)}$ is assessed. The value $T_{hold}(R^{(k)})$ characterizes the time interval during which the nuclear facility defense unit, given the specified integral resource $R^{(k)}$, maintains combat capability and the ability to perform defense tasks in the threatened direction, which is a necessary condition for implementing the task of deterring the enemy. Since the moment of loss of combat capability of the nuclear facility defense unit corresponds to the actual cessation of defense at the occupied line, based on the fire engagement model of the defense unit of NI, the generalized time of defense holding $T_{hold}(R^{(k)})$

at a given defense resource $R^{(k)}$ is determined as the sum of calendar time intervals corresponding to successive stages (defensive lines) of defense in the given direction, according to the following expression:

$$T_{hold}(R^{(k)}) = \sum_{i=1}^I t_i(R_i), \sum_{i=1}^I R_i \leq R^{(k)}, \quad (5)$$

where i – the number of the defensive line on a given threatened direction, within which the defense unit holds its positions until the loss of combat capability of the corresponding element of the battle formation;

I – the total number of defensive lines in the threatened direction;

R_i – the portion of the defense resource $R^{(k)}$ actually engaged in defending the i -th line, reflecting the composition and combat potential of the units operating at that line;

$t_i(R_i)$ – the time during which the element of the defense maintains combat capability at the i -th defensive line, determined using the fire engagement model of the nuclear facility defense unit, based on the stochastic framework for

modeling combat of small units and the corresponding evaluation methodology [17–19], taking into account the force composition, combat conditions, and parameters of fire confrontation characteristic for the given line:

$$t_i(R_i) = f\{R_i, k_i, k_{parti}, N_{cont}^{plat}, \lambda, \eta\}, \quad (6)$$

where k_i – the spatial (geometric) accessibility coefficient of the i -th zone;

k_{parti} – the participation coefficient of personnel in combat engagements;

N_{cont}^{plat} – the effective number of personnel involved in a fire contact;

λ – the intensity of fire engagements;

η – the baseline intensity of personnel losses of the defense unit during the active phase of fire confrontation.

All components of the defense resource $R^{(k)}$, including reinforcement units, reserves, air defense assets, unmanned systems, and other technical means, are accounted for indirectly in the generalized defense holding time through their influence on the parameters of the dynamic fire engagement model (fire engagement intensities, probabilities of detection and engagement, combat activity coefficients, etc.), which determine the value of t_i for each defensive line.

The specific scenario structure of the defense and combat operations (number of combat episodes, duration of pauses between them, variation in combat intensity) is formed during the practical application stage of the method and is considered separately.

Next, in Block 9, a verification is performed to assess the ability of the nuclear facility defense unit to hold the defense with the current resource $R^{(k)}$ until the directive arrival time of Territorial Defense Forces of the Armed Forces of Ukraine by satisfying the time condition:

$$T_{hold}(R^{(k)}) \geq T_{TDF}. \quad (7)$$

If the condition for repelling the first attack (4) is satisfied, but $T_{hold}(R^{(k)}) < T_{TDF}$, i.e., the defense holding time is insufficient, an increase in resources is required. In this case, the procedure proceeds to the third stage of the method – resource augmentation (Blocks 10–12).

If both criteria are satisfied, the current resource

$R^{(k)}$ is sufficient to ensure the accomplishment of the combat mission, and the algorithm proceeds to Block 13, where the result “sufficient resource” is recorded.

The second stage reflects the logic of the real decision-making cycle: first, the ability to withstand the enemy strike is assessed, and then the ability to hold positions over time. Thus, this stage implements a two-step feedback process based on probabilistic and temporal criteria, constrained by the reserve resources of the corresponding TOA of the NGU.

The third stage of the algorithm (Blocks 10–12) implements iterative augmentation of the defense resource. In Block 11, the resource increment step $\Delta R^{(k)}$ is specified (or refined), which determines the increase in the defense resource. The value of $\Delta R^{(k)}$ is set prior to the start of the evaluation procedure, taking into account the practical context of the task, and can be defined:

- at the level of the combat potential of a typical reinforcement unit (squad, platoon, company);
- as a fraction of the initial resource (typically 5-10%);
- as an equivalent increase in combat potential corresponding to a possible variant of reserve deployment.

Within the method, the notation $\Delta R^{(k)}$ may be used to reflect the possibility of adjusting the step size based on the results of directive criteria checks at previous steps. This flexibility does not change the overall logic of the method and allows, if necessary, for increasing or decreasing the resolution in the search for the minimally sufficient resource.

Next, in Block 12, the next value of the defense resource $R^{(k)}$ is formed. After this, the algorithm returns to Block 5 for a repeated check of resource sufficiency and fulfillment of the directive criteria.

The fourth stage of the algorithm (Blocks 13–14) is responsible for generating the results of the method – determining the minimally sufficient defense resource or recording a resource shortfall.

If, at some step $k = k^*$ both conditions are satisfied simultaneously for the first time:

$$\begin{cases} P_{succ}(R^{(k^*)}) \geq P_{succ}^{est} \\ T_{hold}(R^{(k^*)}) \geq T_{TDF} \end{cases}, \quad (8)$$

then, the current resource value $R^* = R^{(k^*)}$ is determined as the minimally sufficient defense

resource of the National Guard unit for accomplishing the nuclear facility defense mission.

It is important to emphasize that the value R^* is not the minimum of a pre-defined set of possible resource values $R^{(k)}$, since such a set is not explicitly specified in the method. Resource values $R^{(k)}$ are analyzed sequentially through stepwise augmentation, and the minimally sufficient resource is recognized as the value at which the directive criteria are first satisfied. Therefore, the method does not require the use of classical optimization procedures, the minimality of the result is ensured by the logic of sequential verification and the assumption of monotonicity of the dependencies of $P_{succ}(R^{(k)})$ and $T_{hold}(R^{(k)})$.

Thus, the method developed in the unit provides an integration of three partial models into a coherent procedure for determining the minimally sufficient defense resource, taking into account the directive requirements for the probability of success of the first engagement and the duration of defense holding.

Conclusions and prospects for further research. 1. The article develops a method for calculating the resilience of the defense of nuclear facilities by units of the National Guard of Ukraine, which ensures the determination of the minimally sufficient defense resource required to simultaneously meet directive requirements in terms of the probability of repelling the first attack and the duration of holding the defense.

2. The method is presented in the form of an algorithm that integrates three partial models: a balance model for determining resources, a probabilistic model of the first combat engagement, and a model for estimating the generalized duration of holding the defense based on a stochastic framework for modeling small-unit combat. This approach ensures the consistent consideration of the unit's resource capabilities, the force ratio between opposing sides, and the temporal parameters of defense within a unified calculation procedure.

3. A distinctive feature of the method is the use of a sequential resource sufficiency verification procedure, which makes it possible to determine the threshold level of forces and means required to achieve the specified criteria without employing classical optimization methods, thereby enhancing the practical applicability of the method for operational calculations.

The obtained results provide a scientific and

methodological basis for substantiating decisions regarding the required level of reinforcement of defense, the redistribution of reserves, and the determination of boundary conditions for maintaining the combat effectiveness of NGU units during the defense of nuclear facilities.

A promising direction for further research is the extension of the method by incorporating the dynamics of the phased commitment of reserves, as well as the development of a methodology for assessing the capabilities of NGU units in the defense of nuclear facilities.

References

1. Fedchenko V. (2023). Nuclear security during armed conflict: Lessons from Ukraine. SIPRI Research Policy Paper, no. 2303. Stockholm International Peace Research Institute. Retrieved from: <https://surl.li/sdqlha> (accessed 9 February 2026) [in English].
2. InfoAtom (2025). *Atakoiu rosiiskoho BPLA poshkodzheno novyi bezpechnyi konfainment ChAES: shcho vidbulosia i yaka reaktsiia Ukrainy i svitu* [A russian UAV attack damaged the new safe confinement of the Chernobyl NPP: What happened and what was the reaction of Ukraine and the world]. Retrieved from: <https://surl.li/ykddfo> (accessed 11 February 2026) [in Ukrainian].
3. Rosliakov O. V., Sukonko S. M. (2023). *Obgruntuvannia neobkhidnosti otsiniuvannia mozhyvostei chastyn Natsionalnoi hvardii Ukrainy shchodo oborony obektiv krytychnoi infrastruktury* [Justification for the need to assess the capabilities of units of the National Guard of Ukraine in defending critical infrastructure facilities]. *Chest i zakon*, no. 2 (85), pp. 45–50. DOI: <https://doi.org/10.33405/2078-7480/2023/2/85/282537> [in Ukrainian].
4. Matviichuk A. V. (2022). *Udoskonalennia zakonodavstva Ukrainy shchodo zakhystu atomnykh elektrostantsii v umovakh voiennoho stanu* [Improving Ukrainian legislation on the protection of nuclear power plants during martial law]. *Visnyk Kyivskoho natsionalnoho universytetu imeni Tarasa Shevchenka*, vol. 124, no. 5, pp. 66–71. DOI: <https://doi.org/10.17721/1728-2195/2022/5.124-11> [in Ukrainian].
5. Dimitriieva D. V., Pashchenko V. P., Melnyk A. I., Kuzmiak I. Ya., Turanskyi O. D., Valihun N. P. (2025). *Normatyvno-pravova baza fizychnoho zakhystu yadernykh ustanovok Ukrainy* [Improving Ukrainian legislation on the protection of nuclear power plants during martial law]. Regulatory and legal framework for the physical protection of nuclear facilities of Ukraine]. *Yaderna ta radiatsiina bezpeka*, no. 3 (107), pp. 30–45. DOI: [https://doi.org/10.32918/nrs.2025.3\(107\).03](https://doi.org/10.32918/nrs.2025.3(107).03) [in Ukrainian].
6. Melnyk D. S. (2024). *Creating a model of threats to Ukraine's national critical infrastructure as a basis for ensuring its security and resilience*. *Bulletin of Kharkiv National University of Internal Affairs*, vol. 104, no. 1 (part 1), pp. 237–250. DOI: <https://doi.org/10.32631/v.2024.1.20> [in Ukrainian].
7. Dybach O. M. (2024). *Resilience in nuclear energy: definition and conceptualization*. *Elektronic modeling*, vol. 46, no. 5, pp. 115–128. DOI: <https://doi.org/10.15407/emodel.46.05.115> [in Ukrainian].
8. Kotsiuruba V. I., Bilyk A. S., Bzot V. B., Dzeverin I. H. (2023). *Zakhyst obektiv krytychnoi infrastruktury Ukrainy vid priamykh vluchan raket za dopomohoiu pidzemnoho roztashuvannia* [Protection of critical infrastructure facilities of Ukraine from direct missile hits using underground location]. *Yaderna ta radiatsiina bezpeka*, no. 2 (98), pp. 69–79. DOI: [https://doi.org/10.32918/nrs.2023.2\(98\).07](https://doi.org/10.32918/nrs.2023.2(98).07) [in Ukrainian].
9. Fursenko O. K., Chernovol N. M. (2025). *Matematychni modeliuvannia boiovykh dii z mozhyvosti pererozpodilu boiovykh resursiv mizh diliankami zitknennia ta rozpodilu rezerviv* [Mathematical modeling of combat operations with the possibility of redistribution of combat resources between areas of conflict and distribution of reserves]. *Radioelektronika, informatyka, upravlinnia*, no. 1, pp. 63–74. DOI: <https://doi.org/10.15588/1607-3274-2025-1-6> [in Ukrainian].
10. Bibik T. V., Borzenkov V. V., Ostapenko I. A. (2025). *Zakhyshchenist yadernykh ustanovok ta zbroini konflikty: uroky Ukrainy* [Security of nuclear installations and armed conflicts: lessons from Ukraine]. *Yaderna ta radiatsiina bezpeka*, no. 1 (105), pp. 62–69. DOI: [https://doi.org/10.32918/nrs.2025.1\(105\).07](https://doi.org/10.32918/nrs.2025.1(105).07) [in Ukrainian].
11. Ivanets H. V., Horielyshev S. A., Ivanets M. H. (2024). *Formalizovana matematychna model otsiniuvannia boiezdatnosti viiskovykh pidrozdiliv* [Formalized mathematical model for assessing the combat capability of military units]. *Chest i zakon*, no. 2 (89), pp. 1–8. DOI: <https://doi.org/10.33405/2078-7480/2024/2/89/309190> [in Ukrainian].
12. Ivanets H. V., Horielyshev S. A., Ivanets M. H. (2024). *Orhanizatsiino-tekhnichnyi metod otsiniuvannia boiezdatnosti viiskovykh pidrozdiliv* [Organizational and technical method of assessing the combat capability of military units]. *Chest i*

zakon, no. 4 (91), pp. 1–11. DOI: <https://doi.org/10.33405/2078-7480/2024/4/91/324068> [in Ukrainian].

13. Naumenko I. V., Mokrotskyi M. Yu., Shostak R. S. (2024). *Udoskonalena metodyka otsiniuvannia boiovykh mozhlyvostei artylerii mekhanizovanoi bryhady* [Improved methodology for assessing the combat capabilities of artillery of a mechanized brigade]. *Viiskovo-tekhnichnyi zbirnyk*, no. 9, pp. 60–64. DOI: <https://doi.org/10.33577/2312-4458.29.2023.60-64> [in Ukrainian].

14. Poliakov V. Yu., Lehenchuk S. V. (2025). *Oboronnyi bii u suchasnykh umovakh: uroky rosiisko-ukrainskoi viiny* [Defensive battle in modern conditions: lessons of the Russian-Ukrainian war]. *Naukovyi visnyk Kyivskoho instytutu Natsionalnoi hvardii Ukrainy*, no. 2 (7), pp. 132–140. DOI: <https://doi.org/10.59226/2786-6920.2.2025.132-140> [in Ukrainian].

15. Kharun O., Demidchuk F., Chyzh O., Yalnytskyi O., Kushner I. (2025). *Pidvyshchennia zhyvuchosti i bezpeky pidrozdiliv, novi tendentsii z dosvidu rosiisko-ukrainskoi viiny* [Increasing the survivability and security of units, new trends from the experience of the russian-ukrainian war]. *Zbirnyk naukovykh prats Natsionalnoi akademii Derzhavnoi prykordonnoi sluzhby Ukrainy. Seriya: viiskovi nauky*, vol. 1 (98), pp. 70–80. DOI: <https://doi.org/10.32453/3.v98i1.1810> [in Ukrainian].

16. Fedorchuk A. V., Hluzdan O. P., Savchuk R. O. (2024). *Modeliuvannia boiovykh i spetsialnykh dii viiskovykh formuvan Derzhavnoi prykordonnoi sluzhby Ukrainy* [Modeling of combat and special

operations of military formations of the State Border Guard Service of Ukraine]. *Zbirnyk naukovykh prats Natsionalnoi akademii Derzhavnoi prykordonnoi sluzhby Ukrainy. Seriya: viiskovi ta tekhnichni nauky*, vol. 2 (95), pp. 107–118. DOI: <https://doi.org/10.32453/3.v95i2.1662> [in Ukrainian].

17. Horodnov V. P., Ovcharenko V. V., Sukonko S. M., Lisitsyn V. E. (2018). *Model otsiniuvannia vrazlyvosti systemy fizychnoho zakhystu yadernoi ustanovky vid napadu ozbroienykh zlochyntsiiv* [Model for assessing the vulnerability of the physical protection system of a nuclear installation against attack by armed criminals.]. *Chest i zakon*, no. 1 (64), pp. 17–24 [in Ukrainian].

18. Gorodnov V. P., Ovcharenko V. V., Sukonko S. M. (2019). *The tasks modeling for nuclear power plant active protection during counteraction of terrorist threat. Wschodnioeuropejskie Czasopismo Naukowe (East European Scientific Journal)*, vol. 50, no. 10, pp. 9–17 [in English].

Horodnov V. P., Sukonko S. M. (2018). *Metodyka otsiniuvannia vrazlyvosti systemy fizychnoho zakhystu yadernoi ustanovky vid napadu ozbroienykh zlochyntsiiv* [Methodology for assessing the vulnerability of the physical protection system of a nuclear installation against attack by armed criminals.]. *Chest i zakon*, no. 4 (67), pp. 38–46. DOI: <https://doi.org/10.33405/2078-7480/2018/4/67/156840> [in Ukrainian].

Стаття надійшла до редакції / Received: 25.03.2025

Прорецензовано та прийнято до друку / Reviewed and accepted for publication: 20.04.2026

Опубліковано / Published: 30.06.2026

РОСЛЯКОВ ОЛЕКСІЙ ВАСИЛЬОВИЧ

ад'юнкта,

Національна академія Національної гвардії України

<https://orcid.org/0000-0001-9211-562X>

МЕТОД РОЗРАХУНКУ СТІЙКОСТІ ОБОРОНИ ЯДЕРНИХ УСТАНОВОК ПІДРОЗДІЛАМИ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ

У статті розглянуто проблему забезпечення стійкості оборони ядерних установок в умовах інтенсифікації бойових дій та обмежених ресурсних можливостей підрозділів Національної гвардії України (НГУ). Актуальність дослідження зумовлена зростанням воєнних загроз об'єктам критичної інфраструктури, зокрема атомним електростанціям, та необхідністю кількісного обґрунтування достатності сил і засобів для їх оборони.

Метою статті є розроблення методу розрахунку стійкості оборони ядерної установи підрозділами НГУ, який визначає мінімально достатнього ресурсу оборони для одночасного

досягнення директивно встановленої ймовірності успішного відбиття першої атаки противника та забезпечення утримання оборони до заданого часу прибуття сил підсилення.

Метод розрахунку стійкості оборони ядерної установки підрозділами НГУ складається із формалізованої процедури визначення початкового ресурсу оборони на основі балансового розподілу сил і засобів військової частини з охорони важливого державного об'єкта, процедури оцінювання достатності ресурсу за ймовірнісним і часовим критеріями та визначення мінімально достатнього ресурсу оборони.

У межах дослідження використано методи системного аналізу, формалізації бойових процесів, ймовірнісного підходу оцінювання першого бойового зіткнення та стохастичного моделювання вогневого бою малих підрозділів. Метод реалізовано у вигляді алгоритму, що поєднує три часткові моделі: балансову модель визначення ресурсу оборони, ймовірнісну модель оцінювання відбиття першої атаки та модель визначення узагальненого часу утримання оборони до втрати боєздатності. Перевірка достатності ресурсу здійснюється за двома директивними критеріями – мінімально допустимою ймовірністю успіху першого зіткнення та необхідним часом утримання оборони.

Результатом роботи є формалізований метод розрахунку стійкості оборони ядерної установки, який забезпечує інтеграцію ресурсного, ймовірнісного та часових компонентів у єдину розрахункову процедуру. Метод дозволяє визначати мінімально достатній ресурс оборони або встановлювати факт його нестачі в межах наявних резервів. Отримані результати створюють науково-методичне підґрунтя для обґрунтування рішень щодо необхідної кількості підсилення оборони, перерозподілу резервів та визначення граничних умов збереження боєздатності підрозділів НГУ під час виконання завдань з оборони ядерних установок.

Ключові слова: метод оцінювання, ядерна установка, стійкість оборони, ресурс оборони, алгоритм, важливий державний об'єкт, ймовірність відбиття першої атаки, час утримання оборони.



FRANCHUK YURIY

*Researcher of the Research Laboratory
on Innovative Support for the Development
of Capabilities of the National Guard of Ukraine,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0009-0002-6748-177X>*



OKHRIMENKO OLEKSANDR

*Student
Institute of State Military Administration,
National Defence University of Ukraine
<https://orcid.org/0009-0000-9978-878X>*

METHODS OF PSYCHOLOGICAL ASSISTANCE AND PROFESSIONAL PSYCHOLOGICAL TRAINING OF NATIONAL GUARD OF UKRAINE SERVICEMEN UNDER THE THREAT OF FPV DRONE EMPLOYMENT

The article examines current issues of psychological assistance and professional psychological training of servicemen of the National Guard of Ukraine under the constant threat of FPV drone employment in modern combat operations. It has been established that the mass use of FPV drones in the Russian-Ukrainian war significantly affects not only combat tactics but also the moral and psychological state of military personnel. The main psychological factors of the negative impact of FPV drones have been identified, including the constant expectation of attack, a high level of uncertainty, the characteristic sound of drones, and information-psychological influence through the dissemination of combat footage involving unmanned systems.

The study analyzes the main psychological reactions of servicemen to the threat of FPV drone attacks, including anxiety, panic reactions, hypervigilance, emotional exhaustion, impaired concentration, and manifestations of combat stress. The necessity of developing a comprehensive system of psychological assistance and professional psychological training for National Guard personnel to operate under modern technological threats is substantiated.

The article characterizes the main areas of psychological support for servicemen, including psychoeducational activities, the development of psychological resilience, training in psychological self-regulation methods, group psychological support, psychological debriefing, and individual psychological counseling. Particular attention is paid to the use of modern methods of professional psychological training, including VR technologies, stress inoculation training, psychological obstacle courses, audio simulation of FPV drones, and scenario-based combat modeling.

A model of psychological readiness of servicemen to act under the threat of FPV drone employment is proposed, which includes cognitive, emotional-volitional, behavioral, socio-psychological, and professional-applied components. It is concluded that there is a need for further development of the system of professional psychological training for National Guard servicemen, taking into account modern trends in warfare and the large-scale use of unmanned systems.

Keywords: *military psychology; FPV drones; combat stress; psychological resilience; professional psychological training.*

Problem Statement. The ongoing war of aggression waged by Russia against Ukraine is characterized by the extensive employment of unmanned aerial systems, among which FPV (First Person View) drones occupy a particularly significant place. In the Russian-

Ukrainian war, FPV drones have become one of the most widespread and effective means of engaging enemy personnel, equipment, and infrastructure. For example, the effectiveness of enemy personnel engagement by such drones, compared to other means of destruction,



increased from 45 % in 2024 [1, p. 102] to 60 % in 2025 [2]. Their employment has significantly affected not only combat tactics but also the moral and psychological state of servicemembers.

FPV drones are characterized by high maneuverability, speed, surprise in employment, and their constant presence in the airspace. The latter factor significantly expands the areas where the presence of personnel becomes excessively dangerous and reduces the effectiveness of accomplishing the mission. A considerable psychological impact is caused by their distinctive acoustic signature, the difficulty of timely detection, the constant expectation of attack, and the widespread dissemination of video materials depicting the combat employment of FPV drones in the media space. As a result, servicemembers may experience increased anxiety, chronic stress, fear, hypervigilance, emotional exhaustion, and other adverse psycho-emotional conditions.

For servicemembers of the National Guard of Ukraine (hereinafter referred to as the NGU), particularly mobilized personnel performing service-combat missions in areas of active hostilities, the problem of psychological adaptation to the threat posed by FPV drones is of particular importance. An insufficient level of professional-psychological preparedness for such threats may adversely affect mission performance, decision-making, and the overall moral and psychological state of military units. Therefore, there is a need to study and implement modern methods of psychological support and professional-psychological training for NGU servicemembers operating under the constant threat of FPV drone employment.

Analysis of Recent Research and Publications. The issue of psychological support for servicemembers' activities under combat conditions has repeatedly been the subject of scholarly research conducted by Ukrainian scientists. The problems of psychological adaptation (readiness and resilience) of personnel to extreme conditions of professional activity have been studied by V. Aleshchenko, O. Blinov, V. Varenyk, M. Korolchuk, N. Lozinska, V. Moroz, S. Myronets, V. Osodlo, I. Prykhodko, O. Timchenko, and others [3–9].

Researchers emphasise that under conditions of a high level of danger, psychological resilience is one of the key factors in maintaining service members' combat capability. Certain aspects of the psychological impact of modern warfare technologies have been examined in studies devoted to information and psychological operations, combat stress, and the influence of unmanned systems on the psyche of servicemembers [5]. At the same time, the issue of psychological support for servicemembers specifically under the threat of FPV drone employment remains insufficiently explored.

Contemporary combat experience demonstrates the necessity of adapting the system of psychological support to new threats associated with the mass employment of FPV drones. This creates a need for the development of effective methods of professional-psychological training, psychological support during mission execution, and psychological assistance for military personnel [10].

The purpose of the article is to examine methods of psychological support and professional-psychological training for servicemembers of the National Guard of Ukraine under the threat of FPV drone employment. To achieve this purpose, the following objectives were defined: to analyze the psychological characteristics of the impact of FPV drones on servicemembers; to identify the main psychological manifestations of fear and combat stress; to characterize methods of psychological support for servicemembers; and to investigate the directions of professional-psychological training of personnel for operations under the threat of FPV drone employment.

Presentation of the main material. Modern FPV drones create not only a physical but also a significant psychological threat to personnel of military formations, including NGU units. It should be noted that the most common wartime phobias include “fear of mines,” “fear of snipers,” “fear of aircraft,” and “fear of tanks” [9, p. 9], while more recently a “fear of FPV drones” has emerged (Fig. 1).



a



b



c

Figure 1 – Examples of visualization of fear of being hit by an enemy FPV drone:
 a – panic fear of imminent death, which is accompanied by active chaotic actions, escape;
 b – fear, which is accompanied by stupor and the absence of any active actions before imminent death (loss of hope);
 c – fear, which prompts active resistance and the desire to survive

Source: developed by the authors based on data [11, 12]

Unlike traditional means of destruction, FPV drones are characterized by high mobility, the possibility of concealed employment, and a considerable degree of psychological uncertainty. Service members are often unable to detect the direction of an attack in a timely manner or accurately assess the level of danger, which creates a persistent sense of tension and anticipation of threat.

One of the key psychological factors is the distinctive sound of FPV drones, which many servicemembers associate with an immediate threat to life. As a result of prolonged exposure to combat conditions, a persistent anxiety response may develop even to similar auditory stimuli.

In addition, the dissemination of videos depicting the combat employment of FPV drones through social media and the broader information environment exerts a substantial negative impact. The latter constitutes a modern element of cognitive operations against an adversary aimed at demoralizing personnel [13; 14, p. 7].

The psychological consequences of the constant threat of FPV drone employment may include increased anxiety, fear and panic reactions, hypervigilance, sleep disturbances, emotional exhaustion, reduced concentration, impaired decision-making processes, and manifestations of combat stress.

