10.12753/2284-9378-20-63

ASSESSMENT METHODOLOGY OF THE LEVEL OF TRAINING OF JOINT TACTICAL GROUPS OF SHIPS

Capt. (Navy) Vitaly BEZUHLYI, PhD Candidate*

An analysis of military conflicts of the last decades indicates the widespread and comprehensive use of hybrid methods of threats, concealed, indirect (veiled) use of regular troops. Under such conditions, the use of armed forces with other components of the defence forces is indisputable. The new approach to state defence is based on the main categories that affect the development of the use of state defence forces, namely, time, space, reason. Under such conditions, there is a need to make changes in the system of combat training, which will ensure the appropriate level of training of forces (troops) of the Armed Forces and other military formations, acquisition of capabilities to jointly perform tasks as part of joint defence forces. Acquisition of capabilities to jointly perform the tasks by ships the Naval Forces and the Maritime Security Service of the State Border Service has certain features in terms of combat training and deserves attention from military science and requires a separate study.

Keywords: effectiveness of combat training; assessment methodology; level of training; joint tactical groups of ships.

The experience of modern military conflicts indicates the wide and comprehensive use of information, cybernetic, economic, political, diplomatic, legal and illegal measures and methods with limited use of military means. New trends of combat activities at sea have been identified, namely: isolation of the combat area from the sea, fight against quasi-state flotillas, fight against piracy in all its forms, restoration of maritime border control in conditions of non-recognition by the aggressor, opposing to non-military measures and indirect enemy actions.

An analysis of trends in the nature of military conflicts makes it possible to assert that today the aggressor state uses private military companies or regular military formations without insignia. The task of such armed groups is to reduce the military potential of the state in peacetime before the war. The results of such actions can have unpredictable consequences: the loss of Navy bases, the destruction of the logistics system, the loss of ships making up the Navy's combat core, and even the loss of trained human resources. In such conditions, the level of performing the tasks by Naval Forces is significantly reduced, and the successful performing of tasks requires joint efforts with the Maritime Security Service of the State Border Service. A vivid example of this is the armed aggression by the Russian Federation (RF) against Ukraine, the temporary occupation of the Autonomous Republic of Crimea (AR Crimea), and the city of Sevastopol[1].

The leading countries of the world also pay attention to the use of joint (interagency) formations. Thus, the United States in the new strategy of the Army – 2028 determined the creation in 2020 of the Security Force Assistance Brigades and the Security Force Assistance Command and will continue the practical examination of the experimental unit Multi Domain Task Force[2]. These supposed to help to work out the optimal structure and concept for effective use of US Army in future.

Countries that have strong enough navies also resort to joint (interagency) formations. The events of November 2018 in the Kerch Strait confirm this. In order to prevent the peaceful transit of the group of Ukrainian Navy boats and afterward to detain them illegally the Russian Federation resorted to the use of forces and means of the Black Sea Fleet and the Coast Guard of the Border Service of the Russian Federation.

Considering the exclusive responsibility of the Navy in protecting national interests in the maritime operational area, as well as expanding the range of tasks, it is undeniable that the Naval Forces can and should act jointly with the Maritime Security Service of the State Border Service.

* ***National Defence University of Ukraine***
e-mail: *shturmonf7@gmail.com*

For their effective use, it is necessary to unite the ships of the Navy and Maritime Security Service of the State Border Service in tactical groups, which in form and methods of application will meet the tasks assigned to them and will be ready to act both independently and as part of joint (interagency) groups.

Taking into account everything mentioned above, the joint tactical group of ships is the temporary formation created from ships (boats) of the defence forces, for the joint implementation of the tactical task under a unified command. The quality of tasks performed by a joint tactical group of ships (group) directly depends on the effectiveness of the combat training, one of the important indicators of which being the level of training.

The imperfection of the existing methodological approaches to assessing the level of training of the groups in peacetime and the impossibility of their full use to assess the effectiveness of combat training induce the need for improvement of scientific and methodological apparatus and justification of the proposed changes.