In some cases, prolonged exposure to combat stress may lead to the development of post-traumatic stress disorder and psychological maladaptation.

Under such conditions, the system of psychological support for servicemembers becomes particularly important. One of its fundamental areas is psychoeducational work. Its purpose is to develop servicemembers' understanding of the mechanisms underlying fear and stress reactions. Personnel should be informed that fear in combat conditions is a natural protective response of the human organism and that emotional self-control can be achieved through appropriate training [15, pp. 164–186].

Psychoeducational work may include informing personnel about the psychological impact of FPV drones, explaining the physiological manifestations of stress, teaching methods of psychological self-regulation, and developing skills for behavioural control in extreme situations.

An important area is the development of psychological resilience among NGU servicemembers. For this purpose, specialized resilience training, self-control exercises, and psychological endurance training may be employed. One of the most effective approaches is the gradual

adaptation of servicemembers to combat-related stressors through training conducted under conditions that closely resemble real operational environments.

In this regard, within the NGU's Basic Combined Military Training program, one of the greatest areas of emphasis in recent years has been counter-drone training. At the initial stage, personnel are trained using innovative VR simulators (for example, "Dronobii"). At this stage, not only are marksmanship skills (drone engagement) developed, but also the ability to act effectively under conditions of intense stress. At the subsequent stage, servicemembers complete an anti-drone obstacle course at a training range, where real FPV drones carrying non-lethal payloads manoeuvre among buildings, trees, and trenches [16].

During professional-psychological training, it is advisable to employ audio simulations of FPV drone sounds, tactical exercises involving drone training, simulations of FPV drone attacks, training under conditions of sensory overload, and scenario-based modelling of combat situations [17–20]. The systematic implementation of such training contributes to the development of rapid-response skills and reduces emotional disorganisation among service members.

One important element of psychological support is training in psychological self-regulation. Under combat conditions, service members must be able to stabilise their psycho-emotional state rapidly. The principal methods of self-regulation include controlled breathing, muscle relaxation, attention-focusing techniques, internal self-control commands, and short-term anxiety reduction techniques. In particular, the use of breathing techniques helps reduce the physiological manifestations of panic, normalize heart rate, and improve behavioral control during dangerous situations.

Group psychological support is particularly important. A high level of unit cohesion, mutual support, and trust among servicemembers positively influences resilience to combat stress.

The unit commander plays an important role in maintaining personnel's morale and psychological well-being. At his or her level, the commander fosters psychological confidence among personnel, prevents the spread of panic, monitors the moral and psychological condition of servicemembers, and ensures the timely organization of psychological support.

An effective method of group work is psychological debriefing following combat

episodes involving FPV drone employment. During such activities, servicemembers have the opportunity to discuss their experiences, reduce emotional tension, and receive support.

In cases of pronounced psychological disturbances, individual psychological assistance is necessary. Its primary forms include psychological counseling, crisis intervention, psychological correction, emotional stabilization, and the prevention of post-traumatic stress disorders.

It should also be noted that the effectiveness of psychological support largely depends on the degree of integration of psychological support measures into the overall system of servicemember training. Such psychological training should be systematic, continuous, and as close as possible to the actual conditions of combat activity.

Under current conditions, it is advisable to continue implementing comprehensive professional-psychological training programs for NGU servicemembers, including the development of psychological resilience, behavioural training under high-risk conditions, enhancement of self-regulation skills, adaptation to emerging forms of warfare, and psychological support following combat missions [4; 7; 10].

Particular attention may also be paid to the development of a model of psychological readiness of NGU servicemembers and personnel of other military formations to counter threats associated with FPV drone employment. Psychological readiness for operations under the threat of FPV

drone employment should be considered a comprehensive system comprising interrelated cognitive, emotional, behavioural, and professional components.

The structure of the psychological readiness model may include:

1. Cognitive component (understanding the characteristics of FPV threats; knowledge of response algorithms; awareness of the mechanisms of fear and stress);
2. Emotional-volitional component (stress resilience; emotional control; the ability to operate effectively under dangerous conditions);
3. Behavioral component (automated response skills; speed of decision-making; survival skills);
4. Socio-psychological component (unit cohesion; mutual support; trust in the commander);
5. Professional-applied component (practical experience of operating under FPV threats; adaptation to combat-related stressors; integration of psychological and tactical training).

The effectiveness of servicemembers' psychological readiness may depend on the level of development of all the above-mentioned components and their adaptation to the realities of modern combat. The following section presents, in a generalized form, examples of possible psychological reactions of servicemembers to the threat of FPV drone employment and potential methods of correction (Table 2). These approaches will require further empirical validation in future research.

Table 2 – Psychological Reactions – Methods of Correction

Psychological reaction	Main manifestations	Methods of psychological correction
Anxiety	Constant expectation of attack, tension	Breathing techniques, psychoeducation, stress resilience training
Panic reactions	Chaotic actions, loss of control	Algorithmization of actions, scenario-based training, self-regulation
Hypervigilance	Suspicion, excessive environmental monitoring	Psychological recovery techniques, workload regulation
Emotional exhaustion	Apathy, decreased motivation	Psychological support, rest, debriefing
Impaired concentration	Errors during task performance	Cognitive training, concentration exercises
Fear of auditory stimuli	Reaction to UAV sound	Adaptation training, audio simulation
Combat stress	Sleep disturbance, maladaptation	Crisis counseling, psychological support

It should also be noted that one of the directions of professional-psychological training for service members is the use of virtual reality (VR) technologies. Modern VR systems make it possible to simulate combat environments with a high degree of realism without exposing service members to actual danger.

In the context of preparation for threats associated with FPV drone employment, VR technologies may be used for simulating FPV drone attacks, training behavior under time constraints, developing decision-making skills, adapting personnel to combat-related stressors, and fostering psychological resilience.

An important advantage of VR-based training is the ability to repeatedly rehearse hazardous scenarios while gradually increasing psychological stress. This facilitates the development of adaptive behavioural patterns and reduces the level of disorganised fear.

In addition, in our opinion, one effective approach to developing psychological resilience is stress inoculation training. Its essence lies in the gradual adaptation of servicemen to stress factors through controlled exposure to psychological stressors.

During preparation for FPV drone threats, it is advisable to employ the progressive intensification of training conditions, sensory loading, time constraints, tactical exercises conducted under psychological pressure, and the simulation of sudden FPV drone attacks. The primary objective of such training is to develop the ability to function effectively under high-stress, high-uncertainty conditions.

Another promising element of professional-psychological training is the implementation of a psychological obstacle course [16], which combines physical exertion, tactical elements, and psychological stressors. During the completion of such a course, the following may be employed: FPV drone sound simulators, explosive and visual effects, smoke-generating devices, rapid decision-making tasks, casualty evacuation drills, and activities conducted in confined spaces.

The primary purpose of a psychological obstacle course is to develop resilience to combat stress and enhance the ability to operate effectively under conditions of sensory overload. An example of comprehensive professional-psychological training may be a tactical-psychological exercise conducted by an NGU unit under simulated FPV threat conditions. The practical implementation of such training activities can enhance service members' psychological readiness, reduce the incidence of

panic reactions, and improve performance during actual FPV drone threats.

Conclusions and prospects for further research. Thus, the widespread employment of FPV drones in modern combat operations creates new psychological challenges for servicemen of the National Guard of Ukraine. The constant threat of attack, a high level of uncertainty, and the significant psycho-emotional impact of FPV drones may adversely affect the moral and psychological state of personnel and the effectiveness of service-combat mission accomplishment.

In this regard, the implementation of a comprehensive system of psychological support and professional-psychological training for service members is of particular importance. The most effective areas include psychoeducational activities, the development of psychological resilience, training under conditions approximating actual combat environments, instruction in self-regulation techniques, group psychological support, and individual psychological assistance.

Further research may focus on the development of specialized psychological training programs for NGU servicemen, both during Basic Combined Military Training and during education at higher military educational institutions, aimed at preparing personnel for operations in environments involving the employment of modern unmanned systems.

References

1. Oleksenko O. O., Huk O. M., Snitsarenko V. V., Ikaiev D. R., Rahulin V. V. (2024). *Shchodo osoblyvosti boiovoho zastosuvannia FPV-droniv u viini mizh rosiieiu ta Ukrainoiu* [On the peculiarities of combat use of FPV drones in the war between Russia and Ukraine]. *Naukovi pratsi Derzhavnoho nauково-doslidnoho instytutu vyprobuvan i sertyfikatsii ozbroiennia ta viiskovoi tekhniki*, vol. 4 (22), pp. 99–105. DOI: <https://doi.org/10.37701/dndivsovt.22.2024.12> [in Ukrainian].
2. RNBOU (2026). *Pidsumky oboronnoi promyslovosti Ukrainy u 2025 rotsi: drony FPV* [Results of Ukraine's defense industry in 2025: FPV drones]. Retrieved from: <https://surl.li/ogcmeye> (accessed 30 January 2026) [in Ukrainian].
3. Aleshchenko V. I. (2023). *Formuvannia psykholohichnoi hotovnosti viiskovosluzhbovtsiv do vedennia boiovykh dii* [Formation of psychological readiness of servicemen for combat operations]. *Visnyk Natsionalnoho universytetu oborony Ukrainy*, no. 4 (74), pp. 5–13. DOI: <https://doi.org/10.33099/2617-6858-23-74-4-5-13> [in Ukrainian].

4. Prykhodko I. I. (2019). *Psykhologichne zabezpechennia sluzhbovo-boiovoi diialnosti viiskovosluzhbovtiv Natsionalnoi hvardii Ukrainy* [Psychological support of service-combat activity of the National Guard of Ukraine servicemen]. Kharkiv: NA NHU [in Ukrainian].
5. Blinov O. A. (2019). *Boiova psykhična trauma* [Combat psychological trauma]. Kyiv: Talkom [in Ukrainian].
6. Osiodlo V. I. (2012). *Psykhologhiia profesiinoho stanovlennia ofitsera* [Psychology of professional development of an officer]. Kyiv: Zoloti Vorota [in Ukrainian].
7. Kolesnichenko O. S., Matsehora Ya. V., Prykhodko I. I., Timchenko O. V., Yurieva N. V., Horielyshev S. A. (2019). *Psykhologichna hotovnist do ryzyku viiskovosluzhbovtiv Natsionalnoi hvardii Ukrainy* [Psychological readiness for risk of the National Guard of Ukraine servicemen]. Kharkiv : NA NHU [in Ukrainian].
8. Klochkov V. (ed.) (2024). *Psykhologichne zabezpechennia Zbroinykh Syl Ukrainy* [Psychological support of the Armed Forces of Ukraine]. Kyiv : NDTs HP ZSU [in Ukrainian].
9. Kurchenko Ye., Moroz R., Tsukanova T. (2015). *Podolannia boiovoho stresu ta yoho psykholohichnykh naslidkiv* [Overcoming combat stress and its psychological consequences]. Mykolaiv. Retrieved from: <https://surl.li/bvyesci> (accessed 30 January 2026) [in Ukrainian].
10. *Nakaz Ministerstva vnutrishnikh sprav Ukrainy "Pro vnesennia zmin do Polozhennia pro psykholohichne zabezpechennia v Natsionalnii hvardii Ukrainy" № 616* [Order of the Ministry of Internal Affairs of Ukraine "On Amendments to the Regulations on Psychological Protection in the National Guard of Ukraine" activity no. 616]. (2024, September 9). Retrieved from: <https://surl.li/nrgffz> (accessed 30 January 2026) [in Ukrainian].
11. 414 Ptakhy Madiara (2026). *Zymova utylizatsiia: 414 Ptakhy Madiara znyshchuiut tekhniku y khrobakiv* [Winter disposal: 414 Magyar Birds destroy equipment and worms]. Retrieved from: <https://surl.li/nayodb> (accessed 30 January 2026) [in Ukrainian].
12. Madiar (2026). *Shobla tyzhnia, epizod 42. Vot taka vona, asvabaditelia put* [Weekly gang, episode 42. That's how the liberator's path looks]. Retrieved from: <https://surl.li/jzcgac> (accessed 30 January 2026) [in Ukrainian].
13. Koval V. V., Semenenko O. M., Kin O. V. (2025). *Kohnityvni operatsii ta viiny v suchasnomu bezpekovomu seredovyshchi: peredumovy, dynamika, naslidky* [Cognitive operations and wars in the modern security environment: prerequisites, dynamics, consequences]. *Military Strategy and Technology*, no. 2 (2), pp. 30–46. DOI: <https://doi.org/10.63978/3083-6476.2025.2.2.03> [in Ukrainian].
14. NATO (2021). *Cognitive warfare*. NATO Innovation Hub. Retrieved from: <https://surl.li/ndaces> (accessed 30 January 2026) [in English].
15. DM do STI 000H(B).22L (n. d.). *Psykhologichna pidhotovka (kurs individualnoi pidhotovky, kurs vyvchennia dii v skladi pidrozdilu)* [Psychological training (Individual training course, course of studying actions in a unit)]. Retrieved from: <https://surl.li/ybgode> (accessed 30 January 2026) [in Ukrainian].
16. Natsionalna hvardiia Ukpainy (2026). *BZVP: Boiova azbuka suchasnoi viiny* [Combat alphabet of modern war]. Retrieved from: <https://surl.li/bmmgqd> (accessed 30 January 2026) [in Ukrainian].
17. TEXTY.ORG.UA (2026). *Okopna viina v epokhu FPV-droniv: yak zakhystytysia vid atak bezpilotnykiv* [Trench warfare in the era of FPV drones: how to protect against UAV attacks]. Retrieved from: <https://surl.li/gtrgwl> (accessed 30 January 2026) [in Ukrainian].
18. *ArmiiaInform* (2025). *"Obkatka dronamy": yak zakhysnykiv hotuiut protystoiaty BPLA* ["Drone run-in": how defenders are trained to resist UAVs]. Retrieved from: <https://surl.li/muwnuq> (accessed 30 January 2026) [in Ukrainian].
19. BlueBird Tech (2026). *Yak skhovatys vid FPV-droniv: bazovi pryntsyipy bezpeky* [How to hide from FPV drones: basic safety principles]. Retrieved from: <https://surl.li/olkhru> (accessed 22 January 2026) [in Ukrainian].
20. Mezhyvskyi meridian (2025). *Yak vberehtysia vid atak FPV-droniv: diievi porady vid viiskovykh ta DSNS* [How to protect against FPV drone attacks: effective advice from the military and SES]. Retrieved from: <https://surl.li/nawqwk> (accessed 22 January 2026) [in Ukrainian].

Received / Стаття надійшла до редакції: 02.03.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 27.03.2026

Published / Опубліковано: 30.06.2026

ФРАНЧУК ЮРІЙ ВОЛОДИМИРОВИЧ

науковий співробітник науково-дослідної лабораторії
з питань інноваційного забезпечення розвитку спроможностей
Національної гвардії України,
Київський інститут Національної гвардії України
<https://orcid.org/0009-0002-6748-177X>

ОХРІМЕНКО ОЛЕКСАНДР ВІКТОРОВИЧ

слухач
Інституту державного військового управління,
Національний університет оборони України
<https://orcid.org/0009-0000-9978-878X>

МЕТОДИ ПСИХОЛОГІЧНОЇ ДОПОМОГИ ТА ПРОФЕСІЙНО-ПСИХОЛОГІЧНОЇ ПІДГОТОВКИ ВІЙСЬКОВОСЛУЖБОВЦІВ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ В УМОВАХ ЗАГРОЗИ ЗАСТОСУВАННЯ FPV-ДРОНІВ

Досліджено актуальні питання психологічної допомоги та професійно-психологічної підготовки військовослужбовців Національної гвардії України в умовах постійної загрози застосування FPV-дронів у сучасних бойових діях. Установлено, що їх масове використання у російсько-українській війні суттєво впливає не лише на тактику ведення бойових дій, але й на морально-психологічний стан особового складу. Визначено психологічні чинники негативного впливу FPV-дронів, серед яких постійне очікування атаки, високий рівень невизначеності, характерний звуковий супровід та інформаційно-психологічний вплив через поширення відеоматеріалів бойового застосування безпілотних систем.

Проаналізовано психологічні реакції військовослужбовців на загрозу застосування FPV-дронів, серед яких тривожність, панічні реакції, гіперпильність, емоційне виснаження, порушення концентрації уваги та прояви бойового стресу. Обґрунтовано необхідність формування комплексної системи психологічної допомоги та професійно-психологічної підготовки особового складу Національної гвардії України до дій в умовах сучасних технологічних загроз.

Охарактеризовано основні напрями психологічної допомоги військовослужбовцям, зокрема психоосвітню роботу, розвиток психологічної стійкості, навчання методів психологічної саморегуляції, групову психологічну підтримку, психологічний дебрифінг та індивідуальне психологічне консультування. Особливу увагу приділено використанню таких сучасних методів професійно-психологічної підготовки, як VR-технології, стрес-інокуляційні тренінги, психологічні смуги перешкод, аудіоімітація FPV-дронів та сценарне моделювання бойових ситуацій.

Запропоновано теоретичну модель психологічної готовності військовослужбовців до дій в умовах загрози застосування FPV-дронів, що охоплює когнітивний, емоційно-вольовий, поведінковий, соціально-психологічний та професійно-прикладний компоненти.

Ключові слова: військова психологія; FPV-дрони; бойовий стрес; психологічна стійкість; професійно-психологічна підготовка.



KHATSAIUK OLEKSANDR

*Honored Coach of Ukraine, Senior Officer, Military Service Section,
Eastern Kharkiv Territorial Directorate, National Guard of Ukraine (Unit 2240)
<https://orcid.org/0000-0002-4166-9099>*



ANATSKYI RUSLAN

*Senior Teacher Department of Physical Education, Special Physical Training and Sports,
Educational and Scientific institute for ensuring state security,
National Academy of the National Guard of Ukraine
<https://orcid.org/0000-0002-5662-9903>*



KRYVYCH VITALII

*Senior Lecturer at the Department of Physical Education,
Special Physical Training and Sports,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0009-0002-5154-625X>*

THEORETICAL AND METHODOLOGICAL ASPECTS OF USING MODERN TRAINING EQUIPMENT IN THE PHYSICAL TRAINING OF FUTURE OFFICERS OF THE NATIONAL GUARD OF UKRAINE

The article provides a scientific and theoretical substantiation and a methodological elaboration of the expediency and effectiveness of using modern training equipment in the system of physical and special physical training of future officers of the National Guard of Ukraine.

In the course of the research and analytical work, a set of complementary scientific methods adequate to the purpose and objectives of the study was employed, namely: analysis of scientific and methodological literature, synthesis and generalization, systems approach, structural-functional analysis, comparative analysis, classification and typology, and pedagogical modeling. In addition, the theoretical research incorporated the authors' practical experience in organizing systems of physical and special physical training for future officers and military personnel of various categories (age groups) within the institutions of the security and defense sector of Ukraine.

The main contradictions within the existing system of physical training of future officers were identified, and the necessity of a systematic integration of training equipment into the educational process of higher military educational institutions was substantiated.

An authorial classification of modern training equipment was proposed, taking into account its functional purpose, and a set of pedagogical conditions and methodological features for the effective use of training devices in physical and special physical training was defined. It was proven that the integration of modern training equipment enhances the professional-applied orientation, controllability, and safety of the training process, promotes the individualization of physical loads, contributes to the development of physical and psychophysiological qualities, and facilitates the formation of readiness of future officers to perform assigned tasks under extreme conditions of service and combat activity.

Keywords: *physical training tools; future military officers; educational process; training methodology; specialized physical training; technical training aids; exercise equipment; physical training; physical fitness components.*



Problem Statement. Modern conditions of service and combat activity of units of the National Guard of Ukraine are characterized by increased intensity of physical and psychophysiological loads, a multifactorial threat environment, the need for rapid decision-making, and the execution of assigned tasks under complex and often extreme conditions. Under such circumstances, the level of physical fitness of future officers becomes a determining factor as a foundation of their professional reliability and effectiveness.

At the same time, an analysis of current educational programs and the practice of physical training in higher military educational institutions of the National Guard of Ukraine indicates the persistence of predominantly traditional approaches to organizing the training process. These approaches do not fully take into account modern requirements for the professional activity of seekers of higher education and limit the possibilities for the targeted development of professionally significant physical qualities. In this context, the problem of the substantiated implementation of modern training equipment as an effective means of intensifying and individualizing the physical training of future officers of the National Guard of Ukraine becomes particularly relevant.

Despite the existence of a considerable number of scientific works devoted to general issues of physical education, physical training, and special physical training of military personnel, the problem of theoretical and methodological substantiation of the use of modern training equipment specifically in the training of future officers of the National Guard of Ukraine (NGU) remains insufficiently developed. In particular, there is a need to clarify the pedagogical potential of modern training tools, their place in the structure of physical and special physical training, as well as the principles of their selection and methodological application, taking into account the professional tasks of military personnel of relevant specializations.

Thus, an objective contradiction arises between the increasing requirements for the level of physical readiness of future officers of the NGU and the lack of a systematic approach to the use of modern training equipment in the process of their

physical training. Overcoming this contradiction necessitates a scientific and theoretical understanding and methodological substantiation of the feasibility and effectiveness of using modern training tools in the educational process of seekers of higher military educational institutions of the NGU.

The study was conducted within the framework of the initiative research project “Expanding the Arsenal of Physical Training Means for National Guard Personnel” (code “FP-TMSTE-NGU-01/26”), implemented with the direct participation of physical training specialists from the Kyiv Institute of the National Guard of Ukraine and the National Academy of the National Guard of Ukraine.

Analysis of recent research and publications.

An analysis of scientific publications devoted to the training of officer personnel for the needs of the security and defense sector of Ukraine, in particular the National Guard of Ukraine, indicates the presence of a number of problems that directly affect the quality of professional, including physical, readiness of future officers. In the works of researchers such as O. Markov, Yu. Samsonov, S. Borodin, V. Shemchuk, I. Atamanenko [1]; S. Romanchuk, V. Ozharevskyi, Ya. Pankevych, I. Kolinko, V. Pylypchak, O. Meleshchenko, R. Senyk [2]; O. Khatsaiuk, M. Medvid, B. Maksymchuk, O. Kurko (et al.) [3], it is emphasized that the transformation of the security environment, the increasing intensity of combat operations, and the expansion of the range of service and combat tasks necessitate a revision of traditional approaches to officer training.

One of the most pressing problems under current conditions is the inconsistency between the content of long-term training programs for future officers and the modern requirements of service and combat activity. Researchers such as R. Kizian, O. Khatsaiuk, O. Biriukov [4]; O. Khatsaiuk, A. Turchynov, D. Vaniuk, Ye. Yevtushenko, A. Bykovska, O. Mahula [5]; A. Plaksin, A. Kurbatov [6] note that the training of future officers in higher military educational institutions of the National Guard of Ukraine (NGU) often retains an academically oriented character, which limits the development of applied competencies

necessary for actions in complex, dynamic, and extreme conditions of service and combat activity. This, in turn, affects the level of professional preparedness of graduates.

A significant problem highlighted by researchers is the fragmented integration of physical training with other types of professional training. In a number of scientific works: Yu. Samsonov, O. Markov, O. Zabula, O. Khatsaiuk, Ye. Harbar et al. [7]; Yu. Samsonov, O. Khatsaiuk, O. Litvinov, V. Vyaskov, O. Smagin, S. Shabatura [8]; M. Medvid, O. Khatsaiuk, K. Sydorenko, S. Vorok, A. Kernas, M. Borovyk [9]), it is noted that physical training is often considered as an autonomous component of the educational process, without proper integration with tactical, firearms, pre-medical, and psychological training (the core components of military training of personnel). Such an approach reduces the effectiveness of forming key competencies, which may negatively affect the quality and efficiency of future officers' performance of assigned tasks.

A separate group of problems relates to limitations in the material and technical support of the educational process, in particular the insufficient level of equipment of higher military educational institutions of the security and defense sector with modern training devices. Studies by V. Bizin, D. Myrhorod, O. Khatsaiuk [10]; Ye. Zakharina, A. Zakharin, P. Martyn [11]; O. Khatsaiuk, S. Hirenko, D. Vaniuk, V. Volianskyi, K. Zadorozhnyi (et al.) [12]; M. Vasyliiev, O. Khatsaiuk, O. Repenko [13] emphasize that outdated or limited training infrastructure complicates the implementation of innovative physical training methods, does not allow full realization of the principles of individualization and differentiation of workloads, and constrains the use of applied, practice-oriented training programs.

Furthermore, scientific publications by researchers such as R. Liubchych [14]; O. Petrachkov, O. Yarmak [15]; D. Oleniev, V. Shemchuk, O. Korniienko, S. Zhembrovskyi [16]; and V. Shvets [17] emphasize the insufficient systematicity of monitoring and assessment of the level of physical fitness of future officers. The predominant use of norm-oriented physical

exercises (tests) does not always reflect the actual level of readiness of seekers to perform assigned tasks, including under extreme conditions. This complicates the process of adjusting training interventions and limits the possibilities for timely identification of functional reserves and risks of overload.

In the works of researchers such as V. Shemchuk, N. Verbyn, S. Kostiv, O. Shemchuk [18]; S. Lanovyi, O. Repenko, S. Lehenchuk, O. Shylo, S. Yelin (et al.) [19]; O. Khatsaiuk, A. Turchynov, O. Yareshchenko, M. Bak [20]; V. Ovcharenko, V. Klishyn, A. Makhobei, Yu. Belashov, A. Nikonenko [21], the problem of insufficient methodological preparedness of academic and teaching staff for the use of modern training technologies in physical training is highlighted. The absence of unified methodological guidelines and scientifically substantiated models for the implementation of training equipment leads to its episodic and unsystematic use, which, in turn, reduces the effectiveness of physical development among the studied category.

Summarizing the results of the analysis of scientific research, it is reasonable to state that the problems of training officer personnel for the needs of the National Guard of Ukraine are complex in nature and require a systematic solution. Of particular relevance is the scientific substantiation of ways to improve the physical training of future officers through the integration of modern training equipment into the educational process of higher military educational institutions, which determines the scientific focus of this study.

Thus, the generalization of scientific publications confirms the existence of a significant research gap regarding the theoretical and methodological support for the effective use of modern training equipment in the physical training of future officers. This substantiates the need for further research aimed at the scientific and theoretical justification and methodological elaboration of the feasibility and effectiveness of integrating modern training technologies into the system of physical training of future officers of the National Guard of Ukraine.