This requires a scientific justification of a comprehensive methodology for assessing the level of training of joint tactical groups of ships and indicates the relevance of the topic.

To determine the level of training of the group $N_{T_G}(t)$, it is proposed to use the following methodology.

It is proposed to assess the level of training of the group $N_{T_G}(t)$ by an indicator, the value of which determines the level of knowledge of military personnel and their ability to perform the tasks in the group.

The indicators that characterize the level of training of the group are proposed to include: the integral level of individual capabilities (IC) of military personnel of the group command (GC), which is responsible for the implementation of the group and the level of coherence of the group.

Given that the IC of military personnel of the GC affect the coherence of the group, indicates a high correlation of indicators. Under the following conditions, it is proposed to calculate the level of training of the group $N_{T_G}(t)$ at the *t* moment of time by means of normalized multiplicative aggregation[3]:

$$N_{T_G}(t) = Z_{IC_{GC}}(t)^{q_{IC_{GC}}} \cdot Z_{C_G}(t)^{q_{C_G}},$$

where $Z_{IC_{GC}}(t)$ – the integral level of IC of military personnel of the GC at the *t* moment of time; $Z_{IC_{GC}}(t)$ – the level of coherence of the group at the *t* moment of time; $q_{IC_{GC}}$, q_{C_G} – the "weight" coefficients of indicators $Z_{IC_{GC}}(t)$ and $Z_{C_G}(t)$. Calculation of the "weight" coefficients is carried out by the method of expert evaluation[4]. Each of the indicators consists of a set of indicators of the lower level of the hierarchy, which characterize and reveal their physical content.

It is proposed to calculate the integral level of IC of military personnel of the GC $Z_{IC_{GC}}(t)$ with indicators that take into account the integral level of IC *j-th* category of military personnel of the GC:

- the category of group commander who directly decides on the training and implementation of the group;
- the category of staff officers who develop planning documents for the training and implementation of the group, combat orders, annexes to them, etc.

The integral level of IC of military personnel of the GC $Z_{IC_{GC}}(t)$ will depend on the indicator of the level of IC of each of the categories. It should be noted that the level of IC of certain categories of military personnel of the GC does not depend on each other.

Under the following conditions, the integral level of IC of military personnel of the GC is proposed to be calculated using additive aggregation:

$$Z_{IC_{GC}}(t) = \sum_{j=1}^{J} C_{ICj}(t)^{q_j},$$

where, $C_{ICj}(t)$ – the level of IC *j-th* category of military personnel of the GC at the *t* moment of time; q_j – the "weight" coefficients of indicators $C_{ICj}(t)$. Calculation of "weight" coefficients is carried out by the method of expert evaluation.

The level of IC *j-th* category of military personnel of the GC depends on the level of IC every *i-th* serviceman of the category and does not depend on each other, so their performance does not affect each other. Under the following conditions, in order to calculate the level of IC *j-th* category of military personnel of the GC $C_{ICj}(t)$ at the *t* moment of time we will use the next formula:

$$C_{ICj}(t) = \frac{\sum_{i=1}^{I} X_{ICj_i}}{I}(t),$$

where $X_{ICj_i}(t)$ – the level of IC of the *i-th* serviceman *j-th* category of military personnel of the GC the *t* moment of time; I – the quantity of servicemen in *j-th* category of military personnel of the GC at the *t* moment of time.

The assessment of $X_{ICj_i}(t)$ level of IC of the *i-th* serviceman *j-th* category of military personnel of the GC is determined by indicators that characterize the level of education of the *i-th* serviceman in *n-ths* main subjects of education, by the next formula:

$$X_{ICj_i}(t) = \frac{\sum_{b=1}^{B} M_b}{B}(t),$$

where $M_b(t)$ – the level of education of the *i-th* serviceman in *b-th* subject of education at the *t* moment of time; B – the quantity of the main subjects of education at the *t* moment of time.

The assessment of $M_b(t)$ is proposed to determine with indicators that characterize the level of theoretical knowledge and practical skills of the servicemen in *b-ths* main subjects of education.

Due to the fact that knowledge and skills are not dependent on each other, and therefore their indicators are not dependent, it is proposed to use additive aggregation[5] to assess the level of education of the *i-th* serviceman in the *b-th* subject of study.

$$M_b(t) = \sum_{b=1}^{B} L_{bi}(t) \cdot q_b,$$

where $L_{bi}(t)$ – the level of education of the *i-th* serviceman: "theoretical knowledge" $L_{zi}(t)$, "practical skills" $L_{ui}(t)$; q_b – the – weight" coefficients of indicators $L_{bi}(t)$.

Calculation of the "weight" coefficients q_b is carried out by the method of expert evaluation.

The indicator that characterizes the level of the theoretical knowledge of the *i-th* serviceman $L_{zi}(t)$ is proposed to be calculated based on the results of theoretical questions (testing) in the *b-th* main subject of study. The total number of questions should provide an objective and comprehensive assessment of the level of theoretical knowledge of the serviceman.

The assessment of the theoretical knowledge the theoretical knowledge $L_{zi}(t)$ of the *i-th* serviceman is calculated by formula:

$$L_{zi}(t) = \frac{U_{fi}(t)}{U_{ti}(t)},$$

where $U_{fi}(t)$ – the quantity of correct answers given by *i-th* serviceman; $U_{ti}(t)$ – the total quantity of the theoretical questions.

The indicator that characterizes the level of practical skills of the *i-th* serviceman $l_{fi}(t)$ $L_{ui}(t)$ is calculated based on the results of practical tasks performed by him. The content and number of tasks should take into account the functional purpose of the serviceman in accordance with the position held.

The assessment of the level of practical skills $L_{ui}(t)$ is done by formula:

$$L_{zi}(t) = \frac{U_{fi}(t)}{U_{ti}(t)},$$

where $U_{fi}(t)$ – the quantity of tasks performed by the i-th serviceman correctly; $U_{ti}(t)$ – the total quantity of tasks that were given to the *i-th* serviceman.

The level of coherence of the group $Z_{C_G}(t)$ is proposed to be calculated by indicators that take into account the level of coherence of the GC and the level of training of the ships to jointly perform tasks in the group. It should be noted that the indicators that determine the level of coherence of the group do not affect each other. Under such conditions, the level of coherence of the group is proposed to be calculated using additive aggregation:

$$Z_{C_G}(t) = C_{C_{GC}} q_{C_{GC}} + C_{T_{JPT}} q_{T_{JPT}},$$

where $C_{C_{GC}}(t)$ – the indicator that expresses "the level of coherence of the GC"; $C_{T_{JPT}}(t)$ – the indicator that expresses "the level of training of the ships to jointly perform tasks in the group"; $q_{C_{GC}}$, $q_{T_{JPT}}$ – the "weight" coefficients of the indicators.

The numerical value of the indicator $C_{C_{GC}}(t)$ is proposed to be calculated based on the results of performance of collective training standards by the GC.

Therefore, the assessment of the level of coherence of the GC is done by formula:

$$C_{C_{GC}}(t) = \frac{\sum_{k=1}^{K} X_k(t)}{5 \cdot K}; \quad X_k(t) = \overline{2,5},$$

where $X_k(t)$ – the grade of the GC in *k-th* collective training standard at the *t* moment of time;

K – the quantity of the collective training standards in accordance with the plan of training.