The purpose of the article is the scientific and theoretical justification and methodological elaboration of the feasibility and effectiveness of using modern training equipment in the physical training of future officers of the National Guard of Ukraine.

Presentation of the main material. In the course of the research and analytical work, the following research methods were employed:

1) analysis of scientific and methodological literature (applied for studying of modern approaches to the use of training equipment in the system of physical training of National Guard of Ukraine personnel);

2) synthesis and generalization (enabled the systematization of scientific provisions regarding the didactic and methodological potential of modern training equipment);

3) systems approach (ensured consideration of modern training equipment as a structural element of an integral system of physical and special physical training of future officers of the NGU);

4) structural and functional analysis (used to determine the functional purpose of training equipment in accordance with the professional tasks of future officers of the NGU);

5) comparative analysis (made it possible to compare traditional and innovative means of physical training in terms of their effectiveness and pedagogical feasibility);

6) classification and typology (applied to develop an authorial classification of modern training equipment in the physical and special physical training of the studied category of personnel).

The study was based on empirical data, in particular on the generalization of combat experience and the results of long-term training of officer personnel for the needs of the NGU, which increased its practical significance and relevance to current realities.

Based on the analysis of specialized (reference) scientific and methodological literature [1, 3, 12, 15, 21], the members of the research group identified the main contradictions within the existing system of physical training of future officers of the NGU, namely between:

1) the increasing requirements for the level of physical and special physical fitness of future

officers under modern conditions of service and combat activity and the predominance of traditional means and methods of physical training, which do not fully reflect the specifics of real military-professional workloads;

2) the availability of modern training equipment in higher military educational institutions of the NGU and the lack of a systematic theoretical and methodological substantiation for its targeted and focused use in the physical and special physical (combat) training of future officers;

3) the necessity of individualizing physical loads in accordance with the functional capabilities and specialization of seekers and the standardized nature of curricula and assessment norms, which limits the adaptive potential of physical (special physical) training;

4) the orientation of physical and special physical training toward the formal fulfillment of control standards and the need to develop professionally significant physical qualities and military-applied skills required for the effective performance of assigned tasks;

5) the potential of modern training and technical means to increase the intensity, safety, and variability of the physical (special physical) training process and the insufficient preparedness of academic and teaching staff of higher military educational institutions for their methodologically grounded application in the educational process of future officers;

6) the necessity of integrating the existing system of physical training of future officers of the NGU into Euro-Atlantic standards (NATO) and the limited implementation of innovative approaches and modern training technologies in the practice of higher military education.

In the course of further research and analytical work, particular attention was paid to scientific studies [3, 9, 10, 12] that reveal the essential characteristics of the concept of “training equipment.” It should be emphasized that, from a military-pedagogical perspective, modern training equipment is considered as a set of specialized technical, mechanical, and information-technological instructional tools designed for the purposeful formation, development, and improvement of physical and professionally significant qualities (military-applied skills) of

military personnel, as well as for modeling the conditions of their future service and combat activities within a safe, controlled, and pedagogically managed environment.

From the standpoint of the theory of physical and special physical training, training equipment acts as an integrated didactic tool that combines the functions of instruction, training, monitoring, and correction of physical fitness. Its use provides opportunities for the regulation and individualization of physical loads, increases the intensity and variability of the training process, and ensures a targeted impact on the development of military-applied skills and physical qualities required for the performance of assigned tasks under various conditions of service and combat activity, including extreme ones.

In the military-pedagogical dimension, training equipment also performs a modeling function, as it enables the reproduction of individual elements or the overall structure of motor activities, characterised for service and combat operations (movement with load, overcoming artificial and natural obstacles, force interaction, actions in confined spaces, application of physical force measures, etc.). This contributes not only to the development of physical qualities but also to the formation of motor skills, fatigue resistance, and the psychophysical readiness of future officers.

Thus, in the military-pedagogical context, modern training equipment should be regarded not as an auxiliary element of the material and technical base, but as a structural component of the system of physical and special physical training, ensuring the implementation of the principles of professional orientation, scientific validity, safety, and adaptability of the training process for the studied category of personnel.

It should be emphasized that the effective physical training of future officers requires particular attention to the systematic use of modern training equipment. Its diversity makes it possible to purposefully influence the development of basic physical qualities, military-applied skills, and professionally significant functional indicators. The presented classification table (Table 1) illustrates the main groups of training devices and tools, their examples, key physical and professional tasks, as well as their practical application in professional training.

In our opinion, such systematization makes it possible to structure the approach to planning the training process and to optimize the preparation of seekers of higher military educational institutions in accordance with the specific tasks of military service.

The proposed classification reflects the functional multidimensionality of modern training equipment and its alignment with the key objectives of military-professional training of future officers. Its application creates the preconditions for the systematic, purposeful, and methodologically grounded implementation of training devices in the physical and special physical training of representatives of the studied category.

Taking into account the results of the analysis of scientific and methodological literature [1, 3, 7, 12], it is appropriate to state that the effectiveness of using modern training equipment in the preparation of future officers is determined by a set of interrelated pedagogical and methodological conditions (Table 2).

The implementation of these conditions ensures the targeted development of physical and special physical fitness of military personnel of various categories, enhances the level of professional readiness, and increases resilience to extreme conditions of service and combat activity.

Table 1 – Classification of Modern Training Equipment for Seekers of Higher Military Educational Institutions

Equipment group	Training devices	Develops physical qualities (skills)	Applied significance
I. Strength equipment	Barbells, dumbbells, strength stations, cable (resistance) machines	Development of strength and muscular endurance, strengthening of all muscle groups	Preparation for carrying loads, overcoming artificial and natural obstacles, readiness to apply physical force measures (special combat techniques)
II. Functional training equipment	TRX, pilates stations, battle ropes, kettlebells, sandbags	Coordination (vestibular stability), explosive strength, muscle interaction (ligaments and tendons)	Preparation for tactical actions involving significant stimulation of the vestibular system and task execution under high psychophysiological stress
III. Special endurance equipment	Treadmills, stationary bicycles, rowing machines, ski simulators (and other cardio equipment)	Aerobic/anaerobic endurance, cardiovascular system development	Ability to perform tasks under fatigue (high psychophysiological load), forced marches (on foot and on skis)
IV. Plyometric equipment	Plyometric boxes, jump platforms	Speed, explosive strength, reaction speed	Jumping, rapid changes of direction, situational responsiveness, airborne operations using various methods
V. Specialized simulators	Combat simulators (VR/AR), tactical shooting simulators, simulators for practicing physical force application techniques, combat vehicle simulators	Simulation of combat conditions, psychophysical adaptation, development of applied military hand-to-hand combat techniques, combat vehicle operation	Preparation for real combat tasks, readiness to apply special combat techniques (physical force measures), development of practical skills in operating combat vehicles
VI. Real-time monitoring tools	Heart rate monitors, load sensors, video analysis systems (biomechanical analysis)	Assessment of physical condition, control of hand-to-hand combat techniques (and shooting with various weapons), development and improvement of vestibular stability	Monitoring servicemen's adaptation to psychophysiological stress under extreme operational conditions
VII. Vestibular and coordination equipment	Balance boards, step platforms	Vestibular stability, proprioception, movement coordination	Preparation for rapidly changing conditions of the "combat environment"
VIII. Rehabilitation equipment	Pulse/electrostimulation devices, recovery equipment	Recovery after injuries, prevention of chronic conditions	Maintenance of combat readiness, reduction of injury risk, restoration of body functions

Table 2 – Pedagogical conditions and methodological features of the use of modern training equipment in the system of physical (special physical) training of future officers

Dominant components (pedagogical conditions, methodological features)	Key requirements for training equipment (professional orientation)
1. Pedagogical conditions for the effective use of modern training equipment	
1.1. Professional orientation of the educational process	The use of modern training equipment should be subordinated to the formation of professional readiness of future officers, with a clear focus on service and combat tasks performed under conditions of increased physical and psycho-emotional stress (extreme conditions of service and combat activity).
1.2. Integration of training equipment into a holistic system of professional training	Training equipment should be organically integrated with the content of academic disciplines such as “Physical Education and Special Physical Training,” “Physical Education and Methodology of Physical Training,” and “Special Physical Training” (and other related disciplines), ensuring interdisciplinary unity and consistency in the development of professional competencies (military-applied skills).
1.3. Competency-based approach to training	The use of training equipment should be aimed not only at developing physical qualities but also at forming integrated competencies (functional, psychophysical, coordination, and tactical) necessary for the effective performance of assigned tasks under extreme service and combat conditions.
1.4. Individualization and differentiation of physical loads	The organization of the training process involves consideration of individual morphofunctional, psychophysiological, and level-specific characteristics of future officers, ensured through variability in modes and parameters of training equipment (including real-time monitoring tools).
1.5. Continuous pedagogical control and feedback	The effectiveness of modern training equipment depends on systematic monitoring of physical condition indicators, exercise technique, and training dynamics, enabling prompt adjustment of training interventions.
2. Methodological features of the effective use of modern training equipment	
2.1. Scientifically grounded selection of training equipment	The selection of training equipment should be based on its alignment with training objectives, functional purpose, level of complexity, and the specifics of the military-professional activities of future officers.
2.2. Gradual progression and variability in the use of training equipment	The methodology involves gradual increase in exercise complexity, variation of load regimes (static, dynamic, interval), and combination with traditional and applied means of physical (special physical) training.
2.3. Simulation of service and combat conditions	Training sessions should fully reproduce the spatial-temporal, tactical, and psycho-emotional conditions of real professional activity (working in full gear, under time constraints, in non-standard body positions, confined spaces, etc.).
2.4. Optimization of the structure of practical training sessions using modern equipment (real-time monitoring tools)	The use of training equipment (including real-time monitoring tools) should be methodically integrated into the structure of physical training sessions (introductory, main, and concluding parts), with clear regulation of load volume and intensity (well-defined algorithms for the use of modern technical training aids).
2.5. Use of digital technologies for monitoring and analysis	The application of heart rate monitoring, motion video analysis, biomechanical analysis, and software for load tracking increases the objectivity of evaluating the effectiveness of the physical training process.
2.6. Ensuring safety and injury prevention	The methodology for using modern training equipment should include regulated requirements for exercise technique, spotting, recovery measures, and gradual adaptation to physical loads.

In the course of further research, members of the research group have established that the integration of modern training equipment into the comprehensive system of physical training of future officers is objectively determined by contemporary requirements for the professional activity of military personnel and the transformation of the educational process in higher military educational institutions [6, 9, 12, 13]. This approach ensures increased effectiveness, manageability, and professional orientation of physical training for representatives of the studied category.

In our view, the main advantages of integrating modern training equipment into the comprehensive system of physical training of future officers of the NGU are as follows:

1) enhancement of the professional-applied orientation of training (training equipment enables the targeted modeling of motor activities characteristic of service and combat tasks, such as movement in full gear, force interaction, obstacle overcoming, and actions in confined spaces. This ensures the development of physical qualities and motor skills (military-applied skills) in direct connection with the future military-professional activity of the officer);

2) optimization of training process management (the use of modern training equipment ensures precise regulation of the volume and intensity of physical loads, monitoring of exercise performance parameters, and the possibility of operational adjustment of training interventions. This increases the scientific validity and manageability of the physical training process for representatives of the studied category);

3) individualization and differentiation of physical training (the integration of training equipment creates conditions for adapting training programs to the individual morphofunctional, psychophysiological, and level-specific characteristics of seekers in higher military educational institutions, which is especially important given differing initial levels of physical fitness);

4) comprehensive development of physical and psychophysiological qualities of future officers and military personnel (modern training equipment

ensures a simultaneous impact on strength, speed-strength, coordination, and endurance components of physical fitness, and also promotes the development of fatigue resistance, attention, decision-making speed, and psycho-emotional stability);

5) improved safety and reduced injury risk (training equipment allows for practicing complex motor actions and elements of professional activity in controlled and safe conditions, reducing the risk of injury and facilitating gradual adaptation of military personnel to high loads);

6) optimization of time required to master physical exercises and applied movements (integration of modern training equipment into the structure of physical training sessions increases motor density, optimizes the use of training time, and enables the simultaneous development of several physical qualities within a single training cycle);

7) increased motivation and learning activity of future officers (the use of modern training technologies, especially those incorporating digital monitoring and feedback (real-time information tools), enhances engagement, fosters a conscious attitude toward physical training, and promotes the development of self-control and self-discipline);

8) compliance with modern educational and defense standards (the integration of training equipment ensures that the physical training system aligns with current requirements of higher military education, professional training standards, and the competency-based approach, which is essential for the preparation of future officers of the NGU).

Thus, the integration of modern training equipment into the comprehensive system of physical training of future officers will ensure the integrity, professional orientation, and manageability of the educational and training process, contribute to improvement of the level of physical and special physical preparedness, and develop readiness to perform assigned tasks under extreme conditions of service and combat activity.

Conclusions and prospects for further research.

1. In the course of the theoretical and analytical study, it has been established that modern conditions of service and combat activity of units

of the National Guard of Ukraine determine increased requirements for the level of physical and special physical preparedness of future officers. Physical training acquires the status of a fundamental component of professional readiness, directly influencing the effectiveness of task performance in complex and extreme conditions.

2. The analysis of scientific and methodological literature within the selected research domain has revealed a number of systemic contradictions, in particular between modern requirements of service and combat activity and the predominance of traditional means and methods of physical training, as well as between the existing potential of modern training equipment and the lack of a comprehensive theoretical and methodological approach to its purposeful application.

3. The military-pedagogical essence of the concept of “modern training equipment” has been clarified, it is advisable to consider it as an integrated didactic tool that combines instructional, training, simulation, monitoring, and corrective functions, and ensures the development of physical qualities, military-applied skills, and psychophysical readiness of future officers within a pedagogically controlled environment.

4. The expediency of the systematic use of modern training equipment as a structural component of physical and special physical training has been substantiated. This approach makes it possible to implement the principles of professional orientation, individualization, safety, adaptability, and scientific validity of the educational and training process in higher military educational institutions.

5. A classification of modern training equipment has been developed and presented, reflecting its functional multidimensionality and applied orientation in accordance with the tasks of military-professional activity. The proposed systematization creates the preconditions for rational planning of the educational and training process, optimization of the structure of practical classes (training sessions), and the targeted development of physical and psychophysiological qualities of seekers of higher military educational institutions of the National Guard of Ukraine.

6. A set of pedagogical conditions and methodological features for the effective use of modern training equipment has been identified. The dominant ones include the professional orientation of the educational process, integration of training equipment into the system of combat training, a competency-based approach, individualization of loads, continuous pedagogical control, and the use of digital technologies for analysis and feedback.

7. It has been proven that the integration of modern training equipment into the comprehensive system of physical (special physical) training will enhance the manageability and effectiveness of the educational and training process, contribute to the comprehensive development of physical and psychophysiological qualities, reduce the risk of injuries, increase the motivation of higher military education seekers, and optimize the time required to master military-applied skills.

8. The generalization of the research results makes it possible to state that the systematic implementation of modern training equipment in the physical and special physical training of future officers of the National Guard of Ukraine complies with contemporary educational and defense standards, is scientifically substantiated, and represents a promising direction for improving the training of officer personnel for the needs of the National Guard of Ukraine.

An important direction for further research is the development of differentiated criteria and indicators for assessing physical preparedness using real-time monitoring tools, as well as determining optimal modes of cardio training loads, taking into account professional specialization, stages of training, and the functional state of military personnel. The implementation of these tasks will contribute to enhancing the scientific validity of the regulatory framework, the effectiveness of physical training, and the readiness of future officers of the National Guard of Ukraine to perform assigned tasks under complex (extreme) conditions of service and combat activity.

References

1. Markov O. V., Samsonov Yu. V., Borodin S. V., Shemchuk V. A., Atamanenko I. O. (2021). *Formuvannia profesiynykh kompetentnostei maibutnikh ofitseriv riznykh instytutstii sektoru bezpeky i oborony Ukrainy v systemi vohnevoi pidhotovky iz vykorystanniam suchasnykh tekhnichnykh zasobiv navchannia* [Formation of professional competencies of future officers of various institutions of the security and defense sector of Ukraine in the system of fire training using modern technical training tools]. *Innovatsiina pedahohika*, no. 32 (2), pp. 60–74 [in Ukrainian].
2. Romanchuk S., Ozharevskyi V., Pankevych Ya., Kolinko I., Pylypchak V., Meleshenko O., Senyk R. (2024). *Fizychna pidhotovlenist – yak skladova uspishnoho vykonannia zavdan za pryznachenniam (na prykladi fakhivtsiv inzhenernykh viisk)* [Physical fitness – as a component of successful performance of assigned tasks (on the example of specialists of the engineering troops)]. *Naukovyi chasopys Ukrainskoho derzhavnoho universytetu imeni Mykhaila Drahomanova. Serii: nauko-pedahohichni problemy fizychnoi kultury (fizychna kultura i sport)*, no. 7 (180), pp. 147–154. DOI: <https://spppc.com.ua/index.php/journal/article/view/2039> [in Ukrainian].
3. Khatsaiuk O., Medvid M., Maksymchuk B., Kurok O., Dziuba P., Tiurina V., Chervonyi P., Yevdokimova O., Levko M., Demchenko I., Maliar N., Maliar E., Maksymchuk I. (2021). Preparing Future Officers for Performing Assigned Tasks through Special Physical Training. *Revista Romaneasca pentru Educatie Multidimensionala*, no. 13 (2), pp. 457–475. DOI: <https://doi.org/10.18662/%20r-rem/13.2/431> [in English].
4. Kizian R. V., Khatsaiuk O. V., Biriukov O. I. (2023). *Aprobatsiia orhanizatsiino-pedahohichnykh umov formuvannia navychok strilby z avtomatychnoi striletskoi zbroi maibutnikh ofitseriv NGU* [Testing of organizational and pedagogical conditions for the formation of automatic small arms shooting skills of future NGU officers]. *Naukovyi visnyk Kyivskoho instytutu Natsionalnoi hvardii Ukrainy*, no. 2, pp. 31–39. DOI: <https://doi.org/10.59226/2786-6920.2.2023.31-39> [in Ukrainian].
5. Khatsaiuk O. V., Turchynov A. V., Vaniuk D. V., Yevtushenko Ye. H., Bykovska A. M., Mahula O. S. (2023). *Vprovadzhennia binarnykh zaniat u systemu spetsialnoi fizychnoi pidhotovky maibutnikh ofitseriv-pravookhorontsiv* [Implementation of binary classes in the system of special physical training of future law enforcement officers]. *Naukovyi chasopys Ukrainskoho derzhavnoho universytetu imeni Mykhaila Drahomanova. Serii: nauko-pedahohichni problemy fizychnoi kultury (fizychna kultura i sport)*, no. 1 (159), pp. 136–142. DOI: [https://doi.org/10.31392/NPU-nc.series15.2023.1\(159\).33](https://doi.org/10.31392/NPU-nc.series15.2023.1(159).33) [in Ukrainian].
6. Plaksin A. A., Kurbatov A. A. (2023). *Posylennia praktychnoi skladovoi zmistu pidhotovky maibutnikh ofitseriv u VZVO dlia vedennia boiovykh dii* [Strengthening the practical component of the training content of future officers in higher military educational institutions for conducting combat operations]. *Naukovyi chasopys Ukrainskoho derzhavnoho universytetu imeni Mykhaila Drahomanova. Serii: pedahohichni nauky*, no. 105, pp. 104–110. DOI: <https://doi.org/10.31392/UDU-nc.series5.2025.105.19> [in Ukrainian].
7. Samsonov Yu. V., Markov O. V., Zabula O. Ye., Khatsaiuk O. V., Harbar Ye. O., Mehmet T. M., Zadorozhnyi K. A., Povar O. V. (2023). *Aprobatsiia pedahohichnykh umov formuvannia hotovnosti maibutnikh ofitseriv NHU do zastosuvannia PTRK "JAVELIN" iz aktsentovanykh vykorystanniam zasobiv SFP* [Approbation of pedagogical conditions for the formation of readiness of future NGU officers to use the JAVELIN ATGM with an emphasis on the use of special physical training means]. *Naukovyi chasopys Natsionalnoho pedahohichnoho universytetu imeni M. P. Drahomanova. Serii: nauko-pedahohichni problemy fizychnoi kultury (fizychna kultura i sport)*, no. 3 (161), pp. 136–141. DOI: <https://spppc.com.ua/index.php/journal/article/view/1141> [in Ukrainian].
8. Samsonov Yu. V., Khatsaiuk O. V., Litvinov O. V., Viaskov V. M., Smahin O. I., Shabatura S. O. (2023). *Zmistovo-funktsionalna model formuvannia viiskovo-prykladnykh navychok strilby z avtomatychnoi striletskoi zbroi*

maibutnikh ofitseriv Natsionalnoi hvardii Ukrainy [Content-functional model of forming military-applied skills of firing automatic small arms in future officers of the National Guard of Ukraine]. *Naukovyi chasopys Natsionalnoho pedahohichnoho universytetu imeni M. P. Drahomanova. Serii: nauково-pedahohichni problemy fizychnoi kultury (fizychna kultura i sport)*, no. 11 (171), pp. 162–168. DOI: <https://spppc.com.ua/index.php/journal/article/view/1568> [in Ukrainian].

9. Medvid M., Khatsaiuk O., Sydorchenko K., Vorok S., Kernas A., Borovyk M. (2024). Sports Pedagogy: Readiness of Cadets to Apply Physical Action in Different Conditions of Service Activity. *RREM*, no. 16 (2), pp. 336–355. DOI: <https://doi.org/10.18662/rrem/16.2/860> [in English].

10. Bizin V. P., Myrhorod D. A., Khatsaiuk O. V. (2021). Technical means of teaching motor actions. Berlin, pp. 36–42.

11. Zakharina Ye., Zakharina A., Martyn P. (2022). *Zmistovi aspekty profesiino-prykladnoi fizychnoi pidhotovky maibutnikh pravookhorontsiv zasobamy ozdorovchoho fitnesu* [Content aspects of professional-applied physical training of future law enforcement officers by means of health-oriented fitness]. *Naukovyi chasopys Ukrainskoho derzhavnoho universytetu imeni Mykhaila Drahomanova. Serii: pedahohichni nauky*, no. 2 (146), pp. 39–43. DOI: <https://spppc.com.ua/index.php/journal/article/view/693> [in Ukrainian].

12. Khatsaiuk O. V., Hirenko S. P., Vaniuk D. V., Volianskyi V. H., Zadorozhnyi K. A., Lazorenko S. S., Deliamba M. M. (2022). *Vprovadzhennia suchasnykh tekhnichnykh zasobiv navchannia v systemu SFP maibutnikh ofitseriv* [Implementation of modern technical teaching aids in the system of special physical training of future officers]. *Naukovyi chasopys Natsionalnoho pedahohichnoho universytetu imeni M. P. Drahomanova. Serii: nauково-pedahohichni problemy fizychnoi kultury (fizychna kultura i sport)*, no. 8 (153), pp. 104–109. DOI: <https://spppc.com.ua/index.php/journal/article/view/889> [in Ukrainian].

13. Vasyliiev M., Khatsaiuk O., Repenko O. (2025). *Intehratsiia suchasnykh tekhnolohii u protses planuvannia boiovykh operatsii* [Integration of modern technologies into the process of planning combat operations]. *Naukovyi*

visnyk Kyivskoho instytutu Natsionalnoi hvardii Ukrainy, no. 1, pp. 61–71. DOI: <https://doi.org/10.59226/2786-6920.1.2025.61-71>. [in Ukrainian].

14. Liubchych R. I. (2020). *Tekhnolohiia formuvannia profesiinoi kompetentnosti maibutnikh ofitseriv Natsionalnoi hvardii Ukrainy u protsesi fizychnoi pidhotovky* [Technology for forming professional competence of future officers of the National Guard of Ukraine in the process of physical training]. *Innovatsiina pedahohika*, no. 25 (2), pp. 115–116 [in Ukrainian].

15. Petrachkov O., Yarmak O. (2023). *Poslidovnist prymannia upravlinskykh rishen shchodo orhanizatsii fizychnoi pidhotovky ofitseriv* [Sequence of managerial decision-making regarding the organization of officers' physical training]. *Naukovyi chasopys Ukrainskoho derzhavnoho universytetu imeni Mykhaila Drahomanova. Serii: pedahohichni nauky*, no. 11 (171), pp. 147–151. DOI: <https://spppc.com.ua/index.php/journal/article/view/1565>. [in Ukrainian].

16. Oleniev D., Shemchuk V., Korniienko O., Zhembrovskiy S. (2023). *Orhanizatorska diialnist fakhivtsia z fizychnoi pidhotovky i sportu* [Organizational activities of a specialist in physical training and sports]. Kyiv : Nationalnyi universytet oborony Ukrainy [in Ukrainian].

17. Shvets V. (2025). *Orhanizatsiino-psykholohichni chynnyky efektyvnosti roboty instruktoriv z fizychnoi pidhotovky orhaniv vnutrishnikh sprav* [Organizational and psychological factors of the effectiveness of physical training instructors in internal affairs bodies]. *Naukovyi chasopys Ukrainskoho derzhavnoho universytetu imeni Mykhaila Drahomanova. Serii: pedahohichni nauky*, no. 11 (198), pp. 232–237. DOI: <https://doi.org/10.31392/UDU-nc.series15.2025.11> (19-8).47 [in Ukrainian].

18. Shemchuk V. A., Verbyn N. B., Shemchuk O. M. (2023). *Model rozvytku diagnostychnoi kompetentnosti vykladachiv vyshchykh viiskovykh navchalnykh zakladiv u protsesi osvithno-naukovoï pidhotovky u khodi rosiisko-ukrainskoi viiny* [Model of development of diagnostic competence of higher military

education instructors in the process of educational and scientific training during the russian-Ukrainian war]. *Innovatsiina pedahohika*, no. 62, pp. 162–168. DOI: <https://doi.org/10.32782/2663-6085/2023/61.2.50> [in Ukrainian].

19. Lanovyi S. V., Repenko O. M., Lehenchuk S. V., Shylo O. M., Yelin S. M., Bovsuniivskyi I. M. (2024). *Osobystisnyi rozvytok pochatkuiuchykh vykladachiv VVNZ instytuttsii sektoru bezpeky i oborony Ukrainy iz aktsentovanykh vykorystanniam zasobiv spetsialnoi fizychnoi pidhotovky* [Personal development of novice higher military education instructors of institutions of the security and defense sector of Ukraine with an emphasis on the use of special physical training means]. *Naukovyi chasopys Natsionalnoho pedahohichnoho universytetu imeni M. P. Drahomanova. Serii: nauково-pedahohichni problemy fizychnoi kultury (fizychna kultura i sport)*, no. 9 (182), pp. 156–164. DOI: <https://spppc.com.ua/index.php/journal/article/view/2138> [in Ukrainian].

20. Khatsaiuk O. V., Turchynov A. V., Yareschenko O. A., Bak M. A. (2025).

Optimizatsiia systemy sportyvno-masovoi roboty maibutnikh ofitseriv Natsionalnoi hvardii Ukrainy [Optimization of the system of sports and mass activities of future officers of the National Guard of Ukraine]. *Naukovyi chasopys Natsionalnoho pedahohichnoho universytetu imeni M. P. Drahomanova. Serii: nauково-pedahohichni problemy fizychnoi kultury (fizychna kultura i sport)*, no. 2 (187), pp. 197–207. DOI: <https://spppc.com.ua/index.php/journal/article/view/2388> [in Ukrainian].

21. Ovcharenko V. V., Klishyn V. M., Makhobei A. V., Belashov Yu. O., Nikonenko A. M. (2025). *Vzaiemozviazok kreatyvnosti vykladacha vyshchoho viiskovoho navchalnoho zakladu iz yakistiu pidhotovky maibutnikh ofitseriv u realiiakh siohodennia* [Relationship between the creativity of a higher military education instructor and the quality of future officers' training in contemporary conditions]. *Innovatsiina pedahohika*, no. 83 (2), pp. 133–140. DOI: <https://doi.org/10.3272/2663-6085/2025/83.2.26> [in Ukrainian].

Received / Стаття надійшла до редакції: 17.02.2025

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 20.03.2026

Published / Опубліковано: 30.06.2026

KHATSAIUK OLEKSANDR

*Honored Coach of Ukraine, Senior Officer, Military Service Section,
Eastern Kharkiv Territorial Directorate, National Guard of Ukraine (Unit 2240)
<https://orcid.org/0000-0002-4166-9099>*

ANATSKYI RUSLAN

*Senior Teacher Department of Physical Education, Special Physical Training and Sports,
Educational and Scientific Institute for Ensuring State Security,
National Academy of the National Guard of Ukraine
<https://orcid.org/0000-0002-5662-9903>*

KRYVYCH VITALII

*Senior Lecturer at the Department of Physical Education,
Special Physical Training and Sports,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0009-0002-5154-625X>*

ТЕОРЕТИКО-МЕТОДИЧНІ АСПЕКТИ ВИКОРИСТАННЯ СУЧАСНОГО ТРЕНАЖЕРНОГО ОБЛАДНАННЯ У ФІЗИЧНІЙ ПІДГОТОВЦІ МАЙБУТНІХ ОФІЦЕРІВ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ

Обґрунтовано доцільність використання сучасного тренажерного обладнання у системі фізичної та спеціальної фізичної підготовки майбутніх офіцерів Національної гвардії України. Актуальність дослідження зумовлена зростанням інтенсивності і складності службово-бойової діяльності, що висуває підвищені вимоги до рівня фізичної, психофізіологічної та професійно-прикладної готовності майбутніх офіцерських кадрів.

Уточнено військово-педагогічну сутність поняття «сучасне тренажерне обладнання» як інтегрованого дидактичного засобу, що поєднує навчальну, тренувальну, моделювальну, контрольну та корекційну функції.

Визначено основні суперечності чинної системи фізичної підготовки майбутніх офіцерів та обґрунтовано необхідність системного впровадження тренажерних засобів в освітній процес вищих військових навчальних закладів.

Запропоновано авторську класифікацію сучасного тренажерного обладнання з огляду на його функціональне призначення, а також визначено комплекс педагогічних умов і методичних особливостей ефективного використання тренажерів у фізичній і спеціальній фізичній підготовці.

Доведено, що інтеграція сучасного тренажерного обладнання забезпечує підвищення професійно-прикладної спрямованості, керованості й безпеки навчально-тренувального процесу, сприяє індивідуалізації навантажень, розвитку фізичних і психофізіологічних якостей та формуванню готовності майбутніх офіцерів до виконання завдань за призначенням в екстремальних умовах службово-бойової діяльності.

Ключові слова: *засоби фізичної підготовки; майбутні офіцери; освітній процес; методика; спеціальна фізична підготовка; технічні засоби; тренажерне обладнання; фізична підготовка; фізичні якості.*



CHYHRYNA HALYNA

Candidate of Legal Sciences, Associate Professor,
Associate Professor of the Department of Law Enforcement Activities,
State Tax University
<https://orcid.org/0000-0002-4546-0145>

MECHANISM FOR ENSURING INTERACTION OF THE LAW ENFORCEMENT AGENCIES IN THE CONTEXT OF EUROPEAN INTEGRATION PROCESSES IN UKRAINE

The author's vision of the content of the "mechanism for ensuring interaction of the law enforcement agencies" is formulated and the main elements of this mechanism, grouped by functional purpose, are highlighted.

The mechanism for ensuring the interaction of law enforcement agencies is a holistic system of means, methods and tools that create conditions for effective joint (team) work of law enforcement agencies and which is directly aimed at the result: coordinated work of law enforcement agencies to achieve common goals - protecting the rights, freedoms and interests of citizens, ensuring public safety and maintaining law and order, in particular under the legal regime of martial law, in the case of large-scale cyberattacks, technical failures, information wars, etc.

The main elements of the mechanism for ensuring the interaction of law enforcement agencies are grouped by functional purpose: 1) regulatory and legal element (considered as the basic one, without which the interaction will be chaotic or illegal); 2) organizational and managerial element (considered as the engine that launches and accompanies the interaction process); 3) information and analytical element (provides a common vision of situations, allows for the definition of common goals, setting and solving tactical and strategic tasks); 4) resource (material and technical) element (provides the practical possibility of interaction); 5) control and supervisory element (ensures the legality and assessment of the effectiveness of the interaction of law enforcement agencies).

Considering that the mechanism for ensuring the interaction of law enforcement agencies is a holistic system, and the listed elements are components of this system, the content of individual elements will be determined by the functional criteria (main areas of activity) of the law enforcement agencies being involved in the interaction process. Improving individual elements of the mechanism for the interaction of law enforcement agencies will contribute to the effectiveness of the entire mechanism.

The results obtained can be used for the academic researching of the ways to improve the mechanism for ensuring the interaction of law enforcement agencies.

Keywords: law enforcement agencies; interaction; mechanism for ensuring interaction.

Problem Statement. As of 2026, the reform of law enforcement activities in Ukraine is at the stage of active practical implementation of the Comprehensive Strategic Plan for the Reform of Law Enforcement Agencies, designed through 2027 [1]. The completion of law enforcement reform remains a critical condition for Ukraine's accession to the European Union (hereinafter – the EU) and is focused on the transition from a “punitive model” of law enforcement activity to a “service-oriented” one.

The European Union Advisory Mission for Civilian Security Sector Reform in Ukraine (hereinafter – EUAM Ukraine) actively contributes to the completion of the reform of Ukraine's law enforcement system [2].

EUAM has been operating in Ukraine since 2014. It was established by the European Union at the request of the Government of Ukraine following the events of the Revolution of Dignity of 2013–2014, which deepened Ukrainian

society's distrust toward the authorities and security forces. The reason for this distrust was a series of violent incidents in Kyiv involving protesters, police special units, and unidentified snipers [2].

Among other requests, the Government of Ukraine asked the EU to support the reform of law enforcement agencies and institutions of the rule-of-law system, as well as to facilitate the restoration of public trust in them. As a result of this request, in 2014 the European Union Advisory Mission for Civilian Security Sector Reform in Ukraine was established [2].

The civilian security sector includes law enforcement agencies and institutions of the rule-of-law system, in particular the Ministry of Internal Affairs of Ukraine and its subordinate bodies (the National Police of Ukraine, the National Guard of Ukraine, the State Border Guard Service of Ukraine, the State Migration Service of Ukraine, and others), the Ministry of Justice of Ukraine, the



Office of the Prosecutor General together with regional prosecutor's offices, the Security Service of Ukraine, the State Bureau of Investigation, the Bureau of Economic Security of Ukraine, courts, and anti-corruption agencies. In addition, civil society and parliament (the Verkhovna Rada of Ukraine) play an important role in ensuring the reform process of this sector [2].

Only a modern mechanism for ensuring interaction will enable Ukraine's law enforcement agencies to be effective, capable of continuing the fight against crime, protecting citizens, and restoring justice, particularly under the legal regime of martial law, in the event of large-scale cyberattacks, technical failures, information warfare, etc.

Analysis of Recent Research and Publications. The study of issues concerning interaction among law enforcement agencies in general, and among Ukrainian law enforcement agencies in particular, as well as the improvement of individual elements of the mechanism for ensuring such interaction, has been addressed in the works of a wide range of both Ukrainian and foreign scholars. Researchers examine both general theoretical aspects and specific areas of law enforcement interaction (countering organized crime, protection of human rights, administrative and legal foundations, and others). This indicates the complexity and multidimensional nature of this type of activity.

Thus, the issues of the coordinating role of the prosecutor's office and the improvement of coordination among state bodies in counteracting offenses were studied by M. Burbyka, Yu. Hroshevyi, L. Davydenko, V. Dolezhan, P. Karkach, M. Kosyuta, M. Kurochka, V. Maliuha, M. Mychka, V. Nor, Ye. Popovych, M. Rudenko, V. Synchuk, and other Ukrainian scholars.

Certain issues concerning the interaction of the National Police with other law enforcement units were studied by M. Bortun, S. Butkevych, V. Vasylynychuk, R. Hren, M. Davydova, I. Demidov, Ye. Zozulia, I. Kolinka, O. Kravchenko, V. Matviienko, S. Nevmerzhytskyi, L. Skalozub, A. Khankevych, O. Kharaberiush, V. Cherniei, S. Chuchko, and other Ukrainian scholars.

A comprehensive study of interaction between law enforcement agencies and public institutions and the public is presented in the works of V. Keidaliuk [3; 4].

Taking into account the reform of the law enforcement system, issues of interaction and cooperation in the field of preventing criminal offenses were studied by I. Odnolko [5].

Having analyzed the legal regulation of cooperation between city administrations and police under conditions of restriction of certain rights and freedoms, Yu. Pryvatskyi proposed improving mechanisms for the joint financing of security programs [6; 7].

Representatives of specialized universities also play a significant role in shaping the scientific discourse on law enforcement interaction issues: O. Bandurka – advisor to the rector of the Kharkiv National University of Internal Affairs (KhNUA), as a specialist in law enforcement activity; O. Holovko and O. Manzhai – representatives of KhNUA engaged in organizing scientific events on current law enforcement issues.

Foreign authors have also not remained indifferent to the problems of law enforcement interaction and the improvement of mechanisms for ensuring it.

Thus, in the context of identifying key elements and improving the mechanism for ensuring interaction among law enforcement agencies, the following deserve attention: the fundamental work on changing the structure and interaction of police worldwide by D. Bayley and C. Shearing [8]; studies of interagency cooperation models and partnerships between police and communities conducted by A. Cherney and J. Hartley [9]; D. Heyer's study of police interaction with other state institutions within the concept of new public management [10]; C. Edwards' study of policing strategies considering the demands of 21st-century society [11]; the analysis of challenges in joint law enforcement activity aimed at reducing crime conducted by J. Fleming and J. Wood [12]; issues of information interaction and data exchange in combating crime highlighted by T. Luen and S. Al-Hawamdeh [13]; the methodology proposed by D. Rosenbaum for assessing the effectiveness of interagency partnership and police work in crime prevention [14]; and the analysis of public administration and interagency cooperation in the law enforcement sector conducted by B. Steinheider and T. Wuestewald [15].

Considering the above, it may be concluded that the topic of interaction among law enforcement agencies is not new. Scholars have studied individual aspects of law enforcement interaction, but the mechanism for ensuring interaction among law enforcement agencies, considering international experience, has not been systematically researched. The elements of the mechanism for ensuring interaction among law enforcement agencies have not been distinguished, and their content and influence on the activities of

Ukraine's law enforcement agencies have not been examined.

The purpose of this article . To investigate the mechanism for ensuring interaction among law enforcement agencies, taking into account international experience and best global practices, to identify its main elements, and to propose ways to improve the mechanism for ensuring interaction among Ukrainian law enforcement agencies.

Presentation of the main material. The reform of law enforcement activity in Ukraine is aimed at transitioning from a "punitive model" to a "service-oriented" one, with a focus on partnership with the community (Community Policing), digitalization of processes, ensuring human rights, and increasing transparency. Key aspects include public trust, interagency coordination, crime prevention, and effective cooperation with territorial communities.

To better understand the mechanism for ensuring interaction among Ukrainian law enforcement agencies, it is first advisable to identify and analyze the general (key) aspects of the transformation of law enforcement activity. Thus, the study of international experience [8–15; 18] makes it possible to distinguish such general aspects of law enforcement activity as a *human-centered approach; the Community Policing concept; digitalization and openness; interagency interaction; and respect for human and civil rights.*

A *human-centered approach* in law enforcement activity is understood as the orientation of law enforcement agencies toward the needs of the population and the community, where the level of trust serves as the main indicator of the effectiveness of a law enforcement agency.

The *Community Policing* concept and its defining role in the activities of Ukrainian law enforcement agencies, in our opinion, became especially relevant with the introduction of the legal regime of martial law in Ukraine. Cooperation of law enforcement agencies, first and foremost the police, with communities and public associations aimed at *jointly* resolving security issues and *preventing* offenses rather than merely documenting them is particularly evident in Ukraine today.

Digitalization and openness are European standards of law enforcement activity that are being successfully integrated into the law enforcement practice of our state. The introduction of modern IT tools for data exchange among law enforcement agencies of different departments, ensuring transparency in the activities of law enforcement bodies, and joint (interagency) access to information increase the effectiveness of

combating crime and shorten the duration of investigations into serious crimes, including transnational ones.

As international experience demonstrates [8–15; 18], *interagency interaction* among law enforcement agencies and professional coordination of the work of different law enforcement structures (the Ministry of Internal Affairs, the Security Service of Ukraine, the Bureau of Economic Security, the State Bureau of Investigation, the prosecutor's office, and other state law enforcement agencies) increase the effectiveness of countering threats to society and state sovereignty.

Respect for human and civil rights, as a defining international standard of law enforcement activity, has been fully accepted and successfully implemented by Ukraine's law enforcement agencies, as repeatedly emphasized in reports of the European Union Advisory Mission. The priority of legality, protection of freedoms, and security of citizens during all procedural actions in criminal proceedings and throughout all procedures applied by Ukrainian law enforcement agencies is steadily becoming the norm in the work of Ukrainian law enforcement personnel.

The listed changes in the activities of Ukrainian law enforcement agencies are aimed at strengthening public security and building trust in the law enforcement system.

The study of the practice of interaction among Ukrainian law enforcement agencies under the legal regime of martial law allows us to assert that *a modern mechanism for ensuring interaction* is being formed in Ukraine, which will enable law enforcement agencies to be effective, capable of continuing the fight against crime, protecting citizens, and restoring justice in the event of large-scale cyberattacks, technical failures, information warfare, etc.

Interaction among law enforcement agencies has moved to a qualitatively new level aimed at improving work efficiency and adapting to the legal conditions of martial law.

The introduction of martial law has radically transformed the interaction among Ukrainian law enforcement agencies, turning it into enhanced interagency cooperation aimed at ensuring public security, countering new types of criminal offenses, and protecting sovereignty. In order to ensure operational effectiveness under conditions of armed aggression, the forces, resources, and information databases of the National Police, the Security Service of Ukraine, the prosecutor's office, the State Bureau of Investigation, and other

state law enforcement agencies have been integrated.

Among the key transformations in the interaction of Ukrainian law enforcement agencies caused by the introduction of martial law is *the transition to a consolidated model*. Instead of fragmented activities, law enforcement agencies are shifting toward the joint performance of functions through the exchange of informational, material-technical, and personnel resources.

The introduction of martial law in Ukraine has necessitated a change in the priorities of law enforcement agencies. Primary attention in law enforcement activity is devoted to countering sabotage and collaborationism, ensuring compliance with curfew regulations, inspecting citizens and vehicles, as well as documenting war crimes.

In response to contemporary demands, the legislator has expanded the powers of law enforcement officers. Interagency interaction among law enforcement agencies is regulated by the Law “On the Legal Regime of Martial Law” and other regulatory legal acts, which allow law enforcement personnel to respond rapidly to offenses and more strictly control compliance with legal requirements [16; 17]. Law enforcement officers have acquired additional powers concerning restrictions on freedom of movement, verification of documents, and inspection of housing. The exercise of these additional powers contributes to the search for new forms of interaction and improves the mechanism for ensuring interaction among law enforcement agencies both at the interagency level and with the public, media, human rights organizations, including international ones.

Martial law also affects the personal dimension of work, requiring personnel to adapt to conditions of constant risk.

However, strong law enforcement institutions are formed not only through daily operations. They begin with the decisions made by leaders – with how priorities, standards, rules, and approaches to communication are defined, as noted by advisors of the EU Advisory Mission in Ukraine [2].

With the aim of preparing qualified personnel for Ukraine’s law enforcement system, advisors of EUAM Ukraine initiated the “Senior Leadership Course” for managers of the Ministry of Internal Affairs and its subordinate bodies [2]. In our opinion, a similar series of training programs aimed at developing strategic thinking, managerial skills, emotional intelligence, planning, transparency, and responsible communication may also be timely and

beneficial for managers of other state law enforcement agencies and their structural subdivisions.

The goal is simple – to help leaders move from reactive decisions toward consistent, professional, and responsible management. This is particularly important now, when decisions made at this level affect tens of thousands of employees and millions of citizens [2].

We agree with the opinion of EUAM Ukraine advisors that the “Senior Leadership Course” brings Ukrainian managerial practices closer to EU standards: legality, professionalism, accountability, respect for human rights, and interagency and international cooperation. These are the principles upon which modern law enforcement management in Europe is based [2].

Investments in leadership are investments in trust, institutional resilience, and their ability to act predictably, in a coordinated manner, and with a forward-looking perspective [2].

Thus, the mechanism for ensuring interaction among law enforcement agencies is, above all, a system of means, methods, and instruments that create conditions for the effective joint work of state law enforcement agencies.

Taking into account its functional purpose, the main elements of the mechanism for ensuring interaction among law enforcement agencies, in our opinion, may be considered the following: the regulatory-legal element; the organizational-managerial element; the information-analytical element; the resource (material and technical) element; and the control-supervisory element. These elements together constitute a unified mechanism for ensuring interaction among Ukrainian law enforcement agencies.

1. *The regulatory-legal element* constitutes the basis (foundation) of interaction among law enforcement agencies. Without proper regulatory and legal support, interaction will be chaotic and/or unlawful. The components of regulatory-legal support include *laws and subordinate regulatory legal acts* governing the process of interaction among law enforcement agencies in carrying out assigned tasks. Among the laws, the principal ones governing interaction among law enforcement agencies under martial law are the Constitution of Ukraine, the Law of Ukraine “On the Legal Regime of Martial Law” [16], and relevant sector-specific laws (for example: “On the Prosecutor’s Office of Ukraine” [20], “On the National Police” [23], “On the Bureau of Economic Security” [24], “On Operational-Search Activity” [21]). The Criminal Procedure Code of Ukraine [22]

determines the procedure for interaction among law enforcement agencies and their subordinate structural subdivisions (in particular, the prosecutor's office, investigative bodies, and operational units) in criminal proceedings.

Subordinate acts include joint (interagency) orders, regulations, instructions, and memoranda of cooperation among agencies.

2. *The organizational-managerial element* may be regarded as a kind of “engine” that initiates the process of interaction among law enforcement agencies. The principal components of the organizational-managerial element, in the context of interaction among law enforcement agencies, include *planning, the establishment of joint (interagency) bodies, and the designation of a coordinator (responsible authority or person)*. Thus, in order for interaction among law enforcement agencies to be effective and achieve its intended objectives, *joint action plans*, crime-fighting strategies, and similar measures are developed. A current example of such planning is the Comprehensive Strategic Plan for Reforming Law Enforcement Agencies as Part of Ukraine's Security and Defense Sector for 2023–2027 [1]. To implement planned measures and realize the provisions of the developed strategy, it is necessary to establish *joint (interagency) bodies*. Examples of such bodies include interagency working groups, investigative-operational groups (IOGs), and investigative teams. The work of such a joint body will be effective if interaction among law enforcement agencies included in working groups, as well as among operational officers, investigators, and detectives included in investigative or investigative-operational groups, is professionally coordinated. For this purpose, it is *mandatory to officially designate a coordinator (responsible authority or person)* for a specific case or area of activity, formalized in an order, directive, or resolution.

3. *The information-analytical element* ensures a “shared vision” of the situation among law enforcement agencies as subjects of interaction. The basic components of the information-analytical element, in the context of interaction among law enforcement agencies, may be considered *a unified information space, data exchange, and analytics*. Those subjects of interaction (individual law enforcement agencies and/or employees of their subdivisions) that possess *a unified information space* – access to shared databases and integrated information systems – are the ones that achieve the intended objectives. Modern information-analytical support

for law enforcement activity in general, and for interaction among law enforcement agencies in particular, is the key to effective crime prevention and ensuring the security of the state and society. Effective *exchange of data* among individual law enforcement agencies and their subdivisions in the course of jointly solving assigned tasks is ensured through channels for the rapid transmission of information regarding crimes, individuals, and events. As international experience demonstrates, *analytics* is a defining component of the information-analytical element of the mechanism for ensuring interaction among law enforcement agencies. Joint analysis of the criminogenic situation in a region and/or country significantly increases the efficiency and promptness of interaction among law enforcement agencies.

4. *The resource (material and technical) element* ensures the practical possibility of interaction among law enforcement agencies. The defining components of the resource element, in the context of interaction among law enforcement agencies, include *technical compatibility, logistics, and financing*. *Technical compatibility* involves the use of compatible communication systems and special equipment, which allows for the rapid exchange of information regarding committed offenses, vehicle movements, the search for and detention of individuals, the search for missing persons, illicit trafficking in weapons, narcotic substances, finances, etc. *Logistics* encompasses the joint use of transport, laboratories, or facilities, which, when necessary, significantly accelerates responses to committed offenses, unlawful behavior by individuals, and criminal groups. *Financing* is a key aspect in determining the practical capabilities of interaction among law enforcement agencies. The allocation of expenses for conducting large-scale joint operations determines the achievement of the intended objective or may render such operations entirely impossible in the absence of sufficient funding.

5. *The control-supervisory element* ensures legality and the assessment of the effectiveness of interaction among law enforcement agencies. The defining components of the control-supervisory element include *prosecutorial supervision, departmental control, and monitoring of results*. *Prosecutorial supervision* involves continuous and systematic oversight of compliance with legislation by law enforcement agencies as subjects of interaction in the course of performing joint tasks. Alongside prosecutorial supervision, *departmental control* is no less important and provides verification by heads of law enforcement agencies

of the implementation of joint decisions by law enforcement personnel. *Monitoring of results* should be systematic and continuous. Assessment of whether interaction contributed to achieving its objective (for example, preventing a crime, identifying and apprehending an offender, etc.) should be carried out continuously, in every instance of interaction among law enforcement agencies. Effective actions, as well as shortcomings and unprofessional conduct, should become the subject of analysis and discussion at joint meetings, professional development courses, and similar activities. The ultimate purpose of monitoring the results of interaction should be the improvement of the regulatory and legal support of law enforcement activity, the enhancement of the professionalism of law enforcement personnel, and the safeguarding of public and state security.

Conclusions and prospects for further research. Thus, in our opinion, the mechanism for ensuring interaction among law enforcement agencies is an integral system of means, methods, and instruments that create conditions for the effective joint (team-based) work of law enforcement agencies and that is directly aimed at achieving results: coordinated activity of law enforcement agencies for the attainment of common goals – the protection of the rights, freedoms, and interests of citizens, ensuring public safety and the protection of law and order, particularly under the legal regime of martial law, in the event of large-scale cyberattacks, technical failures, information warfare, etc.

The main elements of the mechanism for ensuring interaction among law enforcement agencies, taking into account their functional purpose, may be grouped into the following system: 1) the regulatory-legal element (understood as the basic element without which interaction will be chaotic or unlawful); 2) the organizational-managerial element (understood as the engine that initiates and accompanies the interaction process); 3) the information-analytical element (ensures a shared vision of situations and allows for the determination of common goals and the formulation and solution of tactical and strategic tasks); 4) the resource (material and technical) element (ensures the practical possibility of interaction); 5) the control-supervisory element (ensures legality and evaluation of the effectiveness of interaction among law enforcement agencies).

Considering that the mechanism for ensuring interaction among law enforcement agencies constitutes an integral system, and that the listed

elements are components of this system, the content of individual elements will be determined by the functional criteria (main areas of activity) of the law enforcement agencies entering the process of interaction. The improvement of individual elements of the mechanism for interaction among law enforcement agencies will contribute to the effectiveness of the entire mechanism.