Each collective training standard consists of the sections that characterize the capability of the GC to perform certain tasks. It is proposed to assess $X_k(t)$ based on the grades for every section of the collective training standard by the following formula:

$$X_k(t) = \frac{\sum_{l=1}^{L} M_{CTS_L}(t)}{L}; \quad M_{CTS_L} = \overline{2,5},$$

Where $M_{CTS_L}(t)$ – the grade of the results of performance by the unit of the *L-th* section of the collective training standard at the *t* moment of time; L – the quantity of sections of the collective training standard $X_k(t)$ is assessed:

$$X_k = \begin{cases} excellent, \ if \ \dfrac{\sum\limits_{l=1}^{L} M_{CTS_L}(t)}{L} \geq 4,5; \ M_{CTS_L} \geq 4; \\ good, \ if \ \dfrac{\sum\limits_{l=1}^{L} M_{CTS_L}(t)}{L} \geq 3,5; \ M_{CTS_L} \geq 3; \\ satisfactory, \ if \ \dfrac{\sum\limits_{L=1}^{L} M_{CTS_L}(t)}{L} < 3,5; \ M_{CTS_L} \geq 3; \\ unsatisfactory, \ if \ M_{CTS_L}(t) = 2. \end{cases}$$

In turn, the sections of the collective training standard consist of elements that must be performed by the unit. The calculation of the grade of the results of performance by the unit of the *L-th* section of the collective training standard is proposed to do by the following formula:

$$M_{CTS_L}(t) = \left(\frac{x + y}{x^* + y^*} \right) \cdot z_x \quad z_x = \begin{cases} 1, \ x = x^*; \\ 0, \ x < x^*, \end{cases}$$

where x – the number of critical elements performed; x^* – the total number of critical elements; y – the number of other elements performed; y^* – the total number of other elements; z_x – the index of validity of the final result for critical elements (condition of mandatory full implementation).

The section of the collective training standard is graded:

$$M_{CTS_L} = \begin{cases} excellent, \ if \ M_{CTS_L}(t) \geq 0,8; \\ good, \ if \ 0,7 \leq M_{CTS_L}(t) < 0,8; \\ satisfactory, \ if \ 0,6 \leq M_{CTS_L}(t) < 0,7; \\ unsatisfactory, \ if \ M_{CTS_L}(t) < 0,6. \end{cases}$$

The numerical value of the indicator of the level of training of ships to perform jointly the tasks within the tactical group, $C_{T_{JPT}}(t)$, is proposed to calculate based on the results of performance of joint exercises and joint gunnery exercises.

Therefore, the assessment of the level of training of ships to jointly perform tasks in the group is calculated using additive aggregation:

$$C_{T_{JPT}}(t) = X_{je} \cdot q_{je} + X_{jge} \cdot q_{jge}$$

where $X_{je}(t)$ – the indicator that characterizes the level of joint exercises performance by ships in the group at the t moment of time; $X_{jge}(t)$ – the indicator that characterizes the level of joint gunnery exercises performance by ships in the group at the t moment of time; q_{je}, q_{jge} – the "weight" coefficients of the indicators.

The numerical value of the indicator $X_{je}(t)$ that characterizes the level of joint exercises performance by ships in the group, is calculated based on the results of the *v-ths* joint exercises specified in the training plan with formula:

$$X_{je}(t) = \frac{\sum\limits_{v=1}^{V} M_{je_V}(t)}{V}; \quad M_{B_V} = \overline{0,1},$$

where $M_{je_V}(t)$ – the level of performance *v-th* joint exercise by ships in the group at the *t* moment of time; V – the quantity of joint exercises. The joint exercise is graded:

$$M_{je_V}(t)=\begin{cases}1,\text{“}accomplished\text{”},\begin{pmatrix}if\ the\ exercise\ is\ completely\ accomplished\ in\ proper\ time,\\ and\ the\ order\ of\ its\ accomplishment\ was\ in\ accordance\ with\\ tactical\ publications\ without\ critical\ divergences;\end{pmatrix}\\ 0,\text{“}not\ accomplished\text{”},if\ performed\ not\ in\ accordance\ with\ exercise\ requirements.\end{cases}$$

The numerical value of the indicator $X_{jge}(t)$ that characterizes the level of joint gunnery exercises performance by ships in the group is proposed to calculate based on the results of joint gunnery exercises performance[6].