References

1. *Ukaz Prezidenta Ukrainy "Pro Kompleksnyi stratehichnyi plan reformuvannia orhaniv pravoporiadku yak chastyny sektoru bezpeky i oborony Ukrainy na 2023–2027 roky"* № 273/2023 [Decree of the President of Ukraine "On a Comprehensive Strategic Plan for Reforming Law and Order Organizations as a Part of the Security and Defense Sector of Ukraine for 2023-2027" activity no. 273/2023]. (2023, May 11). Retrieved from: <https://zakon.rada.gov.ua/laws/show/273/2023#Text> (accessed 15 January 2026) [in Ukrainian].
2. Ofitsiynyi sait Konsultatyvnoi misii Yevropeiskoho Soiuzu z reformuvannia sektoru tsyvilnoi bezpeky Ukrainy. *Kurs "Senior Leadership Course" dlia kerivnykiv Ministerstva vnutrishnikh sprav* ["Senior Leadership Course" for managers of the Ministry of Internal Affairs]. Retrieved from: <https://surli.cc/rwgzgf> (accessed 14 January 2026) [in Ukrainian].
3. Keidaliuk V. O. (2024). *Normatyvno-pravovi zasady vzaємodii Natsionalnoi politsii Ukrainy z hromadskymy obiednanniamy pravookhoronnoi spriamovanosti* [Normative and legal principles of the interaction of the National Police of Ukraine with public demands for law enforcement]. Doctor's thesis. Odesa : Odeskyi derzhavnyi universytet vnutrishnikh sprav, 238 p. [in Ukrainian].
4. Keidaliuk V. O. (2021). *Administratyvno-pravovi zasady vzaємodii politsii z hromadskistiuv umovakh voiennoho stanu* [Administrative-legal principles of the interaction of the police with the public in conditions of martial law]. *Prykarpatskyi yurydychnyi visnyk*, vol. 5 (40), pp. 104–108 [in Ukrainian].
5. Odnolko I. V. (2017). *Vzaiєmodiia pravookhoronnykh orhaniv u sferi zapobihannia kryminalnym pravoporushenniam* [Interaction of law enforcement agencies in the sphere of preventing criminal offenses]. *Pytannia borotby zi zlochynnistiuv*, vol. 34, pp. 41–51 [in Ukrainian].
6. Pryvaskyi Yu. Yu. (2024). *Osoblyvosti vzaємodii orhaniv mistsevoho samovriaduvannia ta pravookhoronnykh orhaniv v umovakh voiennoho stanu* [Peculiarities of the interaction between local self-government bodies and law

enforcement bodies in martial law conditions]. *Naukovi pratsi Kyivskoho aviatsiinoho instytutu. Seriia: yurydychnyi visnyk "Povitriane i kosmichne pravo"*, no. 3 (72), pp. 112–119 [in Ukrainian].

7. Pryvarskyi Yu. Yu. (2025). *Instytutsiini mekhanizmy vzaïemodii orhaniv mistsevoho samovriaduvannia ta pravookhoronnykh orhaniv u zabezpechenni publichnoi bezpeky v umovakh voïennoho stanu* [Institute mechanisms for the interaction of local government bodies and law enforcement bodies in ensuring public safety under martial law conditions]. *Naukovi innovatsii ta peredovi tekhnologii*, no. 12 (52), pp. 2857–2870 [in Ukrainian].

8. Bayley, D. H., & Shearing, C. D. (2001). The New Structure of Policing: Description, Conceptualization, and Research Agenda. Washington, D.C. : National Institute of Justice [in English].

9. Cherney, A., & Hartley, J. (2017). Models of multi-agency collaboration: A review of the literature on police-community partnerships. *Journal of Policing, Intelligence and Counter Terrorism*, vol. 12, iss. 1, pp. 62–75. DOI: <https://doi.org/10.1080/18335330.2016.1251368> [in English].

10. Den Heyer, G. (2011). New Public Management and Policing: An International Comparison. *Police Practice and Research*, vol. 12, no. 6, pp. 469–483 [in English].

11. Edwards, C. (2005). Changing Policing Theories: For 21st Century Societies. Sydney : Federation Press [in English].

12. Fleming, J., & Wood, J. (2006). Fighting Crime Together: The Challenges of Policing and Crime Reduction. Sydney : UNSW Press [in English].

13. Luen, T. W., & Al-Hawamdeh, S. (2001). Knowledge management in law enforcement: Case studies and lessons learned. *International Journal of Information Management*, vol. 21, iss. 5, pp. 333–346 [in English].

14. Rosenbaum, D. P. (2002). Evaluating multi-agency partnerships: Interorganizational processes and police performance. *Crime Prevention Studies*, vol. 14, pp. 171–203 [in English].

15. Steinheider, B., & Wuestewald, T. (2008). From the Courtroom to the Capitol: Interagency Collaboration in the Law Enforcement Sector. *Public Administration Review*, vol. 68, iss. 5, pp. 845–855 [in English].

16. *Zakon Ukrainy "Pro pravovyi rezhym voïennoho stanu" № 389-VIII* [Law of Ukraine about the Legal Regime of Martial Law" activity no. 389-VIII]. (2015, May 12). Retrieved from: <https://surl.li/zozzcx> (accessed 11 January 2026) [in Ukrainian].

17. *Ukaz Prezydenta Ukrainy "Pro vvedennia voïennoho stanu v Ukraini" № 64/2022* [Decree of the President of Ukraine "On the introduction of martial law in Ukraine" activity no. 64/2022]. (2022, February 24). Retrieved from: <https://surl.li/cc/wnxgql> (accessed 11 January 2026) [in Ukrainian].

18. Doslidnytska sluzhba Verkhovnoi Rady Ukrainy (2024). *Naukova kontseptsiiia zakonodavchoho zabezpechennia diïalnosti orhaniv pravoporiadku Ukrainy* [Scientific concept of legislative support for the activities of law enforcement agencies of Ukraine]. Retrieved from: <https://surl.li/xjzcnn> (accessed 12 January 2026) [in Ukrainian].

19. *Konstitutsiia Ukrainy* [Constitution of Ukraine]. (1996, June 28). Retrieved from: <https://surl.li/kqpdsa> (accessed 23 January 2026) [in Ukrainian].

20. *Zakon Ukrainy "Pro prokuraturu" № 1697-VII* [Law of Ukraine about the Prosecutor's Office activity no. 1697-VII]. (2014, October 14). Retrieved from: <https://surl.li/wvqozd> (accessed 23 January 2026) [in Ukrainian].

21. *Zakon Ukrainy "Pro operativno-rozshukovu diïalnist" № 2135-XII* [Law of Ukraine about the Operative and Search Activities activity no. 2135-XII]. (1992, February 18). Retrieved from: <https://surl.li/uncawv> (accessed 23 January 2026) [in Ukrainian].

22. *Kryminalnyi protsesualnyi kodeks Ukrainy № 4651-VI* [Criminal Procedural Code of Ukraine activity no. 4651-VI]. (2012, April 13). Retrieved from: <https://surl.li/sfjsdq> (accessed 23 January 2026) [in Ukrainian].

23. *Zakon Ukrainy "Pro Natsionalnu politsiuu" № 580-VIII* [Law of Ukraine about the National Police activity no. 580-VIII]. (2015, July 2). Retrieved from: <https://surl.li/kutlvj> (accessed 12 January 2026) [in Ukrainian].

24. *Zakon Ukrainy "Pro Biuro ekonomichnoi bezpeky Ukrainy" № 1150-IX* [Law of Ukraine about the Bureau of Economic Security of Ukraine activity no. 1150-IX]. (2021, January 28). Retrieved from: <https://surl.li/npmzvn> (accessed 8 January 2026) [in Ukrainian].

Стаття надійшла до редакції / Received: 17.02.2025
Прорецензовано та прийнято до друку / Reviewed and accepted for publication: 20.03.2026
Опубліковано / Published: 30.06.2026

ЧИГРИНА ГАЛИНА ЛЕОНІДІВНА

кандидат юридичних наук, доцент,
доцент кафедри правоохоронної діяльності,
Державний податковий університет
<https://orcid.org/0000-0002-4546-0145>

МЕХАНІЗМ ЗАБЕЗПЕЧЕННЯ ВЗАЄМОДІЇ ПРАВООХОРОННИХ ОРГАНІВ У КОНТЕКСТІ ЄВРОІНТЕГРАЦІЙНИХ ПРОЦЕСІВ В УКРАЇНІ

Сформульовано авторське бачення змісту механізму забезпечення взаємодії правоохоронних органів, виділено і згруповано за функціональним призначенням основні елементи цього механізму.

Визначено механізм забезпечення взаємодії правоохоронних органів як цілісну систему засобів, методів та інструментів, що створюють умови для ефективної спільної (командної) роботи правоохоронних органів, безпосередньо спрямованої на результат – злагоджена діяльність правоохоронних органів для досягнення спільних цілей: захист прав, свобод та інтересів громадян, забезпечення публічної безпеки й охорони правопорядку, зокрема в умовах правового режиму воєнного стану, у разі масштабних кібератак, технічних збоїв, інформаційних воєн тощо.

Згруповано за функціональним призначенням основні елементи механізму забезпечення взаємодії правоохоронних органів: нормативно-правовий; організаційно-управлінський; інформаційно-аналітичний; ресурсний (матеріально-технічний); контрольно-наглядовий.

Оскільки механізм забезпечення взаємодії правоохоронних органів є цілісною системою, а перелічені елементи – її складники, зміст цих елементів зумовлюватиметься функціональними критеріями (основними напрямками діяльності) правоохоронних органів, які вступають у процес взаємодії. Удосконалення окремих елементів сприятиме ефективності всього механізму взаємодії правоохоронних органів.

Отримані результати можливо використовувати для наукових пошуків шляхів удосконалювання механізму забезпечення взаємодії правоохоронних органів.

Ключові слова: правоохоронні органи; взаємодія; механізм забезпечення взаємодії.



SHAMARA OLEKSANDR

*Doctor of Philosophy in Law, Senior Researcher, Associate Professor,
Advisor to the Director of the State Scientific Institution
«Institute of Information, Security and Law
of the National Academy of Legal Sciences of Ukraine»
<https://orcid.org/0000-0002-0571-0437>*



KOMASHKO VOLODYMYR

*Doctor of Philosophy in Law, Senior Researcher,
Honored Lawyer of Ukraine,
Head of the Department of Legal and Anti-Corruption Policy
Center for Security Studies,
National Institute for Strategic Studies
<https://orcid.org/0000-0003-1851-8548>*



TYTARENKO OLEKSII

*Doctor of Juridical Sciences, Associate Professor,
Head of the Research Laboratory for Training Troops,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0000-0002-3271-9402>*

TRAINING OF PERSONNEL FOR THE JUSTICE SYSTEM IN THE CONTEXT OF IMPLEMENTATION OF CERTAIN PROVISIONS OF THE ROADMAP ON THE RULE OF LAW

The scientific article contains an analysis of the legislation of Ukraine, in particular the laws of Ukraine "On the Judiciary and the Status of Judges", "On the Prosecutor's Office", "On the High Council of Justice", "On the Bar and Advocacy", European experience in organizing and implementing special training and advanced training for justice bodies (court, prosecutor's office, bar), and also suggests ways to implement the provisions of the Roadmap on the rule of law "Some issues of ensuring the negotiation process on Ukraine's accession to the European Union under cluster 1 "Fundamentals of the EU accession process", approved by the order of the Cabinet of Ministers of Ukraine № 475 (2025, May 14), in the field of organizing special training and advanced training for personnel for justice bodies.

The results of the study revealed the functioning of several key participants in the justice system of Ukraine (state bodies/educational (training) institutions), which, in accordance with the current legislation, carry out special training and advanced training of representatives of the justice system of Ukraine: the National School of Judges of Ukraine, the Training Center for Prosecutors of Ukraine and the Higher School of Advocacy. It was found that the status and areas of work of the National School of Judges of Ukraine and the Training Center for Prosecutors of Ukraine are defined in special laws of Ukraine "On the Judiciary and the Status of Judges", "On the Prosecutor's Office", and the status of the Higher School of Advocacy is not defined at the legislative level, which puts the court, the prosecutor's office and the bar, united by the Constitution of Ukraine into a single institutional system of justice, on unequal terms. The study concluded that Article 104 of the Law of Ukraine "On the Judiciary and the Status of Judges" defines the National School of Judges of Ukraine as a state institution with a special status in the justice system, which provides training of highly qualified personnel for the justice system and carries out scientific and research activities, which gives grounds to assert that there are grounds for the existence of a single educational institution for the training and advanced training of representatives of the justice system of Ukraine. The study concluded that, given the single status of the



© O. Shamara, V. Komashko, O. Tytarenko, 2026

© Scientific Bulletin of the Kyiv Institute of the National Guard of Ukraine, 2026

justice system bodies, the salaries of employees of the National School of Judges of Ukraine and the Training Center for Prosecutors of Ukraine are regulated by various resolutions of the Government of Ukraine with different approaches to the algorithm for the remuneration of persons working there.

Keywords: justice bodies, prosecutor's office; court; bar; Training Center for Prosecutors of Ukraine; National School of Judges of Ukraine; Higher School of Advocacy; advanced training; special training; National School of Justice of Ukraine.

Problem Statement. The present scientific publication continues the scholarly discussion on effective approaches to improving education in the field of specialized training for prosecutors and judges, as well as continuing professional development for lawyers, prosecutors, and judges, the organization of the activities of such educational institutions, and the consideration of ways to implement the Rule of Law Roadmap, “*Certain Issues of Ensuring the Negotiation Process on Ukraine’s Accession to the European Union under Cluster 1 ‘Fundamentals of the EU Accession Process’*,” approved by the Resolution of the Cabinet of Ministers of Ukraine No. 475-r of 14 May 2025 [1], in the context of organizing the activities of a unified educational institution, the National School of Justice of Ukraine, responsible for the specialized training of prosecutors and judges and the professional development of lawyers, prosecutors, and judges [2; 3].

Posts published on the official Facebook pages of the Government Office for Coordination of European and Euro-Atlantic Integration, the Office of the Deputy Prime Minister for European and Euro-Atlantic Integration, and the communication platform of the Deputy Prime Minister’s Office state that during the Forum “*Ukraine’s Accession to the EU: Shaping the Transformation Agenda*,” representatives of public authorities, the European Union, and the expert community discussed Ukraine’s transformation plan in the field of the rule of law [4]. In particular, one of the three roadmaps, namely the rule-of-law roadmap, was presented as a key guideline for achieving Ukraine’s compliance with the EU membership criteria in the coming years.

The document defines the process of further transformations across all areas related to the rule of law and the fulfilment of Ukraine’s obligations in the context of European integration. The approval of the roadmap is a prerequisite for opening Cluster 1, “*Fundamentals of the EU Accession Process*,” which includes Chapters 23, “*Judiciary and Fundamental Rights*,” and 24, “*Justice, Freedom and Security*.”

Progress in implementing this roadmap will determine the dynamics of Ukraine’s negotiation process. In particular, the document identifies

among its key priorities the reform of the judicial system, including strengthening the judiciary and prosecution service; improving the quality and efficiency of justice; ensuring the independence and impartiality of the judiciary and prosecution service; improving legal education; and providing training for judges, prosecutors, and lawyers.

Analysis of recent research and publications.

The scientific basis of the study consists of the current legislation of Ukraine, the works of Ukrainian legal scholars who have examined issues related to the organisation of educational institutions engaged in the specialised training and professional development of judges, prosecutors, and lawyers, as well as studies of European experience in this field [5; 6].

At the same time, most of the issues raised in this article have not been comprehensively examined in Ukrainian legal scholarship.

The purpose of the article is to present the results of scientific research concerning the improvement of organisational arrangements for the specialised training of prosecutors and judges, as well as the professional development of lawyers, prosecutors, and judges as components of the unified justice system of Ukraine. The study is based on an analysis of Ukrainian legislation and is conducted within the framework of implementing the Comprehensive Strategic Plan for the Reform of Law Enforcement Agencies and the Prosecutor’s Office as Part of the Security and Defense Sector of Ukraine for 2023–2027, approved by Presidential Decree No. 273/2023 of 11 May 2023 [7], and the Rule of Law Roadmap, “*Certain Issues of Ensuring the Negotiation Process on Ukraine’s Accession to the European Union under Cluster 1 ‘Fundamentals of the EU Accession Process’*,” approved by the Resolution of the Cabinet of Ministers of Ukraine No. 475-r of 14 May 2025.

Presentation of the main material. Chapter VIII of the Constitution of Ukraine classifies the judiciary, the prosecution service, and the legal profession as components of the justice system. By Resolution No. 475-r of 14 May 2025, the Cabinet of Ministers of Ukraine approved the Rule of Law Roadmap, “*Certain Issues of Ensuring the Negotiation Process on Ukraine’s Accession to the*

European Union under Cluster 1 ‘Fundamentals of the EU Accession Process’” [1].

The Rule of Law Roadmap is a comprehensive strategic document that defines a package of reforms within the framework of negotiations on Ukraine’s membership in the European Union under Chapter 23 “Judiciary and Fundamental Rights” and Chapter 24 “Justice, Freedom and Security.” The document constitutes one of the key prerequisites for opening formal accession negotiations under Cluster 1 “Fundamentals of the EU Accession Process,” which is opened first and closed last. Its development and implementation demonstrate Ukraine’s readiness to meet EU standards, strengthen the confidence of Member States, and reinforce Ukraine’s status as a reliable partner [1].

In developing the Rule of Law Roadmap, Ukraine was guided by the EU *acquis* and, in areas where no *acquis* exists, by the documents and standards of the Council of Europe, as well as the best practices of EU Member States adapted to the national context and wartime realities. The document establishes a broad range of measures aimed at strengthening legal institutions, further improving the judicial system, enhancing the effectiveness of anti-corruption policy, improving human rights protection, and strengthening security and public order. The Roadmap was developed through an inclusive and transparent process. It identifies 124 strategic outcomes that Ukraine seeks to achieve and 529 key measures designed to implement them, with clearly defined deadlines and responsible public authorities. Its implementation will constitute an important step toward Ukraine’s accession to the European Union, strengthen international partners’ confidence, and ensure the sustainability of democratic transformations.

In particular, Section I “Justice,” paragraph 1.1 “Key Reforms,” subparagraph (b) “Reforming the Judicial and Prosecutorial Systems,” provides for the development and approval of a Strategy for the Development of the Justice System and Constitutional Adjudication for 2025–2029, as well as the reform of the legal profession, legal education, and the system of judicial training.

Section I “Justice,” paragraph 1.4 “Training of Judges and Prosecutors,” provides for a package of measures aimed at improving the system of training judges and prosecutors, modernised in accordance with their educational needs, as well as integrating training programmes on EU law, gender equality, integrity, and leadership into the system of professional development for prosecutors. Section I “Justice,” paragraph 1.5 “Legal Education Reform,”

provides for measures intended to improve the quality of legal education.

In this regard, it is appropriate to recall that Presidential Decree No. 421/2019 of 21 June 2019 established the Commission on Legal Reform as an advisory body under the President of Ukraine. Paragraph 5 of the Decree abolished the Council on Judicial Reform and the Constitutional Commission. The primary task of the Commission on Legal Reform is to facilitate the further development of Ukraine’s legal system, grounded in the constitutional principles of the rule of law and the priority of human and civil rights and freedoms, while taking into account Ukraine’s international obligations. Priority areas of the Commission’s work include preparing and submitting to the President of Ukraine proposals for amendments to the Constitution and laws of Ukraine aimed at ensuring the implementation of constitutional norms and principles, particularly the priority protection of fundamental human rights and freedoms, improvement of the territorial organization of government and administrative-territorial structure, further development of legislation governing the judiciary and administration of justice, improvement of legislation on criminal liability and criminal procedure, reform of law enforcement agencies, and creation of conditions for the reintegration of the temporarily occupied territories of Ukraine and their population into the unified constitutional space of Ukraine.

By Presidential Decree No. 584/2019 of 7 August 2019, the Regulations on the Commission on Legal Reform and its membership were approved. Among the working groups established within the Commission was a Working Group on the Development of Legal Education.

The Constitution of Ukraine establishes a unified justice system comprising, *inter alia*, the judiciary, the prosecution service, and the legal profession (Articles 124–131² of the Constitution of Ukraine).

According to the law, bodies and institutions within the justice system are established to ensure the selection of judges and prosecutors, their professional training, evaluation, disciplinary proceedings, and the financial and organisational support of courts (Part 10 of Article 131 of the Constitution of Ukraine).

At the same time, pursuant to the Constitution of Ukraine, its provisions are norms of direct effect. Public authorities and local self-government bodies, as well as their officials, are obliged to act solely on the basis of, within the limits of authority, and in the manner prescribed by the Constitution and laws of

Ukraine (Parts 2 of Articles 8 and 19 of the Constitution of Ukraine).

Within the justice system of Ukraine, several key actors (public institutions/educational institutions) are responsible, under current legislation, for the specialized training and professional development of judges, prosecutors, and lawyers:

1. National School of Judges of Ukraine;
2. Prosecutors' Training Centre of Ukraine;
3. Higher School of Advocacy.

The Prosecutors' Training Centre of Ukraine, pursuant to Article 80 of the Law of Ukraine "On the Prosecutor's Office," is a state institution responsible for the professional development of prosecutors, civil servants of prosecution authorities, and the initial training of trainee prosecutors of district prosecutor's offices. The legislation on higher education does not apply to the Prosecutors' Training Centre of Ukraine. The Prosecutors' Training Centre of Ukraine operates under the Office of the Prosecutor General and may establish regional branches.

Following the liquidation of the National Academy of the Prosecutor's Office of Ukraine in 2020 [8], which has remained in liquidation for more than 5 years, the prosecution authorities, despite having a departmental educational institution, have been deprived of scientific and scientific-methodological support for their activities. In contrast, Part One of Article 104 of the Law of Ukraine "On the Judiciary and the Status of Judges" stipulates that the National School of Judges of Ukraine is a state institution with a special status within the justice system that provides training for highly qualified personnel for the justice system and conducts scientific research activities [9].

The State should ensure consistency in approaches and principles relating to the establishment, status, operation, remuneration, and social protection of state educational institutions within the justice system (the prosecution service and the judiciary).

In this regard, with a view to harmonising the approaches of the Parliament of Ukraine to the establishment of educational institutions within the justice system, it would be appropriate to provide in Article 80 (Prosecutors' Training Centre of Ukraine) of the Law of Ukraine "On the Prosecutor's Office" that the Prosecutors' Training Centre of Ukraine conducts scientific research activities [10].

In light of the foregoing, attention should be drawn to the fact that the current wording of Article 80 of the Law of Ukraine "On the Prosecutor's

Office" provides that the Prosecutors' Training Centre of Ukraine operates under the Office of the Prosecutor General. In order to prevent manipulation and differing interpretations regarding the remuneration of employees of the Prosecutors' Training Centre of Ukraine, it would be justified to stipulate by law that the official salary rates of employees of the Prosecutors' Training Centre of Ukraine may not be lower than the corresponding official salary rates of employees of the Office of the Prosecutor General.

Pursuant to Article 104 of the Law of Ukraine "On the Judiciary and the Status of Judges," the National School of Judges of Ukraine is a state institution with a special status within the justice system that provides training for highly qualified personnel for the justice system and conducts scientific research activities. The legislation on higher education does not apply to the National School of Judges of Ukraine. The National School of Judges of Ukraine is established under the High Qualification Commission of Judges of Ukraine and operates in accordance with this Law and its Charter, approved by the High Qualification Commission of Judges of Ukraine.

Pursuant to Article 105 of the Law of Ukraine "On the Judiciary and the Status of Judges," the National School of Judges of Ukraine carries out: initial judicial training as provided for in Article 89 of this Law; training of judges, including those elected to administrative positions in courts; periodic training of judges aimed at improving their qualifications; courses prescribed by a qualification or disciplinary body for judges temporarily suspended from administering justice; training and professional development of court staff; training and professional development of personnel of the Judicial Security Service; scientific research on improving the judicial system, the status of judges, and judicial proceedings; study of international experience in the organization and operation of courts; and scientific and methodological support for the activities of courts, the High Qualification Commission of Judges of Ukraine, and the High Council of Justice.

The National School of Judges of Ukraine also provides training for judges to maintain and improve their qualifications in accordance with their professional experience, the level and specialisation of the court in which they serve, and their individual needs. For this purpose, the National School of Judges of Ukraine organises mandatory judicial training courses, as well as elective courses that judges may choose based on their individual needs

(Article 89 of the Law of Ukraine “On the Judiciary and the Status of Judges”).

The Law of Ukraine “On the Bar and Legal Practice” does not define the procedure for continuing professional development or designate a body or institution responsible for the professional development of lawyers.

Article 21 of the Law of Ukraine “On the Bar and Legal Practice” identifies the obligation of a lawyer to improve his or her professional competence among the professional duties of lawyers [11]. Article 48 of the Law merely provides that regional bar councils facilitate the professional development of lawyers, while Article 45 stipulates that the National Bar Association of Ukraine ensures a high professional standard among lawyers in Ukraine. According to paragraph 2.2.8 of the Charter of the National Bar Association of Ukraine, one of its objectives is to promote improvements to the system of training and professional development of lawyers.

Thus, the Law of Ukraine “On the Bar and Legal Practice” does not restrict a lawyer’s right to choose the institution in which to pursue professional development. Nevertheless, in this context, reference should be made to the Higher School of Advocacy of the National Bar Association of Ukraine, whose status is not defined by the Law of Ukraine “On the Bar and Legal Practice.” According to the Procedure for Continuing Professional Development of Lawyers in Ukraine, approved by Resolution No. 63 of the Bar Council of Ukraine dated 3 July 2021, the National Bar Association of Ukraine ensures a high professional standard among Ukrainian lawyers. The organisation and implementation of the continuing professional development process for lawyers in Ukraine are carried out by the Higher School of Advocacy of the National Bar Association of Ukraine with the assistance of regional bar councils and external providers of continuing professional development accredited in accordance with this Procedure.

Under such circumstances, there appears to be a potential monopoly on the part of the National Bar Association of Ukraine (a nationwide non-governmental, non-commercial, non-profit professional organisation) in the process of the professional development of lawyers through the Higher School of Advocacy of the National Bar Association of Ukraine. In the absence of external providers, the Higher School of Advocacy of the National Bar Association of Ukraine effectively becomes a monopoly provider of continuing professional development for lawyers, which may

limit a lawyer’s ability, in accordance with the Constitution of Ukraine, the Laws of Ukraine “On Education,” “On Higher Education,” and Article 21 of the Law of Ukraine “On the Bar and Legal Practice,” to improve his or her professional competence at another institution or educational establishment, including a foreign one.

Thus, in Ukraine, there are currently three separate centres responsible for the professional development of each individual “procedural” participant within the justice system.

In the context of the foregoing, attention should be paid to the European Judicial Training Network (EJTN) [12], which serves as the principal platform for training and knowledge exchange within the European judicial system. The EJTN represents the interests of more than 120,000 European judges and prosecutors throughout Europe and reflects the experience of European countries where the training and professional development of prosecutors and judges are carried out within a single institution (for example, such European countries as the Republic of Poland, the Slovak Republic, the Czech Republic, the Kingdom of Belgium, France, Bulgaria, Romania, Portugal, the Kingdom of Spain, and others).

Established in 2000 by the Bordeaux Charter, the EJTN is an international non-profit association governed by Belgian law. The EJTN brings together judicial training institutions from all Member States of the European Union in pursuit of a common European interest: the development and implementation of training and exchange activities for members of the European judiciary. These activities encompass both initial and continuing training and are conducted in close cooperation with EJTN members, associate members, observers, and partners.

The EJTN has developed a broad range of strategic partnerships in order to provide the European judicial system with training opportunities in such areas as human rights and fundamental rights, judicial cooperation in civil matters, joint investigation teams, investigations of offences affecting the financial interests of the European Union, war crimes investigations, and other fields. The mandate of the EJTN is to contribute to the creation of a genuine European area of justice and to promote knowledge of legal systems, thereby enhancing understanding, trust, and cooperation among judges and prosecutors within EU Member States. In furtherance of this mandate, the EJTN promotes training programmes with a genuinely European dimension for judges and prosecutors across Europe. This includes

analysing and identifying training needs, developing joint training programmes and methodologies, promoting exchanges and the dissemination of experience in judicial and prosecutorial training, coordinating programmes, and providing training expertise.

It should be emphasised that the National School of Judges of Ukraine and the Prosecutors' Training Centre of Ukraine hold observer status within the European Judicial Training Network.

Consideration should also be given to the issue of financing state educational institutions that provide specialised training and professional development for judges and prosecutors in the context of the State's difficult financial situation resulting from the allocation of substantial resources to the defence of Ukraine, as well as to the optimisation of the activities of such institutions. In view of the foregoing, it appears appropriate to establish a single state institution that would provide specialised training for judges and prosecutors and professional development for judges, prosecutors, and lawyers.

Particular attention should also be paid to the Resolutions of the Cabinet of Ministers of Ukraine "Certain Issues of Material Support for Employees of the National School of Judges of Ukraine" dated 9 October 2020 No. 935 and "Certain Issues of Material Support for Employees of the Prosecutors' Training Centre of Ukraine" dated 23 December 2020 No. 1307 [13; 14], which should be aligned with a unified remuneration system for employees of the Prosecutors' Training Centre of Ukraine and the National School of Judges of Ukraine as components of the unified justice system of Ukraine. As of today, these subordinate legislative acts regulate the remuneration of employees of educational institutions responsible for the specialised training and professional development of judges and prosecutors in different ways, despite the fact that judges and prosecutors are representatives of a single justice system as defined by the Constitution of Ukraine. The approaches adopted in the decisions of the Government of Ukraine differ and are, to a certain extent, discriminatory towards employees of the Prosecutors' Training Centre of Ukraine.

Given that these state educational institutions (the Prosecutors' Training Centre of Ukraine and the National School of Judges of Ukraine) form part of the justice system, the approaches governing the remuneration of their employees should be unified at the level of both legislation and a single subordinate normative act, with remuneration linked to the official salary scales of the bodies

under which they were established pursuant to the Laws of Ukraine "On the Prosecutor's Office" and "On the Judiciary and the Status of Judges," respectively.

Particular attention should be paid to the status of the National School of Judges of Ukraine as a state institution with a special status within the justice system that provides training for highly qualified personnel for the justice system. It should be noted that the Law of Ukraine "On the Judiciary and the Status of Judges" has already established the prerequisites for the creation of a single state institution that would provide specialised training for judges and prosecutors, as well as professional development for judges, prosecutors, and lawyers.

Such a state institution should be autonomous, possess its own budget, and, through cooperation with judges, prosecutors, and lawyers, be capable of developing training programmes and ensuring their implementation during specialised training and continuing professional development. First, this would enable those responsible for the training of judges, prosecutors, and lawyers to remain independent from processes relating to the appointment or career advancement of judges, prosecutors, and lawyers. Second, it would ensure a proper separation of functions between the body directly responsible for the training and professional development of judges, prosecutors, and lawyers and the bodies exercising disciplinary authority over them.

The establishment of the National School of Justice of Ukraine should provide for its status as a single state institution with a special status within the justice system, responsible for training highly qualified personnel for the justice system and for enhancing their qualifications. The National School of Justice of Ukraine should be entitled to conduct scientific research activities in accordance with the Law of Ukraine "On Scientific and Scientific-Technical Activities." The legislation on higher education shall not apply to the National School of Justice of Ukraine.

The establishment of the National School of Justice of Ukraine should be provided for under the High Council of Justice and it should operate in accordance with the Laws of Ukraine "On the Judiciary and the Status of Judges," "On the High Council of Justice," "On the Prosecutor's Office," "On the Bar and Legal Practice," "On Education," and its Charter approved by the High Council of Justice. Pursuant to Article 131 of the Constitution of Ukraine, the High Council of Justice exercises the powers defined by the Constitution and the laws of Ukraine [15; 16].

It is proposed that the National School of Justice of Ukraine be headed by a Rector, who shall be appointed and dismissed by the High Council of Justice through an open competition. The Vice-Rectors of the National School of Justice of Ukraine are proposed to be appointed and dismissed by the High Council of Justice upon the submission of the Rector of the National School of Justice of Ukraine. The Rector of the National School of Justice of Ukraine shall submit proposals to the High Council of Justice regarding candidates for the filling of vacant Vice-Rector positions. The official salary rates of employees of the National School of Justice of Ukraine may not be lower than the corresponding official salary rates of employees of the High Council of Justice.

The National School of Justice of Ukraine shall have the status of a legal entity, possess a seal bearing the image of the State Emblem of Ukraine and its official name, maintain an independent balance sheet and accounts with the bodies of the State Treasury Service of Ukraine, and may establish regional branches.

It is proposed that among its principal functions, the National School of Justice of Ukraine shall carry out:

1. initial judicial training provided for by Article 89 of the Law of Ukraine “On the Judiciary and the Status of Judges,” specialised training of prosecutors, and initial training in accordance with the procedure and conditions established by the Laws of Ukraine “On the Judiciary and the Status of Judges” and “On the Prosecutor’s Office”;

2. training of judges, including those elected to administrative positions in courts;

3. periodic training of judges, prosecutors, and lawyers for the purpose of improving their qualifications;

4. conducting training courses prescribed by a qualification or disciplinary body for the professional development of judges temporarily suspended from administering justice;

5. training and professional development of court staff, civil servants of prosecution authorities, employees of the High Council of Justice, the High Qualification Commission of Judges of Ukraine, and the Qualification and Disciplinary Commission of Prosecutors;

6. training and professional development of personnel of the Judicial Security Service;

7. conducting scientific research on current issues concerning the functioning of the justice system;

8. studying international experience in the organisation and operation of courts, the legal profession, and prosecution services;

9. providing scientific and methodological support for the activities of courts, prosecution authorities, the bar, the High Council of Justice, the High Qualification Commission of Judges of Ukraine, and the Qualification and Disciplinary Commission of Prosecutors.

Conclusions and prospects for further research. Summarizing the foregoing, it should be emphasized that the introduction of a single state institution responsible for the specialized training of judges and prosecutors and the professional development of judges, prosecutors, and lawyers would be consistent with established European practice and a unified approach to the organization of specialized training and continuing professional development for representatives of the justice system as defined by the Constitution of Ukraine (Part Ten of Article 131 of the Basic Law of Ukraine).

The establishment of a single state institution responsible for the specialised training of judges and prosecutors and the professional development of judges, prosecutors, and lawyers would comply with the provisions of the Constitution of Ukraine, according to which the judiciary, the prosecution service, and the bar are defined as a unified justice system. Within this system, it would be possible to implement a comprehensive set of measures envisaged by Section I “Justice” of the Rule of Law Roadmap:

- subparagraph (b) “reform of the court and prosecution systems” of paragraph 1.1 “Key Reforms,” within the framework of the development and approval of the Strategy for the Development of the Justice System and Constitutional Adjudication for 2025–2029, as well as the reform of the bar, legal education, and the system of judicial training;

- paragraph 1.4 “Training of Judges and Prosecutors,” within the framework of implementing a comprehensive set of measures aimed at improving the system of training judges and prosecutors in accordance with their educational needs, as well as enhancing training programmes on EU law, gender equality, integrity, and leadership integrated into the professional development system for prosecutors;

- paragraph 1.5 “Reform of Legal Education,” within the framework of implementing a comprehensive set of measures aimed at improving the quality of legal education.

Based on the results of the conducted research, we propose the legislative establishment of: the

right of lawyers to freely choose an institution or educational establishment (including a foreign one) for improving their professional competence; the legal status of the Higher School of Advocacy of the National Bar Association of Ukraine; and/or the possibility for lawyers to improve their professional competence within a single state institution responsible for the selection of judges and prosecutors and for the professional training of personnel within the justice system of Ukraine.

The Cabinet of Ministers of Ukraine, with a view to establishing a unified remuneration framework for employees within the justice system, should review the following resolutions: "Certain Issues of Material Support for Employees of the National School of Judges of Ukraine" dated 9 October 2020 No. 935 and "Certain Issues of Material Support for Employees of the Prosecutors' Training Centre of Ukraine" dated 23 December 2020 No. 1307.

References

1. *Rozporiadzhennia Kabinetu Ministriv Ukrainy Deiaki pytannia zabezpechennia perehovornoho protsesu pro vstup Ukrainy do Yevropeiskoho Soiuzu za klasterom 1 "Osnovy protsesu vstupu do YeS" № 475-r* [Order of the Cabinet of Ministers of Ukraine on Certain Issues of Ensuring the Negotiation Process on Ukraine's Accession to the European Union under Cluster 1 "Fundamentals of the EU Accession Process" no. 475-r]. (2025, May 14). *Zakonodavstvo Ukhainy*. Retrieved from: <https://surl.lt/dxdgkb> (accessed 3 January 2026) [in Ukrainian].
2. Shamara O. V., Komashko V. V. (2024). The unified state institution for advanced training of the justice system of Ukraine. Education and science of today: intersectoral issues and development of sciences: Collection of scientific papers "ΛΟΓΟΣ" with Proceedings of the VI International Scientific and Practical Conference (Cambridge, March 29, 2024). Cambridge: P.C. Publishing House, pp. 121–127. DOI: <https://doi.org/10.36074/logos-29.03.2024.029> [in English].
3. Shamara O. (2024). Special training of personnel and advanced training of the system of justice bodies of Ukraine through the prism of the construction and functioning of the military justice system of Ukraine. Law & Society. *Scientific Journal*, vol. 9, pp. 236–241. Retrieved from: <https://surl.li/grrxnu> (accessed 3 January 2026) [in English].
4. Government Office for European and Euro-Atlantic Integration (2025). *Ukraina hotuie try dorozhni karty v mezhakh vstupu do YeS: shcho peredbachaiut tsi dokumenty i chomu vony vazhlyvi* [Ukraine prepares three roadmaps within the framework of EU accession: what these documents envisage and why they are important]. Retrieved from: <https://surl.lu/ygdjkm> (accessed 3 January 2026) [in Ukrainian].
5. Natsionalna akademiia vnutrishnikh sprav (2019). *Profesiina pidhotovka suddiv, prokuroriv ta pratsivnykiv pravookhoronnykh orhaniv: natsionalnyi i zarubizhnyi dosvid* [Professional training of judges, prosecutors and law enforcement officers: national and foreign experience]. Proceedings of the International Scientific and Practical Conference (Ukraine, Kyiv, September 19, 2019). Retrieved from: <https://surl.li/emgiux> (accessed 3 January 2026) [in Ukrainian].
6. McBride, J., Pearson, J. (2017). *Porivnialne doslidzhennia navchannia prokuroriv (mizhnarodni standarty, inozemnyi dosvid, komentari dlia Ukrainy)* [Comparative study on initial training for public prosecutors: international standards, foreign experience and comments for Ukraine]. Council of Europe. Retrieved from: <https://surli.cc/nbedrs> (accessed 3 January 2026) [in Ukrainian].
7. Ukaz Prezydenta Ukrainy "Pro Kompleksnyi stratehichnyi plan reformuvannia orhaniv pravoporiadku yak chastyny sektoru bezpeky i oborony Ukrainy na 2023–2027 roky" № 273/2023 [Decree of the President of Ukraine on the Comprehensive Strategic Plan for Reforming Law Enforcement Bodies as Part of the Security and Defence Sector of Ukraine for 2023–2027 activity no. 273/2023]. (2023, May 11). *Zakonodavstvo Ukhainy*. Retrieved from: <https://surli.cc/nwszro> (accessed 3 January 2026) [in Ukrainian].
8. *Postanova Kabinetu Ministriv Ukrainy "Deiaki pytannia realizatsii zakonodavchykh aktiv Ukrainy shchodo pershocherhovykh zakhodiv iz reformy orhaniv prokuratury" № 175* [Resolution of the Cabinet of Ministers of Ukraine on "Certain Issues of Implementation of Legislative Acts of Ukraine Concerning Priority Measures for the Reform of the Prosecutor's Office" activity no. 175]. (2020, March 3). *Zakonodavstvo Ukhainy*. Retrieved from: <https://surl.li/ujggmj> (accessed 3 January 2026) [in Ukrainian].
9. *Zakon Ukrainy "Pro sudoustrii i status suddiv" № 1402-VIII* [Law of Ukraine about the Judiciary and the Status of Judges activity no. 1402-VIII]. (2016, June 2). *Zakonodavstvo Ukhainy*. Retrieved from: <https://surl.li/yzbipq> (accessed 3 January 2026) [in Ukrainian].
10. *Zakon Ukrainy "Pro prokuraturu" № 1697-VII* [Law of Ukraine about the Prosecutor's Office activity no. 1697-VII]. (2014, October 14).

Zakonodavstvo Ukhainy. Retrieved from: <https://surl.li/efcqcy> (accessed 3 January 2026) [in Ukrainian].

11. *Zakon Ukrainy "Pro advokaturu ta advokatsku diialnist" № 5076-VI* [Law of Ukraine about the Advocacy and Advocacy Activity activity no. 5076-VI]. (2012, July 5). *Zakonodavstvo Ukhainy*. Retrieved from: <https://surl.li/kkapjq> (accessed 3 January 2026) [in Ukrainian].

12. European Judicial Training Network (2025). Official website. Retrieved from: <https://ejtn.eu/> (accessed 3 January 2026) [in English].

13. *Postanova Kabinetu Ministriv Ukrainy "Deiaki pytannia materialnoho zabezpechennia pratsivnykiv Treninhovoho tsentru prokuroriv Ukrainy" № 1307* [Resolution of the Cabinet of Ministers of Ukraine on "Certain Issues of Financial Support of Employees of the Training Center of Prosecutors of Ukraine" activity no. 1307]. (2020, December 23). *Zakonodavstvo Ukhainy*. Retrieved

from: <https://surl.li/cabqmo> (accessed 3 January 2026) [in Ukrainian].

14. *Postanova Kabinetu Ministriv Ukrainy "Deiaki pytannia materialnoho zabezpechennia pratsivnykiv Natsionalnoi shkoly suddiv Ukrainy" № 935* [Resolution of the Cabinet of Ministers of Ukraine on "Certain Issues of Financial Support of Employees of the National School of Judges of Ukraine" activity no. 935]. (2020, October 9). *Zakonodavstvo Ukhainy*. Retrieved from: <https://surl.li/yzbgsf> (accessed 3 January 2026) [in Ukrainian].

15. *Konstytutsiia Ukrainy* [Constitution of Ukraine]. (1996, June 28). *Zakonodavstvo Ukhainy*. Retrieved from: <https://surl.li/pmeqte> (accessed 3 January 2026) [in Ukrainian].

16. *Zakon Ukrainy "Pro Vyshchu radu pravosuddia" № 1798-VIII* [Law of Ukraine on the High Council of Justice activity no. 1798-VIII]. (2016, December 21). *Zakonodavstvo Ukhainy*. Retrieved from: <https://surl.li/cdykos> (accessed 3 January 2026) [in Ukrainian].

Received / Стаття надійшла до редакції: 17.02.2026

Reviewed and accepted for publication / Прорецензовано та прийнято до друку: 20.03.2026

Published / Опубліковано: 30.06.2026

ШАМАРА ОЛЕКСАНДР ВОЛОДИМИРОВИЧ

доктор філософії в галузі права, старший дослідник, доцент,
радник директора Державної наукової установи
«Інститут інформації, безпеки і права
Національна академія правових наук України»
<https://orcid.org/0000-0002-0571-0437>

КОМАШКО ВОЛОДИМИР ВОЛОДИМИРОВИЧ

доктор філософії в галузі права, старший дослідник,
заслужений юрист України,
завідувач відділу правової та антикорупційної політики
центру безпекових досліджень,
Національний інститут стратегічних досліджень
<https://orcid.org/0000-0003-1851-8548>

ТИТАРЕНКО ОЛЕКСІЙ ОЛЕКСІЙОВИЧ

доктор юридичних наук, доцент,
начальник науково-дослідної лабораторії з підготовки військ,
Київський інститут Національної гвардії України
<https://orcid.org/0000-0002-3271-9402>

ПІДГОТОВКА КАДРІВ ДЛЯ СИСТЕМИ ОРГАНІВ ПРАВОСУДДЯ В КОНТЕКСТІ РЕАЛІЗАЦІЇ ОКРЕМИХ ПОЛОЖЕНЬ ДОРОЖНЬОЇ КАРТИ З ПИТАНЬ ВЕРХОВЕНСТВА ПРАВА

Проведено аналіз законодавства України, зокрема законів «Про судоустрій і статус суддів», «Про прокуратуру», «Про Вищу раду правосуддя», «Про адвокатуру та адвокатську діяльність», а також європейського досвіду з організації та здійснення спеціальної підготовки й підвищення кваліфікації органів правосуддя (суд, прокуратура, адвокатура). Запропоновано шляхи реалізації положень Дорожньої карти з питань верховенства права «Деякі питання забезпечення переговорного процесу про вступ України до Європейського Союзу за кластером I “Основи процесу вступу до ЄС”», схваленої розпорядженням Кабінету Міністрів України від 14.05.2025 р. № 475-р, у сфері організації спеціальної підготовки та підвищення кваліфікації кадрів для органів правосуддя.

За результатом проведеного дослідження встановлено функціонування в системі правосуддя України декількох ключових учасників (державних органів/освітніх (навчальних) закладів), які відповідно до чинного законодавства здійснюють спеціальну підготовку й підвищення кваліфікації представників системи правосуддя України. З'ясовано, що статус і напрями роботи Національної школи суддів України та Тренінгового центру прокурорів України визначено у спеціальних законах України «Про судоустрій і статус суддів», «Про прокуратуру». Натомість статус Вищої школи адвокатури на законодавчому рівні не визначено, що ставить суд, прокуратуру та адвокатуру, об'єднаних Конституцією України в єдину інституційну систему правосуддя, у нерівні умови. З огляду на це вбачається доцільним створення єдиного навчального закладу з підготовки та підвищення кваліфікації представників системи органів правосуддя України. Крім того, встановлено, що за умови єдиного статусу органів системи правосуддя заробітна плата працівників Національної школи суддів України та Тренінгового центру прокурорів України регулюється різними постановами Уряду України, які передбачають різні підходи до визначення її розміру.

Ключові слова: органи правосуддя; прокуратура; суд; адвокатура; Тренінговий центр прокурорів України; Національна школа суддів України; Вища школа адвокатури; підвищення кваліфікації; спеціальна підготовка; Національна школа правосуддя України.



SHAMRUK OLEH

*Candidate of Psychological Sciences,
Head of the Department of Professional Military Training,
Kyiv Institute of the National Guard of Ukraine
<https://orcid.org/0009-0008-6138-5318>*

COMBAT EXPERIENCE AS A FORM OF INFORMAL LEARNING: PROBLEMS OF VALIDATION AND RECOGNITION IN THE MILITARY EDUCATION SYSTEM OF THE NATIONAL GUARD OF UKRAINE

The article presents an interdisciplinary study of the problem of recognising combat experience of National Guard of Ukraine servicemembers as a result of informal learning within the formal military education system. The research methodology combines theoretical methods (systematic analysis, synthesis, comparison, hermeneutic analysis) and empirical methods (survey of 50 students of L-1 officer professional development courses and 20 academic staff members at the Kyiv Institute of the NGU). The empirical findings reveal high self-assessment of combat-acquired competencies: tactical ($M = 4.62$), adaptive ($M = 4.51$), leadership ($M = 4.38$), communicative ($M = 3.94$) on a 5-point Likert scale. Strong support for recognition: 88 % of L-1 students and 85 % of academic staff endorse the concept. A positive correlation between combat experience duration and support was established ($r = 0.64$; $p < 0.01$). The regulatory analysis identifies a systemic gap at the departmental level. While the Law No. 2179-IX (2022) introduced qualification centres as entities authorised to assess and recognise learning outcomes from non-formal and informal education, no departmental regulations adapt these procedures to NGU military educational institutions. The comparative analysis of NATO member states' practices (PLAR at the Royal Military College of Canada, RPL at the University of Portsmouth) informs the proposed model. The author proposes a validation model integrating three components: pedagogical (declaration – identification – assessment – recognition), legal (draft regulation), and institutional (establishment of a Qualification Centre at KI NGU, accredited by the National Qualifications Agency). The Centre would assess and recognise learning outcomes from combat experience, NATO-standard courses, and international missions, positioning KI NGU as an institutional leader in informal learning recognition within Ukraine's security and defence sector.

Keywords: *informal education; combat experience; validation; recognition of learning outcomes; National Guard of Ukraine; higher military education; qualification centre; competencies.*

Problem Statement. The full-scale armed aggression of the Russian Federation against Ukraine, which began on 24 February 2022, has fundamentally changed the requirements for the training of military specialists. Tens of thousands of servicemen of the National Guard of Ukraine (hereinafter – NGU) have acquired unique combat experience encompassing tactical skills in conducting modern combined-arms combat, the ability to make unconventional decisions under conditions of uncertainty, leadership competencies in managing units under extreme conditions, as well as practical knowledge of interoperability with allies in accordance with NATO standards.

By its pedagogical nature, this experience fully corresponds to the characteristics of informal education, defined by the Law of Ukraine “On Education” as the “self-organised acquisition by an individual of certain competencies, in particular during everyday activities related to professional ...

activity” [1]. At the same time, the current system of higher military education lacks an effective mechanism for recognising these outcomes, which creates a significant gap both in the pedagogical and legal domains.

The problem acquires particular urgency in view of two aspects. First, the pedagogical aspect: a considerable proportion of cadets and students of higher military educational institutions (hereinafter – HMEIs) of the NGU possess combat experience, yet are compelled to study academic disciplines whose content significantly lags behind their actual competencies acquired on the battlefield. Second, the legal aspect: despite the existence of a general Procedure for the Recognition of Non-formal and Informal Learning Outcomes in Higher Education [2; 3], there are no departmental regulatory acts adapting this procedure to the specific features of NGU HMEIs, taking into account restrictions related to information protection and the particularities of military service.



Thus, the relevance of the study is determined by the need for scientific substantiation of the pedagogical mechanism and legal foundations for the validation of combat experience as a result of informal learning within the NGU military education system. Additional significance is attached to the problem by the Law of Ukraine “On Amendments to Certain Legislative Acts of Ukraine Regarding the Functioning of the National Qualifications System” dated 01.04.2022 No. 2179-IX [19], which provides for the establishment of qualification centres – entities authorised by the National Qualifications Agency to assess and recognise learning outcomes, including those acquired through non-formal or informal education [20]. This regulatory instrument opens a fundamentally new perspective for addressing the problem under study.

Analysis of recent research and publications.

The issue of incorporating combat experience into the educational process of HMEIs is actively explored by Ukrainian scholars. Ye. Yakovenko, S. Bielai, and I. Volkov substantiated the necessity of introducing combat experience into the educational process of the National Academy of the NGU during the study of general military disciplines, noting that such experience constitutes a determining factor in officer training [4]. In subsequent publications, Ye. Yakovenko and R. Kizian examined combat experience in the context of professional military training, focusing on six key stages of its implementation: collection, analytical processing, adaptation, implementation, reflection, and updating [5].

Issues concerning the quality of military education and the integration of practical experience were studied by M. Medvid, M. Kitorov, Yu. Medvid, and others, who established the dependence of the development of HMEIs’ internal quality assurance systems on the incorporation of practical experience into the educational process [6]. Problems of professionalisation of HMEI instructors under conditions of modern warfare, particularly in the context of non-formal and informal education based on the andragogical approach, were highlighted by A. Vitchenko [7]. L. Oliinyk, S. Illiushchenko, and others proposed a structural-functional model for the professional development of academic and teaching staff during advanced training in HMEIs [8].

The organisational foundations for studying and implementing experience in the Armed Forces of Ukraine were investigated by Ye. Honcharenko and A. Tkachenko, who identified directions for improving lessons-learned procedures in

accordance with NATO standards [9]. Yu. Pashchuk conducted a fundamental analysis of the development of organisational learning and implementation of experience in the Armed Forces of Ukraine, substantiating methodological approaches to enhancing the capabilities of HMEIs in this field [10].

Among foreign studies, particular attention should be paid to the work of T. Dyson and Yu. Pashchuk devoted to organisational learning during the war in Donbas, which demonstrated the evolution of lessons-learned processes in the Armed Forces of Ukraine [11]. International standards for the Recognition of Prior Learning (RPL) in armed forces are summarised in the NATO Handbook on Lessons Learned [12], as well as in the practice of the Royal Military College of Canada, where the PLAR (Prior Learning Assessment and Recognition) system operates, allowing military experience to be credited as academic credits [13].

At the same time, the analysis of scholarly publications demonstrates that most studies focus on integrating combat experience into the content of academic disciplines, whereas the problem of recognising this experience as a result of informal learning within the formal military education system remains virtually unexplored. There is no scientifically substantiated model for validating combat experience that would combine a pedagogical mechanism for competency assessment with legal support for recognition procedures in NGU HMEIs.