By formula:

$$X_{jge}(t)=\frac{\sum_{s=1}^{S}M_{jge_S}(t)}{5\cdot S};\quad M_{jge_S}=\overline{2,5},$$

where $M_{jge_S}(t)$ – the indicator that characterizes the grade of the *s-ths* joint gunnery exercises performance at the t moment of time; S – the quantity of the joint gunnery exercises that are planned in accordance with the training plan. The value $M_{jge_S}(t)$ of the joint gunnery exercise is determined by tactical, fire and technical indicators and calculated by formula:

$$M_{C_S}(t)=\frac{L_T+L_F+L_W}{3},\quad L_T;L_F;L_W=\overline{2,5},$$

where $L_T(t)$ – the value of the tactical indicator at the t moment of time; $L_F(t)$ – the value of the firing indicator at the t moment of time; $L_W(t)$ – the value of the technical indicator at the t moment of time.

The joint gunnery exercise is graded:

$$M_{C_S}=\begin{cases}excellent,\ if\ \frac{L_T+L_F+L_W}{3}\geq 4,76;\\ good,\ if\ 3,8\leq\frac{L_T+L_F+L_W}{3}<4,76;\\ satisfactory,\ if\ 2,8\leq\frac{L_T+L_F+L_W}{3}<3,8;\\ unsatisfactory,\ if\ \frac{L_T+L_F+L_W}{3}<2,8.\end{cases}$$

The assessment of the tactical indicator $L_T(t)$ during the firing is determined in accordance with the decisions made by the commander of the group to solve the tactical task, which ensured the success of the battle in a certain time (reduced the effectiveness of the enemy), and calculated by the formula:

$$L_T(t)=5+\sum_{p=1}^{P}K_p,$$

where K_P – coefficient of reduction of the value of a tactical indicator of joint firing for an error made during solving of a tactical task, according to the table[7].

The assessment of the firing indicator $L_F(t)$ is determined by assessing the success of the firing of each *a-th* ship of the group separately, summarized in the overall assessment and calculated by the formula:

$$L_F(t)=\frac{\sum_{a=1}^{A}U_{Fa}(t)}{A};\quad U_{Fa}=\overline{2,5},$$

where U_{Fa} – an indicator that characterizes the assessment of the success of firing of each *a-th* ship of the group at the t moment of time; A – the quantity of the ships in the group.

The firing indicator is graded:

$$L_F = \begin{cases} excellent, \ if \ L_F(t) \geq 4,5; \ L_F \geq 4; \\ good, \ if \ L_F(t) \geq 3,5; \ L_F \geq 3; \\ satisfactory, \ if \ L_F(t) \geq 2,75; \ L_F \geq 2; \\ unsatisfactory, \ if \ L_F(t) < 2,75; L_F \geq 2. \end{cases}$$

The assessment of the success of the firing of each *a-th* ship of the group, $U_{Fa}(t)$, is determined by five firing indicators and calculated:

$$U_{Fa}(t) = \frac{\sum_{g=1}^{G} G}{5}; \qquad G = \overline{2,5},$$

where G_1 – the value of the first firing indicator, time of completion of preparation of group for joint firing; G_2 – the value of the second firing indicator, the value of firing of the *a-th* ship of the group; G_3 – the value of the third firing indicator, the time for the trial firing; G_4 – the value of the fourth firing indicator, the success of the firing; G_5 – the value of the fifth firing indicator, the *firing rate*.

The assessment of the first firing indicator G_1, time of completion of preparation of group for joint firing is determined by the ratio of the *standard time* to prepare for firing to the factual spent time of preparation for firing and is calculated by the formula:

$$G_1 = \frac{T_\alpha}{T_\beta}$$

where T_α – the *standard time* to prepare for firing; T_β – the factual spent time of preparation for firing.

The first firing indicator is graded:

$$G_1 = \begin{cases} excellent, \ if \ G_c(t) \geq 1,0; \\ good, \ if \ 0,9 \leq G_c(t) < 1,0; \\ satisfactory, \ if \ 0,85 \leq G_c(t) < 0,9; \\ unsatisfactory, \ if \ G_c(t) < 0,85. \end{cases}$$

T_α – the *standard time* to prepare for firing is determined by the maximum time of preparation of a single ship and increased by 20 seconds;

T_β – the factual spent time of preparation for firing is the time from the moment of *target data designation* from the command ship (flagship) to the moment of the trial firing.

The assessment of the second firing indicator, G_2, the value of firing of the *a-th* ship of the group is evaluated for every ship separately. The overall value of the second firing indicator in joint firing is determined by the worst value of firing in the group.

The assessment of the second firing indicator is determined by the lowest of the values of the accuracy of training in range and direction:

- when firing at a rate of fire < 30 shots/min. by the deviation of the first shot (when firing on one sight), the middle volley of the first turn (when firing turns on three sights);
- when firing at a rate of fire ≥ 30 shots/min. by the average deviation of the first turn;
- when firing complexes with unguided missiles by the average deviation of the first turn.

The value is determined according to the table of acceptable values of deviations in the transfer of fire from the auxiliary target for ships[8].

The assessment of the third firing indicator, G_3, the time for the trial firing of the group is determined by the ratio of the *standard time* for trial firing to the factual spent time for trial firing and is calculated by the formula:

$$G_3 = \frac{T_\lambda}{T_\varphi}$$

where T_λ – the *standard time* for trial firing; T_φ – factual spent time for trial firing, is calculated from the moment of time of the first trial volley to the moment of time of the first disabling volley.

The third firing indicator is graded:

$$G_3 = \begin{cases} excellent, \ if \ G_p(t) \geq 1,0; \\ good, \ if \ 0,85 \leq G_p(t) < 1,0; \\ satisfactory, \ if \ 0,7 \leq G_p(t) < 0,85; \\ unsatisfactory, \ if \ G_p(t) < 0,7. \end{cases}$$

The value of the *standard time* for trial firing, T_λ , is calculated by formula:

$$T_\lambda = K_\lambda \left(t_n + \tau + t_g \right),$$

where K_λ – the coefficient, depending on the method of trial firing, is determined by the table[9]; t_n – time of flight of a trial volley; τ – interval of silence, for optical 10s and technical observations 15s; t_g – time of performance of all trial volleys.

Time of performance of all trial volleys is calculated by formula:

$$t_g = d(n-1) + t_\omega,$$

where d – the standard time between adjacent trial volleys of the ship, s; n – the number of trial volleys of one ship; t_ω – the period of time between the first trial volley of the first and last ship in the order of execution of the firing, s.

The assessment of the fourth firing indicator, G_4, the success of the firing determined by comparing the number of impacts to firing with the mathematical number of the predicted number of impacts according to the diagram[10].

The assessment of the fifth firing indicator, G_5, the *firing rate* is measured by gaps and is calculated based on the percentage of the number of gaps to the total number of shots fired.

If there were no gaps when firing, the fifth firing indicator, G_5, is evaluated 5 points "excellent", if not more than 10% of the ordnance payload is used – 4 points "good", not more than 25% – 3 points "satisfactory", more than 25% – "unsatisfactory".

The assessment of the technical indicator $L_W(t)$ of joint firings of the group is calculated as integral level of technical indicators of the ships of the group, by formula:

$$L_W(t) \frac{\sum_{n=1}^{N} U_n(t)}{N}; \quad U_n(t) = \overline{2,5},$$

where $U_n(t)$ – the value of the technical indicator of the ship of the group at the t moment of time; N– quantity of ships.

The value of the technical indicator $U_n(t)$ of the *n-th* ship of the group is calculated as the average grade of all combat departments of the ship rounded to an integer, by formula:

$$U_n(t) \frac{\sum_{h=1}^{H} G_h(t)}{H}; \quad G_h(t) = \overline{2,5},$$

where $G_h(t)$ – the value of the technical indicator of the *n-th* ship at the *t* moment of time; *H* – the quantity of combat departments of the ship that are being evaluated.