The purpose of the article is to provide scientific substantiation of combat experience as a form of informal learning and to develop a model for validating its outcomes within the higher military education system of the National Guard of Ukraine, particularly through the establishment of a Qualification Centre at the Kyiv Institute of the NGU (hereinafter – KINGU). To achieve this purpose, the following tasks were defined: 1) to verify the hypothesis regarding the pedagogical equivalence of combat experience and informal learning outcomes; 2) to analyse the regulatory and legal framework for recognition and identify gaps concerning NGU HMEIs; 3) based on empirical research, to determine the competencies acquired by NGU servicemen during combat operations and the attitudes of educational process participants toward recognition procedures; 4) to generalise foreign experience in recognising prior learning within the armed forces of NATO countries; 5) to substantiate a model for validating combat experience and the expediency of establishing a Qualification Centre at KINGU. The research methodology is based on a

combination of theoretical methods (systemic analysis, synthesis, comparison, generalisation, and hermeneutic analysis of regulatory texts) and empirical methods (questionnaire survey using descriptive statistics). The empirical study sample consisted of 50 participants in L-1 officer advanced training courses at KINGU who had combat experience, and 20 academic and teaching staff members of KINGU. The total sample comprised 70 respondents.

Research Instrumentation. The questionnaire consisted of three blocks. The first block (12 statements) was aimed at self-assessment of competencies acquired during combat operations using a five-point Likert scale (1 – “not developed at all”, 5 – “developed at a high level”). The second block (8 statements) identified attitudes toward the procedure for official recognition of combat experience in formal education. The third block (6 statements) concerned preferences regarding specific assessment methods and institutional formats. The content of the questionnaire was aligned with the theoretical constructs of the study, ensuring content validity. The reliability of the instrument was tested using Cronbach’s alpha method: for the first block $\alpha = 0.83$, and for the second block $\alpha = 0.79$, corresponding to an acceptable level of internal consistency ($\alpha \geq 0.70$). Prior to the main data collection, a pilot survey ($n = 8$) was conducted, following which the wording of two statements was refined.

Presentation of the main material. **Combat Experience as a Category of Informal Learning: Theoretical Justification.** According to Article 8 of the Law of Ukraine “On Education,” informal education (self-education) is education that involves the self-organized acquisition by an individual of certain competencies, particularly during everyday activities related to professional, civic, or other activities [1]. Comparing this definition with the characteristics of combat experience allows us to assert that the participation of military personnel in combat operations fully corresponds to the features of informal learning.

The Doctrine on Lessons Learned and Experience Implementation in the Armed Forces of Ukraine defines experience as a “set of lessons, knowledge, abilities, and skills acquired in the course of practical activity” [14]. The Instruction on the Study and Implementation of Experience in Performing Combat (Special) Tasks by the National Guard of Ukraine during the Repulsion of Armed Aggression specifies this definition in relation to the particularities of the National Guard [15]. A substantive analysis of these regulatory documents

demonstrates a correlation between the concept of “combat experience” in military doctrine and the concept of “informal learning outcomes” in educational legislation.

For the scientific substantiation of this thesis, it is advisable to refer to the competency-based approach. Combat experience ensures the formation of a set of competencies that may be classified into the following groups: 1) tactical competencies – the ability to plan and conduct combat operations, manage fire, and organize interaction; 2) leadership competencies – the capacity to make decisions under conditions of uncertainty, motivate personnel, and manage stress; 3) communicative competencies – the ability to interact effectively with allies, use communication means, and conduct negotiations; 4) adaptive competencies – the ability to adapt quickly to changes in the operational environment, creatively apply available resources, and act in non-standard situations.

It is important to note that these competencies are formed not as a result of purposeful learning according to a defined curriculum, but as a consequence of practical activity in real combat conditions, which constitutes a key feature of informal learning. As noted by A. Vitchenko, the andragogical approach to military education presupposes recognition of prior experience as a valuable educational resource [7]. This corresponds with the provisions of the Law of Ukraine “On Education,” which guarantees the recognition of the results of non-formal and informal education within the formal education system [1].

Regulatory and Legal Framework for the Recognition of Informal Learning Outcomes: Analysis of Gaps. The legal basis for the recognition of informal education outcomes is the Procedure for the Recognition in Higher and Professional Pre-Higher Education of Learning Outcomes Acquired through Non-Formal and/or Informal Education, approved by Order of the Ministry of Education and Science of Ukraine dated 08 February 2022 No. 130 [2]. Order of the Ministry of Education and Science dated 13 May 2025 No. 724 introduced substantial amendments to this Procedure, particularly defining the recognition of non-formal and informal learning outcomes as “one of the instruments for forming the learner’s individual educational trajectory” [3].

According to the specified Procedure, an educational institution is obliged to develop its own recognition procedure and independently determine the specific organizational aspects of recognition procedures, authorize relevant structural units, appoint authorized persons, and determine methods and formats of assessment [2]. The recognition

procedure includes sequential stages: submission of an application and declaration of prior learning; identification of learning outcomes; comparison with the learning outcomes envisaged by the educational programme; assessment and decision-making.

The Regulation on the Peculiarities of the Organization of the Educational Process in Higher Military Educational Institutions of the Ministry of Defence of Ukraine, approved by Order of the Ministry of Defence of Ukraine dated 15 February 2024 No. 120, recognizes that higher military educational institutions conduct educational processes both within formal and non-formal education frameworks [16]. However, an analysis of the regulatory framework reveals a number of significant gaps regarding NGU higher military educational institutions.

First, there is no departmental procedure for the recognition of informal learning outcomes adapted to the specifics of the NGU. The general Procedure of the Ministry of Education and Science does not take into account restrictions associated with secrecy requirements, the NGU's subordination to the Ministry of Internal Affairs (rather than the Ministry of Education and Science), and the peculiarities of documenting combat experience under combat conditions.

Second, methods for assessing competencies acquired specifically during combat operations have not been defined. Standard methods (testing, examination, portfolio assessment) require substantial adaptation, considering that a significant part of combat experience is confidential and cannot be documented in open sources.

Third, no procedure has been developed for matching competencies acquired on the battlefield with the learning outcomes envisaged by educational programmes for training NGU officers. This complicates making well-grounded decisions regarding the transfer of academic credit for disciplines or their individual modules.

These gaps necessitate the development of a comprehensive approach combining a pedagogical validation mechanism with appropriate legal support.

Foreign Experience in the Recognition of Prior Learning in the Armed Forces of NATO Member States. To develop a substantiated model for validating combat experience, it is advisable to refer to the practice of the armed forces of NATO member states, where prior learning recognition (RPL) procedures have a long history and a well-developed regulatory framework.

In Canada, the PLAR (Prior Learning Assessment and Recognition) system actively operates at the Royal Military College of Canada. The purpose of this system is to ensure an accessible, fair, and academically grounded process for assessing prior learning in order to determine its compliance with university-level standards [13]. Military personnel submit portfolios that include a Military Personnel Record Resume, descriptions of completed courses, and certificates of acquired qualifications. Based on the assessment, individual academic disciplines may be credited or academic credits awarded.

In the United Kingdom, the University of Portsmouth applies an RPL system in which recognition of military experience is carried out, inter alia, on the basis of NATO rank classification. Thus, a service member holding NATO OR-7 rank and possessing two years of service may receive recognition of up to 240 undergraduate-level credits [17]. Canada's Fanshawe College recognizes military experience as a source of prior learning for obtaining academic credits, provided that the learning outcomes correspond to those of specific programme courses [18].

The *NATO Lessons Learned Handbook* (4th Edition, 2022) defines a standardized procedure for analysing and institutionalizing experience, including observation, identification, dissemination, and implementation of lessons learned [12]. Although this document does not directly regulate recognition of experience within the educational system, it establishes a methodological basis for structuring and assessing competencies acquired during combat operations.

The generalization of foreign experience allows the identification of key principles that should underpin a domestic model for validating combat experience: 1) the principle of accessibility – the recognition procedure should be understandable and accessible to military personnel; 2) the principle of reliability – assessment methods should ensure objectivity and reproducibility of results; 3) the principle of flexibility – the procedure should account for the diversity of forms of combat experience; 4) the principle of confidentiality – the procedure should ensure the protection of restricted-access information.

Empirical Study: Survey Results. To empirically verify the theoretical provisions, a survey of two groups of respondents was conducted. The first group consisted of 50 participants of the L-1 officer advanced training courses at the Kyiv Institute of the National Guard of Ukraine who had direct combat experience (average duration of deployment in the

combat zone – 14.7 months; 72% held command positions ranging from platoon commander to company commander). The second group comprised 20 academic and teaching staff members of KINGU (65% hold academic degrees, and 40% possess their own combat experience).

In response to the question concerning self-assessment of competencies acquired during combat operations (using a 5-point Likert scale), L-1 participants rated tactical competencies the highest ($M = 4.62$; $SD = 0.53$), which is expected given the intensity of combat training. Adaptive competencies ($M = 4.51$; $SD = 0.58$) ranked second, confirming the development of a high level of cognitive flexibility under real combat conditions. Leadership competencies were assessed at $M = 4.38$ ($SD = 0.67$). The somewhat lower assessment of communicative competencies ($M = 3.94$; $SD = 0.81$) is explained by varying levels of interaction between respondents and units of other defence components and international partners.

Regarding attitudes toward the recognition procedure: 88% of L-1 participants considered official recognition of combat experience within the formal education system appropriate; 76% expressed willingness to undergo an assessment procedure to obtain ECTS academic credits. Among acceptable assessment methods, respondents selected: structured interview – 68%; practical skills demonstration – 62%; combat experience portfolio – 54%; testing – 38%. Correlation analysis demonstrated a positive relationship between the duration of combat experience and the level of support for recognition ($r = 0.64$; $p < 0.01$).

The survey results among KINGU academic and teaching staff ($n = 20$) demonstrated that: 85% support the idea of recognizing combat experience as an outcome of informal learning; 90% believe that such a procedure would increase military personnel's motivation to obtain higher education. At the same time, 70% expressed reservations regarding the need to ensure objectivity of assessment, and 55% noted the need for specialized training of assessors. Regarding the institutional format: 80% of academic and teaching staff considered the establishment of a specialized Qualification Centre to conduct recognition procedures to be optimal; 84% of L-1 participants also supported this idea, indicating consensus between both categories of educational process participants.

Thus, the empirical study confirmed that combat experience forms an integrated set of verifiable competencies; the overwhelming majority of respondents in both groups support the idea of

official recognition; and there exists a clear demand for the establishment of an institutional mechanism (a Qualification Centre) to implement validation procedures.

Model for Validating Combat Experience and Rationale for the Qualification Center of KINGU. Based on theoretical analysis, examination of the regulatory and legal framework, synthesis of foreign experience, and the results of the empirical study, a model for validating combat experience as a result of informal learning was developed. The model integrates three components: pedagogical (competency assessment mechanism), legal (regulatory support for the recognition procedure), and institutional (Qualification Center).

The pedagogical component of the model provides for four consecutive stages.

The first stage – declaration: a servicemember submits an application and completes a structured declaration of combat experience, indicating: periods of participation in combat operations; positions held; tasks performed; training courses and exercises completed in the combat zone (including those conducted according to NATO standards); and key situations requiring responsible decision-making. Disclosure of restricted-access information is not required at this stage.

The second stage – identification: a subject commission, consisting of specialists from the relevant department and representatives of the combat experience unit, compares the declared competencies with the learning outcomes prescribed by the relevant educational program. At this stage, a list of academic disciplines (modules) whose learning outcomes may potentially be recognized is determined.

The third stage – assessment: to confirm the actual level of competencies, combined methods adapted to military specifics are applied. These include: structured interviews with departmental specialists (allowing assessment of the depth of understanding of tactical processes without disclosure of confidential information); practical demonstration of skills at training facilities (for tactical and fire competencies); analysis of a combat experience portfolio, which may include open-source documents (NATO course certificates, commendations, awards) and the servicemember's reflective report; and solving situational tasks (case studies) based on typical combat situations.

To ensure objectivity and prevent the reinforcement of erroneous skills, a three-level verification procedure is applied during the assessment stage. First, referential comparison: the declared experience is compared with NGU

regulatory documents (combat orders, mission reports, commanders' statements), which makes it possible to confirm the context in which the experience was acquired and to eliminate purely subjective or unreliable information. Second, cross-verification: during the structured interview, the commission asks control questions oriented toward critical thinking (for example: "What decision did you make and what consequences did it have?" and "How would your actions change in a similar situation considering the experience gained?"). This technique makes it possible to identify reflective understanding of experience as opposed to mechanical reproduction of actions. Third, compliance with current standards: the assessed competencies are compared with current doctrinal and tactical standards of the NGU and NATO. If the experience contains elements that contradict current standards or are considered ineffective according to post-combat analysis, such elements are not subject to recognition, and the relevant conclusion is recorded in the recommendation section of the commission protocol.

The fourth stage – recognition: based on the assessment results, the subject commission decides on full or partial recognition of informal learning outcomes. Recognition may take three forms: credit transfer for an academic discipline (if competencies fully correspond); recognition of individual modules of an academic discipline (in cases of partial correspondence); recognition within the elective component of the educational program.

The legal component of the model provides for the development and approval of a Regulation on the Recognition of Informal Learning Outcomes in NGU higher military educational institutions, which should include: procedures for submission and review of applications; requirements for the composition of subject commissions; a list of assessment methods and decision-making criteria; an appeals mechanism; requirements for the protection of restricted-access information; and procedures for recording recognition results in academic documentation and awarding ECTS credits.

Appeals Mechanism. The appeals mechanism has a two-tier structure. The first level – internal appeal: a servicemember who disagrees with the decision of the subject commission submits an appeal to the Head of the Qualification Center within 10 working days from the date of receiving the reasoned written decision. An appeals commission consisting of at least three members, at least two of whom did not participate in the initial assessment, reviews the case within 15 working

days and adopts one of three decisions: confirmation of the initial decision with detailed justification; referral for reassessment involving an independent specialist in the relevant tactical or specialized discipline; or annulment of the initial decision and recognition of the learning outcomes. The second level – external appeal: if the individual disagrees with the decision of the appeals commission, they have the right to apply to the National Qualifications Agency in accordance with Article 41 of the Law "On Education," as well as to an administrative court in accordance with the Code of Administrative Procedure of Ukraine. All decisions are documented in protocols signed by each commission member and stored in the archive of the Qualification Center for no less than five years.

Risks of Erroneous Recognition and Mechanisms for Their Minimization. The procedure for validating combat experience is associated with three groups of risks, each requiring specific managerial responses. First, academic risks: unjustified awarding of ECTS educational credits reduces the actual level of officer training and devalues formal qualifications. These risks are minimized through mandatory collegial decision-making (at least three commission members), which prevents unilateral influence, as well as through annual external audits of assessment quality conducted by the Scientific and Methodological Council of KINGU. Second, operational-combat risks: recognition of erroneous or morally outdated tactical techniques may instill false combat doctrines in future officers and endanger personnel safety. These risks are minimized through mandatory comparison of declared experience with current NGU doctrinal documents and NATO standards, as well as by involving specialists whose combat experience covers the period no earlier than 2022–2026. Third, corruption risks: subjectivity or bias on the part of assessors toward subordinates, comrades, or acquaintances. These risks are minimized through the incompatibility rule, according to which a commission member must declare recusal if they are in a relationship of direct subordination, kinship, or close personal acquaintance with the applicant, as well as through mandatory audio recording of structured interviews, with recordings retained for three years.

Institutional Component: Qualification Center of KINGU. A key practical recommendation of the study is the substantiation of the feasibility of establishing a Qualification Center at the Kyiv Institute of the NGU. According to the Law of Ukraine "On Amendments to Certain Legislative Acts of Ukraine Regarding the Functioning of the

National Qualifications System” of 01.04.2022 No. 2179-IX [19] and Article 38 of the Law “On Education” (2025 edition) [20], a qualification center is an entity authorized by the National Qualifications Agency to conduct assessment and recognition of learning outcomes, including those acquired through non-formal or informal education, and to award and confirm professional qualifications. The rationale is based on four arguments.

Regulatory argument: accreditation of a qualification center by the National Qualifications Agency grants legitimacy to recognition procedures and ensures compliance with nationwide quality standards for assessment.

Empirical argument: 84% of L-1 course participants and 80% of KINGU academic staff support the establishment of the center, indicating a social demand among both categories of participants in the educational process.

Infrastructure argument: KINGU possesses the necessary material and technical base for assessment procedures (training complexes, tactical ranges, modern equipment for simulating combat situations), as well as human resources (academic staff with combat experience and specialists in tactical and special disciplines).

Functional argument: the Qualification Center of KINGU would provide assessment and recognition of informal learning outcomes for L-1, L-1A, and L-1B course participants; assessment of competencies acquired according to NATO standards; awarding/confirmation of professional qualifications for NGU servicemembers; recognition of qualifications acquired during international missions and internships; and creation of a database of verified competencies for improving educational programs. Establishing such a center would transform KINGU into an institutional leader among higher military educational institutions of the security and defense sector in the field of recognition of informal learning outcomes.

Legal argument: legal responsibility for recognition outcomes has a three-level subject structure with clearly differentiated types of responsibility for each participant in the procedure. The Qualification Center of KINGU, as a legal entity (a structural subdivision of KINGU), bears institutional administrative responsibility for compliance with assessment procedures established by the National Qualifications Agency; violation of accreditation conditions may result in suspension or revocation in accordance with Law No. 2179-IX. The Head of the Qualification Center bears personal

disciplinary responsibility under the NGU Disciplinary Statute for improper organization of the center’s activities, as well as administrative liability for violations concerning storage and protection of personal data (Article 188-39 of the Code of Ukraine on Administrative Offenses). Members of the subject and appeals commissions bear collegial disciplinary responsibility for the substantiation of decisions recorded in protocols bearing their handwritten signatures; in the event of deliberate adoption of knowingly unfounded decisions, they may incur criminal liability for official negligence (Article 367 of the Criminal Code) or abuse of official position (Article 364 of the Criminal Code of Ukraine). The applicant bears personal criminal liability for knowingly false statements (Article 383 of the Criminal Code) and disciplinary responsibility for providing false information in the declaration of combat experience. This three-tier system of responsibility constitutes a necessary condition for accreditation of the Qualification Center and a guarantee of trust in the recognition documents it issues.

Conclusions and prospects for further research.

The conducted interdisciplinary study made it possible to substantiate a number of theoretical provisions and practical recommendations.

1. The hypothesis regarding the pedagogical equivalence of combat experience and informal learning outcomes was verified: combat experience corresponds to all constitutive characteristics of informal education as defined in Article 8 of the Law of Ukraine “On Education”. Four clusters of competencies were structured: tactical, leadership, communicative, and adaptive.

2. A systemic gap was identified at the departmental level of regulatory and legal support: despite the existence of a legislative framework (including the institution of qualification centers under Law No. 2179-IX), the NGU system lacks specific regulatory acts that adapt the recognition procedure to the particularities of higher military educational institutions.

3. A high level of support for the idea of recognition was empirically confirmed: 88% of L-1 course participants and 85% of KINGU academic and teaching staff support it. A positive correlation was established between the duration of combat experience and the level of support ($r = 0.64$; $p < 0.01$). Preferences regarding assessment methods were identified: structured interviews and practical demonstrations proved to be the most acceptable. Foreign RPL/PLAR experience (Canada and the

United Kingdom) was summarized, demonstrating the effectiveness of the portfolio-oriented approach.

4. An original model for validating combat experience was developed, integrating three components: pedagogical (four stages: declaration, identification, assessment, and recognition), legal (draft Regulation on recognition), and institutional (the Qualification Center of KINGU accredited by the National Qualifications Agency). The feasibility of establishing the Qualification Center was empirically substantiated: 84% of L-1 course participants and 80% of KINGU academic and teaching staff support this initiative.

Prospects for further research are associated with: developing assessment and evaluation materials for the validation procedure; preparing a package of documents for accreditation of the Qualification Center of KINGU by the National Qualifications Agency; studying the impact of recognition of combat experience on academic performance and learner motivation; and conducting comparative research on recognition practices across different components of Ukraine's security and defense sector.

References

1. *Zakon Ukrainy "Pro osvitu" № 2145-VIII* [Law of Ukraine about the Education activity no. 2145-VIII]. (2017, September 5). *Zakonodavstvo Ukrainy*. Retrieved from: <https://surli.cc/oqlpmp> (accessed 15 March 2026) [in Ukrainian].
2. *Nakaz Ministerstva osvity i nauky "Pro zatverdzhennia Poriadku vyznannia u vyshchii ta fakhovii peredyshchii osviti rezultativ navchannia, zdobutykh shliakhom neformalnoi ta/abo informalnoi osvity" № 130* [Order of the Ministry of Education and Science "On approval of the Procedure for recognition in higher and specialized higher education of the results of training obtained through non-formal and/or informal education" activity no. 130]. (2022, February 8). *Zakonodavstvo Ukrainy*. Retrieved from: <https://zakon.rada.gov.ua/go/z0328-22> (accessed 15 March 2026) [in Ukrainian].
3. *Nakaz Ministerstva osvity i nauky "Pro zatverdzhennia Zmin do Poriadku vyznannia u vyshchii ta fakhovii peredyshchii osviti rezultativ navchannia, zdobutykh shliakhom neformalnoi ta/abo informalnoi osvity" № 724* [Order of the Ministry of Education and Science "On approval of amendments to the Procedure for recognition in higher and specialized higher education of the results of training obtained through non-formal and/or informal education" activity no. 724]. (2025, May 13). *Zakonodavstvo Ukrainy*. Retrieved from: <https://surli.li/bjgpxe> (accessed 15 March 2026) [in Ukrainian].
4. Yakovenko Ye. S., Bielai S. V., Volkov I. M. (2022). *Zaprovadzhennia boiovoho dosvidu v osvitnii protses Natsionalnoi akademii Natsionalnoi hvardii Ukrainy pid chas vyvchennia zahalnoviiskovykh dystsyplin* [Introduction of combat experience into the educational process of the National Academy of the National Guard of Ukraine during the study of general military disciplines]. *Chest i zakon*, no. 4 (83), pp. 144–148 [in Ukrainian].
5. Yakovenko Ye. S., Kizian R. V. (2025). *Boiovyi dosvid u profesiinii pidhotovtsi viiskovykh fakhivtsiv* [Combat experience in professional training of military specialists]. *Problemy pravoohoronnoi ta osvitnoi diialnosti*, no. 2, pp. 16–22. DOI: <https://doi.org/10.59226/3041-1971.2.2025.16-22> [in Ukrainian].
6. Medvid M. M., Kitorov M. O., Medvid Yu. I., Poliakov V. Yu., Havryshchuk M. M., Vyshnevskaya Ya. A. (2023). *Zalezhnist rozvytku systemy vnutrishnoho zabezpechennia yakosti vid vprovadzhennia dosvidu praktychnoi diialnosti v osvitnii protses zakladu vyshchoi osvity* [Dependence of internal quality assurance system development on the implementation of practical experience in the educational process of higher education institution]. *Visnyk Cherkaskoho natsionalnoho universytetu imeni Bohdana Khmelnytskoho. Seriya: pedahohichni nauky*, no. 1, pp. 13–19. DOI: <https://doi.org/10.31651/2524-2660-2023-1-13-19> [in Ukrainian].
7. Vitchenko A. O. (2024). *Problemy profesionalizatsii vykladachiv VVNZ v umovakh suchasnoi viiny* [Problems of professionalisation of military higher education institution lecturers in modern warfare conditions]. *Osvita doroslykh: teoriia, dosvid, perspektyvy*, no. 26 (2), pp. 56–71. DOI: [https://doi.org/10.35387/od.2\(26\).2024.56-71](https://doi.org/10.35387/od.2(26).2024.56-71) [in Ukrainian].
8. Oliinyk L., Illiushchenko S., Aksanov T., Hnes B., Baranetska M. (2024). *Strukturno-funktsionalna model profesiinoho rozvytku naukovo-pedahohichnykh pratsivnykiv u protsesi pidvyshchennia kvalifikatsii u vyshchyykh viiskovykh navchalnykh zakladakh* [Structural-functional model of professional development of academic staff in the process of professional development in higher military educational institutions]. *Viiskova osvita*, no. 2 (50), pp. 116–125. DOI: <https://doi.org/10.33099/2617-1783/2024-50/116-125> [in Ukrainian].

9. Honcharenko Ye., Tkachenko A. (2022). *Vyvchennia ta vprovadzhennia dosvidu u Zbroinykh Sylakh Ukrainy* [Study and implementation of experience in the Armed Forces of Ukraine]. *Povitriana mits Ukrainy*, no. 1–2 (3), pp. 56–59. DOI: [https://doi.org/10.33099/2786-7714-2022-1-2\(3\)-56-59](https://doi.org/10.33099/2786-7714-2022-1-2(3)-56-59) [in Ukrainian].
10. Pashchuk Yu. (2023). *Rozvytok orhanizatsiinoho vyvchennia i vprovadzhennia dosvidu u Zbroinykh Sylakh Ukrainy ta yoho efektyvnist pid chas rosiisko-ukrainskoi viiny na Donbasi (2014–2021)* [Development of organizational lessons learned in the Armed Forces of Ukraine and its effectiveness during the russian-Ukrainian war in Donbas (2014–2021)]. *Viiskovo-naukovyi visnyk*, no. 39, pp. 217–236 [in Ukrainian].
11. Dyson, T., & Pashchuk, Yu. (2022). Organisational learning during the Donbas War: the development of Ukrainian Armed Forces lessons-learned processes. *Defence Studies*, no. 22 (2), pp. 141–167 [in English].
12. NATO Joint Analysis and Lessons Learned Centre (2022). *The NATO Lessons Learned Handbook*. Lisbon : JALLC [in English].
13. Royal Military College of Canada (n. d.). Prior Learning Assessment & Transfer Credits (Undergraduate). Retrieved from: <https://www.rmc-cmr.ca/en/plar> (accessed 15 March 2026) [in English].
14. Heneralnyi shtab ZSU (2020). *Doktryna z vyvchennia ta vprovadzhennia dosvidu u Zbroinykh Sylakh Ukrainy № 1928/NVHSH: VKP 7-00(01).01* [Doctrine on lessons learned in the Armed Forces of Ukraine activity no. 1928/NVHSH]. (2020, July 3). Kyiv : Heneralnyi shtab ZSU [in Ukrainian].
15. *Nakaz Komanduvacha Natsionalnoi hvardii Ukrainy "Pro zatverdzhennia Instruktсии z vyvchennia ta vprovadzhennia dosvidu vykonannia boiovykh (spetsialnykh) zavdan Natsionalnoi hvardiei Ukrainy pid chas vidsichi zbroinoi ahresii" № 390* [Order of the Commander of the National Guard of Ukraine "On approval of the Instruction on the study and implementation of experience in performing combat (special) tasks of the National Guard of Ukraine during the period of armed aggression" activity no. 390]. (2022, November 10) [in Ukrainian].
16. *Nakaz Ministerstva oborony Ukrainy "Pro zatverdzhennia Polozhennia pro osoblyvosti orhanizatsii osvithnoho protsesu u vyshchykh viiskovykh navchalnykh zakladakh Ministerstva oborony Ukrainy" № 120* [Order of the Ministry of Defense of Ukraine "On approval of the Regulations on the peculiarities of the organization of the educational process at higher educational institutions of the Ministry of Defense of Ukraine" activity no. 120]. (2024, February 15). Retrieved from: <https://surl.li/gozrlz> (accessed 15 March 2026) [in Ukrainian].
17. Fanshawe College (2022). Assessment of Military Experience through PLAR. In Prior Learning Assessment and Recognition (PLAR) at Fanshawe College. Retrieved from: <https://surl.li/duyols> (accessed 15 March 2026) [in English].
18. University of Portsmouth (n. d.). Recognition of Prior Learning (RPL). Retrieved from: <https://surl.li/xtrpow> (accessed 15 March 2026) [in English].
19. *Zakon Ukrainy "Pro vnesennia zmin do deiakykh zakonodavchykh aktiv Ukrainy shchodo funktsionuvannia natsionalnoi systemy kvalifikatsii" № 2179-IX* [Law of Ukraine about Amendments regarding the national qualifications system activity no. 2179-IX]. (2022, April 1). *Zakonodavstvo Ukrainy*. Retrieved from: <https://surl.li/caefpu> (accessed 15 March 2026) [in Ukrainian].

Стаття надійшла до редакції / Received: 27.03.2026
Прорецензовано та прийнято до друку / Reviewed and accepted for publication: 24.04.2026
Опубліковано / Published: 30.06.2026

ШАМРУК ОЛЕГ ПАВЛОВИЧ

*кандидат психологічних наук,
начальник кафедри професійної військової підготовки,
Київський інститут Національної гвардії України
<https://orcid.org/0009-0008-6138-5318>*

БОЙОВИЙ ДОСВІД ЯК ФОРМА ІНФОРМАЛЬНОГО НАВЧАННЯ: ПРОБЛЕМИ ВАЛІДАЦІЇ ТА ВИЗНАННЯ У СИСТЕМІ ВІЙСЬКОВОЇ ОСВІТИ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ

Здійснено міждисциплінарне дослідження проблеми визнання бойового досвіду військовослужбовців Національної гвардії України як результату інформального навчання у системі формальної військової освіти. На підставі аналізу нормативно-правової бази та результатів емпіричного дослідження (анкетування 50 слухачів курсів підвищення кваліфікації офіцерського складу L-1, а також 20 науково-педагогічних працівників Київського інституту НГУ) верифіковано гіпотезу про педагогічну тотожність бойового досвіду та інформального навчання. Запропоновано науково обґрунтовану модель валідації, що поєднує педагогічний механізм оцінювання компетентностей із нормативно-правовим забезпеченням процедури визнання. Обґрунтовано практичну доцільність створення у Київському інституті Національної гвардії України Кваліфікаційного центру як інституційного механізму реалізації процедур визнання результатів навчання відповідно до Закону України «Про внесення змін до деяких законодавчих актів України щодо функціонування національної системи кваліфікацій».

Ключові слова: *інформальна освіта; бойовий досвід; валідація; визнання результатів навчання; Національна гвардія України; вища військова освіта; кваліфікаційний центр; компетентності.*



YAKHNO IHOR

Adjunct,

Kyiv Institute of the National Guard of Ukraine

<https://orcid.org/0009-0006-0046-7163>



PAVLOV DMYTRII

Candidate of Military Sciences, Senior Researcher,

Professor of the Department of State Security,

Kyiv Institute of the National Guard of Ukraine

<https://orcid.org/0000-0002-4586-6399>

OPPORTUNITIES AND PROBLEMS OF USING RADIO-ELECTRONIC INTELLIGENCE WHEN PERFORMING TASKS IN ENSURING PUBLIC SAFETY AND PROTECTION OF OBJECTS

The possibilities and challenges of using electronic intelligence to ensure public safety and protect important government facilities amid increasing non-military threats have been explored. Recent trends in the spread of drones and remote-controlled explosive devices operating via radio communication channels have also been considered.

The goal is highlighted – exploring the possibilities and identifying the problematic issues of using electronic intelligence in ensuring the implementation of state security measures, such as: ensuring public safety and protecting important facilities in situations involving threats related to the spread of unmanned systems and remote-controlled explosive devices that operate using radio communication channels, as well as substantiating ways to improve the effectiveness of electronic intelligence to create situational awareness for the leadership.

The capabilities of electronic intelligence for detecting, recognizing, identifying, and tracking unmanned systems and radio-controlled explosive devices based on evaluating radio signal parameters have been analyzed. The role of electronic intelligence in building situational awareness for leadership has been determined.

The main problematic issues of a technical, organizational, and legal nature related to the use of electronic intelligence in the field of public safety have been considered. The need to integrate electronic intelligence tools with other surveillance systems, as well as to create a unified information space, has been substantiated.

Keywords: *state security; electronic intelligence; public safety; protection of especially important state facilities; protection of state power facilities; detection of radio-controlled devices.*

Problem Statement. Under contemporary conditions of the development of information and communication technologies and the widespread availability of technical means for remote control, there is a significant transformation in the nature of threats to public security (PS) and to important objects subject to protection, especially particularly important state objects, state authorities, and critical infrastructure facilities.

Current trends include:

- the proliferation of the use of radio-controlled unmanned systems (UAS), primarily unmanned aerial vehicles (UAVs);
- the steady increase in the number and types of explosive devices (EDs), the control or initiation of

which is carried out using radio communication channels.

The availability of commercial unmanned platforms, radio signal transmission means, and software-hardware means for remote control significantly increases the likelihood of their use not only for civilian purposes but also for unlawful ones.

These technical means may be used to conduct reconnaissance of important protected objects, deliver dangerous items, remotely detonate EDs, or perform other actions that pose a threat to the lives and health of citizens and the functioning of important protected objects. The use of radio communication channels to transmit control signals or initiate the detonation of EDs makes their



timely detection by traditional security measures more difficult, since radio signals can be transmitted across different frequency ranges and using different communication protocols.

In this regard, ensuring the timely detection, identification, recognition, and tracking of UAVs and remote control means of EDs that operate using radio communication channels becomes particularly relevant when protecting important objects, ensuring PS, preventing offences, preserving the life and health of citizens of Ukraine, etc. This will make it possible to establish sources of radio control in time with the aid of appropriate technical means, carry out their neutralisation, and take the necessary measures to protect the population and objects under protection.

The task of identifying the sources of radio control of technical means is achieved by analysing the radioelectronic environment, through continuous searching for and detecting their radio signals, i.e., conducting Signals Intelligence (SIGINT), the systematic collection, processing, analysis, and substantiation of information about the functioning of sources of radio emissions.

At the same time, analysis of the practice of performing such tasks indicates that, to date, there are a number of unresolved issues, namely:

- a shortage of scientifically grounded approaches to organising the search for, detection, recognition, identification, and tracking of UAVs and remote control means of EDs operating using radio communication channels under conditions of a complex radioelectronic environment;

- insufficiently studied issues related to integrating SIGINT means with technical surveillance systems of important protected objects, followed by the formation of a single information space to ensure an appropriate level of situational awareness of command personnel;

- the need to clarify organisational and staffing decisions regarding the use of SIGINT units in the interests of ensuring PS, and the methods of their interaction with other components of the security sector;

- the lack of agreed approaches to assessing the effectiveness of using SIGINT means, and the criteria for their performance in the specified field limits the possibilities for their practical use.

Thus, existing gaps in theoretical development, methodological support, and practical approaches to SIGINT use necessitate further research in this area, thereby substantiating the relevance of the article's topic and defining its purpose.

Analysis of recent research and publications.

The issues of detecting and countering threats

associated with the use of UAS and the remote control of explosive devices operating via radio communication channels have, in recent years, been actively studied in scientific works by both foreign and domestic scholars. In particular, current scientific studies have demonstrated the effectiveness of passive radio-frequency monitoring methods for detecting and identifying unmanned aerial vehicles using signal parameters of their control channels [1–3].

In works [1, 2], the feasibility of using machine learning methods for classifying UAV radio signals is demonstrated, thereby enabling higher recognition accuracy even under jamming conditions. Article [3] examines approaches to passive detection, tracking, and countering UAVs using radio-frequency sensors.

At the same time, it should be noted that similar principles can also be applied to detecting means of remote control of explosive devices that use standard or specialized radio communication channels for control. This necessitates expanding the functional capabilities of SIGINT systems to monitor the radio-frequency spectrum in order to detect potentially dangerous signals in a timely manner.

Domestic scientific works place significant emphasis on the development and application of SIGINT and radioelectronic monitoring means. In particular, in the work by I. Maiboroda, K. Vlasov, M. Hlushchenko [4], the capabilities and prospects of developing mobile SIGINT assets are considered, and their role in ensuring timely acquisition of information about the radioelectronic environment is defined.

In the article by S. P. Leshchenko, A. A. Adamenko, V. A. Lupandina, G. V. Mehelbei [5], approaches to building information support systems for countering UAVs are substantiated based on the integrated use of radiotechnical reconnaissance and electronic warfare means, which directly affects the formation of situational awareness of command personnel.

In addition, in the work by S. A. Shabeti [6], the use of radioelectronic monitoring tools in conditions of information confrontation is considered, particularly with respect to detecting and analyzing radio signals as sources of information about potential threats.

Thus, the results of the studies presented indicate that the application of SIGINT means creates prerequisites for improving the level of situational awareness of command personnel through the timely detection, recognition, and

tracking of UAVs and means of remote control of explosive devices operating using radio communication channels.

At the same time, analysis of scientific research shows that the issue of applying SIGINT capabilities to implement measures of state security—namely, directly in the interests of ensuring PS and protecting important objects – has been insufficiently addressed. Most scientific works are devoted to its use in the military sphere, whereas problems of adapting the relevant technologies to the needs of law-enforcement activity and security systems for important objects remain insufficiently studied. This necessitates further scientific research into the feasibility of using SIGINT to detect and identify technical means that use radio communication channels, in the interests of ensuring PS and protecting important objects, as well as to identify problematic issues related to implementing such means in the specified field of activity.

In addition, further scientific elaboration is required regarding the integration of SIGINT means with other surveillance systems, the organization of effective information support, and maintaining an appropriate level of situational awareness of command personnel, as well as considering legal aspects of using SIGINT means. This necessitates conducting comprehensive research in this direction.

Statement of the Task. The purpose of the article is to study the capabilities and identify problematic issues of using SIGINT in the interests of ensuring PS and protecting important objects under conditions of the proliferation of threats associated with the use of UAVs and means of remote control of explosive devices operating using radio communication channels, as well as to substantiate the directions for improving the effectiveness of using SIGINT for forming situational awareness of command personnel.

Presentation of the Main Material. Trends in the application of UAVs and means of remote control of explosive devices operating using radio communication channels have become widespread due to the availability of component-based solutions, the development of wireless communication technologies, and the ability to adapt them to various application scenarios.

As a rule, for control, open or semi-closed radio communication channels are used (GSM (English Global System for Mobile Communications, global system for mobile communications), Wi-Fi (English Wireless Fidelity, wireless local area communication technology), ISM (English

Industrial, Scientific, and Medical, parts of the radio-frequency spectrum intended for industrial, scientific, and medical use rather than telecommunications), LTE (English Long Term Evolution) / 5G (English 5th Generation, mobile communication standards), etc.), which makes it possible for them to be detected by SIGINT means [1–3].

This necessitates developing and implementing effective approaches to detecting, recognising, identifying, and tracking such means in real time; this makes SIGINT an important tool for these tasks, enabling the acquisition of information about radio emission parameters, the determination of signal source locations, and classification.

In view of this, it is expedient to consider the features of the radioelectronic environment in which the specified means operate, as well as the characteristic signal features that can be used to detect them.

1. Features of the Radioelectronic Environment and Signal Features of UAVs and Means of Remote Control of Explosive Devices Operating Using Radio Communication Channels.

The radioelectronic environment of modern facilities is characterised by a high density of signals of various purposes, which creates complex conditions for detecting potentially dangerous sources of radio emissions. Under such conditions, special importance is placed on isolating the signal features of radio signals inherent to UAVs and to remote control of explosive devices operating over radio communication channels.

The main features that can be used to identify UAVs and means of remote control of explosive devices operating using radio communication channels include:

- characteristic frequency ranges of operation of the specified technical means (e.g., 2.4 GHz, 5.8 GHz);
- the structure of the radio signal (type of modulation, bandwidth, etc.);
- time parameters of radio signal transmission;
- features of data exchange protocols between the operator (a likely malicious actor) and the UAV, explosive device remote control means, etc.

Studies show that combining radio-frequency signal analysis with machine learning algorithms increases the probability of identifying emission sources and determining their UAV origin [1, 2]. This is especially relevant in conditions where signal masking is deliberately employed or where civilian communication standards are used.

2. Capabilities of SIGINT in Detecting and Tracking Radio Emission Sources.

Based on consideration of the features of the radioelectronic environment, the practical capabilities of SIGINT for detecting and tracking radio emission sources are defined.

SIGINT ensures the implementation of a set of functions important for exposing modern UAVs and means of remote control of explosive devices operating using radio communication channels:

- detecting the presence of radio emission from potentially dangerous radio emission sources;
- determining the parameters of radio signals of potentially dangerous radio emission sources with subsequent identification;
- direction finding of radio emission sources;
- tracking radio emission sources in dynamics;
- generating information for making managerial decisions.

The use of passive SIGINT means enables covert surveillance without creating additional electromagnetic load, which is an important factor in ensuring PS. In addition, such means can be effectively used to detect both UAVs and remote-controlled explosive devices, since both types of potentially dangerous technical means rely on radio channels [3].

Ukrainian researchers also emphasise the importance of using mobile SIGINT complexes, which provide flexibility and prompt response to changes in the radioelectronic and operational situation, including changes in radio-frequency environment parameters, the appearance of new radio emission sources, the movement of UAVs, and activating means of remote control of explosive devices [4]. This is especially relevant for protecting facilities with a large territory or complex configuration.

3. The Role of SIGINT in Forming Situational Awareness of Command Personnel.

The results of SIGINT operations acquire practical value only if they are effectively used in the command and control of forces and assets involved in protecting important objects and ensuring PS. The effectiveness of threat countermeasures depends significantly on command personnel's situational awareness. In this context, SIGINT is one of the sources of information on the current situation.

Situational awareness involves command personnel having a holistic understanding of the current situation, including existing threats, their characteristics, and the possible development of events. The data obtained through SIGINT makes it possible to:

- timely detection of real and potential threats from potentially dangerous radiotechnical means;

- assess the nature and level of danger posed by potentially dangerous radiotechnical means;
- forecast the development of the situation regarding their probable use;
- make well-founded command decisions.

As noted in [5], integration of SIGINT data with other information sources (video surveillance, radar, security systems) makes it possible to form a single information space, which significantly increases the effectiveness of command and control of forces and assets involved in performing tasks for protecting important objects and ensuring PS when carrying out tasks to protect against real and potential non-military threats.

Thus, SIGINT plays a key role in providing information support for command and control and in enhancing situational awareness.

4. Problematic Issues of Using SIGINT.

Despite its significant potential, the use of SIGINT to ensure PS and protect important objects is hampered by several problematic issues that limit its effectiveness.

The main ones of these include:

Technical problems:

- difficulty in detecting signals in a dense radio-frequency environment in urban environments and areas of active use of wireless technologies (Wi-Fi, LTE, /5G, etc.), a high level of electromagnetic noise and mutual interference is formed. This makes it difficult to isolate radio emission sources (in particular, weak or short-duration ones), reduces the probability of their detection, and increases the risk of erroneous classification.

- the need to process large volumes of data in real time-SIGINT means carrying out continuous wideband monitoring, generating significant data streams (spectral snapshots, IQ samples (In-phase/Quadrature—representation of a signal in two components), signal signatures). Analysing them requires high-performance computing resources and effective algorithms (filtering, detection, classification); otherwise, delays arise, which critically affect the timeliness of response.

- limited accuracy in determining the coordinates of radio emission sources in conditions of dense urban development – dense construction causes multipath propagation, signal reflections, and signal shadowing. This leads to errors in direction-finding methods, causes shifts in coordinate estimates, and reduces the reliability of localisation, especially for low-power or moving sources.

Organisational problems:

- lack of unified approaches to integrating heterogeneous surveillance systems—different

systems (SIGINT, video surveillance, sensor networks, etc.) are often built on the basis of incompatible standards and protocols. This complicates data exchange, their harmonisation, and the formation of a single picture of the situation, which reduces the effectiveness of management and action coordination.

- possible insufficient number of personnel in the SIGINT direction and an insufficient level of their professional training – the limited number of specialists with the necessary knowledge (radiotechnology, signal processing, analytics) leads to an overload of available personnel. An insufficient level of training or the absence of systematic training reduces the quality of data analysis and the effectiveness of using SIGINT means.

- limitations of resources for deploying modern SIGINT systems – the high cost of equipment, software, and its maintenance limits the ability to implement modern complexes. Additional impacts come from modernisation costs of infrastructure, personnel training, and supporting the continuous operation of the systems.

Legal problems:

- lack of a regulatory framework regarding the use of SIGINT in carrying out measures to ensure public security and when protecting important state facilities;

- the need to comply with requirements for protecting information and confidentiality – during SIGINT activities, data may be obtained that contains personal or official information. This requires strict compliance with information protection legislation to prevent unauthorised access, data leakage, and violations of citizens' rights.

As emphasised in [6], solving these problems requires a comprehensive approach that includes improving the regulatory and legal framework, developing technical means, and training specialists.

Conclusions and Prospects for Further Research. As a result of the conducted analysis, it has been established that the rapid growth in the availability of unmanned technologies and radio-control means increases the level of threats to protected objects and to public security overall. The use of such means is characterised by high mobility, covert operation, and the possibility of using standard radio communication channels, which significantly complicates their timely detection by traditional means.

It is substantiated that one of the most effective tools for detecting and countering such means is signal intelligence (SIGINT), which ensures:

- detection of control signals of unmanned systems and means of remote control of explosive devices that operate using radio communication channels;

- recognition of signal types (analogue/digital, communication protocols, modulation characteristics, etc.), which subsequently enables the identification of emission sources (operators of unmanned systems, relays, explosive-device radio channels, etc.) and tracking of targets through continuous monitoring of signal parameters (frequency, power, direction, time characteristics).

The use of signal intelligence means makes it possible to:

- carry out continuous monitoring of the radio-frequency spectrum within defined zones;

- determine key signal parameters (frequency, bandwidth, modulation type, protocol identifiers) and establish the location of radio emission sources using direction-finding methods, ensuring early detection of unmanned systems and radio-controlled explosive devices; reduce the response time to probable threats from radio-controlled devices.

The use of signal intelligence also increases situational awareness by forming an up-to-date picture of the radioelectronic environment.

- allows integration of data with video surveillance, radar, unmanned system detectors, creating a single information space.

At the same time, a number of problematic issues accompanying the use of signal intelligence in the specified field have been identified, in particular, technical, organisational, and legal limitations.

Further research should be aimed at:

- determining the conditions and factors that affect the effectiveness of fulfilling service-combat tasks by signal intelligence units;

- developing a set of indicators (criteria) for evaluating the effectiveness of fulfilling the tasks of conducting signal intelligence.

References

1. Tekin, K., Yavuz, A. G. (2021). Drone detection using machine learning methods based on RF signals. *IEEE Access*, no. 9, pp. 77165–77181. DOI: <https://doi.org/10.1109/ACCESS.2021.3082531> [in English].
2. Aydin, B., Selvi, E., & Ozdemir, M. F. (2020). Deep learning-based UAV detection using

RF signals. *IEEE Communications Letters*, no. 24 (9), pp. 2019–2023. DOI: <https://doi.org/10.1109/LCOMM.2020.3001844> [in English].

3. Guvenc, I., Koohifar, F., Singh, S., Sichitiu, M. L., & Matolak, D. W. (2018). Detection, tracking, and interdiction for amateur drones. *IEEE Communications Magazine*, no. 56 (4), pp. 75–81. DOI: <https://doi.org/10.1109/MCOM.2018.1700455> [in English].

4. Maiboroda I., Vlasov K., Hlushchenko M. (2024). Application and development prospects of mobile radioelectronic intelligence means of tactical link of the sector of security and defence forces of Ukraine. *Chest i zakon*, no. 2 (89), pp. 83–84 [in English].

5. Leshchenko S. P., Adamenko A. A., Lupandin V. A., Mehelbei H. V. (2022). *Systema*

informatsiinoho zabezpechennia protydii bezpilotnym litalnym aparatom protyvnyka pry kompleksnomu zastosuvanni zasobiv radioelektronnoi borotby [Information support system for countering enemy unmanned aerial vehicles with the integrated use of electronic warfare equipment]. *Litalni aparaty: aerodynamika, sylovi ustanovky, obladnannia, ozbroiennia ta zastosuvannia*, no. 73, pp. 31–36 [in Ukrainian].

6. Shabetia S. A. (2024). *Radioelektronni zasoby monitorynhy v umovakh informatsiinoi viiny* [Radio-electronic monitoring means in the conditions of information warfare]. *Akademichni vizii*, no. 44. Retrieved from: <https://surl.li/tgwexi> (accessed 6 March 2026) [in Ukrainian].

Стаття надійшла до редакції / Received: 14.04.2026

Прорецензовано та прийнято до друку / Reviewed and accepted for publication: 20.05.2026

Опубліковано / Published: 30.06.2026

ЯХНО ІГОР ЮРІЙОВИЧ

ад'юнкта,

Київський інститут Національної гвардії України

<https://orcid.org/0009-0006-0046-7163>

ПАВЛОВ ДМИТРІЙ ВАДИМОВИЧ

кандидат військових наук, старший науковий співробітник,

професор кафедри забезпечення державної безпеки,

Київський інститут Національної гвардії України

<https://orcid.org/0000-0002-4586-6399>

МОЖЛИВОСТІ ТА ПРОБЛЕМНІ ПИТАННЯ ЗАСТОСУВАННЯ РАДІОЕЛЕКТРОННОЇ РОЗВІДКИ ПІД ЧАС ВИКОНАННЯ ЗАВДАНЬ ІЗ ЗАБЕЗПЕЧЕННЯ ГРОМАДСЬКОЇ БЕЗПЕКИ ТА ОХОРОНИ ОБ'ЄКТІВ

Досліджено можливості та проблемні питання застосування радіоелектронної розвідки для забезпечення громадської безпеки й охорони важливих державних об'єктів в умовах зростання загроз невоєнного характеру. Розглянуто сучасні тенденції поширення безпілотних систем і засобів дистанційного керування вибуховими пристроями, що функціонують із використанням каналів радіозв'язку.

Проаналізовано можливості радіоелектронної розвідки щодо виявлення, розпізнавання, ідентифікації та супроводження безпілотних систем і радіокерованих вибухових пристроїв на підставі оцінювання параметрів радіосигналів. Визначено роль радіоелектронної розвідки у формуванні ситуаційної обізнаності керівного складу.

Висвітлено основні проблемні питання технічного, організаційного та правового характеру, пов'язані із застосуванням радіоелектронної розвідки у сфері забезпечення громадської безпеки. Обґрунтовано необхідність інтеграції засобів радіоелектронної розвідки з іншими системами спостереження, а також створення єдиного інформаційного простору.

Ключові слова: *державна безпека; радіоелектронна розвідка; громадська безпека; охорона особливо важливих державних об'єктів; охорона об'єктів державної влади; виявлення радіокерованих засобів.*

Н а у к о в е в и д а н н я

**НАУКОВИЙ ВІСНИК
КИЇВСЬКОГО ІНСТИТУТУ НАЦІОНАЛЬНОЇ ГВАРДІЇ УКРАЇНИ**

Науковий журнал (піврічник)

№ 1 (8) 2026



Відповідальний за випуск *Л. В. Полуніна*
Редактор *Я. М. Холоденко*
Комп'ютерне складання і верстання *Ю. І. Медвідь*

Підписано до друку 29.06.2026.
Формат 60x84/8. Папір офсет. Умовн. друк. арк. 30,2.
Наклад 50 прим. Зам. 341

Видавець і виготовлювач: Київський інститут Національної гвардії України.
Адреса: вул. Оборони Києва, 7, м. Київ, 03179

Свідоцтво про внесення суб'єкта видавничої справи
до Державного реєстру видавців, виготовлювачів і розповсюджувачів
видавничої продукції Серія ДК № 7696 від 8.11.2022 р.

Scientific publication

**SCIENTIFIC BULLETIN
OF THE KYIV INSTITUTE OF THE NATIONAL GUARD OF UKRAINE**

Scientific journal (semiannual)

No. 1 (8) 2026



Responsible for the publication *L. Polunina*

Editor *Ya. Kholodenko*

Computer assembly and layout *Yu. Medvid*

Signed for publication 29.06.2026

Format 60x84/8. Offset paper. Approx. printed pages. 30.2

Edition of 50 copies. Order No 341

Founder and publisher: Kyiv Institute of the National Guard of Ukraine.
Kyiv, 7, Oborony Kyieva Str., 03179

Certificate of registration of a publishing entity to the State Register
of Publishers, Manufacturers and Distributors of Publishing
Products Series DK No 7696 dated 8.11.2022.