The technical indicator of combat departments of the ship $G_h(t)$ is assessed from the beginning of the tactical task to the end of joint firing. If during the assessment there were no breakdowns and failures associated with not properly prepared weapons and military equipment and erroneous actions of personnel, it is considered that all combat departments and services provided joint firing and the technical indicator of combat departments $G_h(t)$ is rated an "excellent" (5 points). If in the process of tactical task and firing there were failures, breakdowns associated with not properly prepared weapons and military equipment or incorrect actions of personnel, the technical indicator of combat departments of the ship is calculated by the formula:

$$G_h(t) = 5 + \sum_{o=1}^{O} K_o,$$

where K_0 – the coefficient of reduction of the grade of the technical indicator of combat departments of the ship according the table[11].

Conclusions

The improved assessment methodology of the level of training of joint tactical groups of ships establishes the procedure for determining of the indicator of the level of training of the group, which, unlike the existing ones, takes into account the level of coherence of the group.

The level of coherence of the group envisages a combination of indicators of the level of coherence of the GC, which is calculated based on the results of their performance of collective training standards and the level of training of the ships of Naval Forces and Maritime Security Service of the State Border Service to jointly perform tasks in the group, which in term, is calculated based on the results of performance of joint exercises and joint gunnery exercises.

The proposed improved assessment methodology of the level of training of joint tactical groups of ships is an integral part of assessing the level of ability of the joint tactical group of ships to perform the tasks assigned to them.

In view of the above, a set of indicators for a comprehensive methodology for assessing the effectiveness of combat training of a joint ship tactical group, which differs from the known one, was further developed by introducing an indicator of the ability of a joint tactical group of ships to perform tasks as assigned.

NOTES:

1 A. Sirotenko, *Modern views on the forms and methods of application of groups of troops (forces) of the Armed Forces of Ukraine, other military formations*, All-Ukrainian scientific-practical conference "Joint actions of military formations and law enforcement agencies of the state: problems and prospects", Odessa, 2018, p. 8.

2 V. Zablocki, *To ensure victory in the Great War*, Ukrainian Week, Kiev, 2019, https://tyzhden.ua/World/228985

3 Thomas L. Saatyi, *Decision Making with Dependence and Feedback,* RWS Publications, New York, 1996, p. 57.

4 V. Matvienko, *Prognostics*, Ukrainian propylaea, Kyiv, 2000, p. 135.

5 E. Wentzel, *Operations Research*, "Soviet Radio", Moscow, 1972, p. 157.

6 Normative document, *Regulations artillery service of the navy*, Military publishing ministries of defence of the USSR, Moscow, 1972, p. 179.

7 *Ibidem*, p. 135.

8 *Ibidem*, pp. 140-141.

9 *Ibidem*, p. 143.

10 *Ibidem*, p. 271.

11 *Ibidem*, p. 185.

REFERENCES

Kant I., *Criticism of Pure Reason*, Cambridge University Press, Cambridge, 1998.

Matvienko V., *Prognostics*, Ukrainian propylaea, Kyiv, 2000.

Saatyi T.L., *Decision Making with Dependence and Feedback*, RWS Publications, New York, 1996.

Sirotenko A., *Modern views on the forms and methods of application of groups of troops (forces) of the Armed Forces of Ukraine, other military formations*, All-Ukrainian scientific-practical conference "Joint actions of military formations and law enforcement agencies of the state: problems and prospects", Odessa, 2018.

Wentzel E., *Operations Research*, "Soviet Radio", Moscow, 1972.

Zablocki V., *To ensure victory in the Great War*, Ukrainian Week, Kiev, 2019, Electronic resource, https://tyzhden.ua/World/228985

Normative document, *Regulations artillery service of the navy*, Military publishing ministries of defence of the USSR, Moscow, 1972.