Indicators of military capabilities of enemy sabotage-reconnaissance groups and their modelling

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Abstract. In the process of modelling combat operations and to organize the fight against sabotage-intelligence groups, estimates of their combat capability indicators have been derived and suggested.

Keywords: military capability, modelling, sabotage-reconnaissance groups.

I. INTRODUCTION

The problem of organizing and leading combat against sabotage-intelligence groups (SIGs) is especially relevant in the case of making informed decisions by commanders at different levels. Commanders and staffs in the maintenance and supply subunits and units have varying degrees of training in this regard. It is this current study that looks at the possibility of organizing the fight against enemy sabotage-intelligence groups in army settings and modelling the combat activities in which they participate by offering estimates of the combat capabilities of the SIGs. In the absence of full-time subunits to face and counteract the first blow of the enemy SIGs and sabotage-intelligence subunits (SISs), significant help may be provided by specialized software products that ensure proper organization, planning, and combat against sabotage-intelligence formations (SIFs) of the probable adversary. This would help them to uncover basic interconnections and ease them in revealing the center of gravity and critical points [1].

II. MATERIALS AND METHODS

In the article, the system approach is used, as the most appropriate way to study interconnected and related activities, to compare them, as a result of which to draw the appropriate conclusions about their development, realized through:

Methods of theoretical research used in the process of researching sources of information for evaluation and content, comparing activities and reporting on previous experience: theoretical analysis, comparison and synthesis; logical modeling.

Military science analysis was also used to examine trends in the development of concepts for the use, preparation and operation of small units.

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III. RESULTS AND DISCUSSION

The environment in which the units operate increases its components as technology develops and new tactics are applied. This process increases the levels of uncertainty that military commanders face and creates the need for greater adaptability to the operational environment [2]. There will always be a degree of uncertainty that is difficult to quantify, which causes the first problem in the development of such software products – the modelling of combat operations in order to quantify the combat capabilities of the SIGs and to predict the results of their actions [3].

In popular mathematical models of combat operations, in addition to global calculations of the ratio between forces and means taking part in the combat, complex quantitative assessments of systems with which units (typically battalions) and formations are equipped are also performed

When modelling the combat capabilities of the forces and the means of combat (on a battalion level or higher) and evaluating the quantitative-qualitative ratios of both

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parties, it is necessary to analyse performance criteria, such as:

- time for task completion;
- the likelihood of hitting the sites with counteraction;
- proportionality ratios and combat capabilities of the groups;
- the amount of losses incurred and inflicted, etc.

In determining the combat potentials that are the basis for making comparative assessments, they are almost not taken into account, because the combat capabilities of the SIFs are "extremely small", formed on the basis of the regular subunits of the special forces.

Well-known mathematical models of combat operations provide a comprehensive quantitative assessment of the weapon systems in the units (most often a battalion) and formations [4], determine the combat capabilities of forces and means (battalion and higher), and optimize performance criteria.

An analysis of the SIG's actions shows that non-fire capabilities characterize the quality of the intelligence subunits' weapons. For this purpose, it is important to determine values that depend on the time elapsed since the start of combat actions. The following are offered as:

- number of surviving personnel;
- the value of material costs for intelligence;
- the cost of a single reconnaissance site;
- mathematical expectations related to the area of the reconnaissance site and the part of the objects found, etc.

In his work [5], S. Stanev analyses subunits' combat capability, taking into account the enemy total losses caused by all the fighters and the teams belonging to those units. The value of total losses in equal conditions depends on the combat capabilities of the subunit and the level of manifested commanding skills. Here is an interesting link that is made between combat capability as a function of the combat capabilities of the subunits.

The purpose of modelling combat capability and SIG's combat capabilities and determining their indicators is twofold: on the one hand, a separate model must be drawn up to predict the actions of the SIG, and on the other, to define quantitative summarised indicators from the SIG model to participate in a common military model of combat. These indicators will be the link between the two models, and will be able to satisfy the input data requirements for the existing common military models set out in formulas (1) and (2).

Combat capabilities of the SIG depend on:

- personnel numbers;
- the level of combat training;
- physical training;
- moral and mental condition;
- the amount of weapons and their fire capabilities;
- logistics;
- command staff training;
- ways to transfer to the rear of the enemy;
- the depth of their combat tasks;
- manoeuvrability and their pace of movement;
- the time to prepare for action;
- the ability to survive in extreme conditions, the strength and nature of the opponent's counteraction, regional terrain and geographical features;
- meteorological conditions, etc.

It is assumed that the available combat capability (CC) of the sabotage-intelligence group will be quantified through losses Msum, such as:

$$Msum = f(CCsum) \quad (1)$$

$$CCsum=f(Kct(exs),Kca(exs),CCweap(exs),CCpers(exs), CCinf(exs)) \quad (2)$$

where:

Kct(exs) is a quotient of the combat task;

Kca(exs) – quotient of the commander's actions;

CCweap(exs) – combat capabilities (CC) of weapons;

CCpers(exs) – CC of the SIG, depending on the personnel training;

CCinf(exs) – combat capabilities of the SIG, determining its ability to reconnoitre and transmit information that causes loss to the enemy.

The index (exs) reflects the fact that the given indicator will be modelled and determined through the Expert System (ExS) apparatus, due to the inability to obtain its exact values through standard calculations at the required time, or even to obtain information about them.

The combat capabilities of weapons (CCweap) are determined by: the combat capabilities of individual and collective weapons (CCweap ind), the presence of explosives in the SIG, as well as devices for carrying out sabotage actions (CCweap sab), use of other combat and special equipment (CCweap spec).

Combat capabilities of individual and collective weapons of the SIG are manifested mainly in two cases: when there is a need for fire support of the other subgroups participating in the action, or when the whole group has to lead a defensive battle.

Then the main indicators of (CCweap) are:

- nomenclature of small arms and heavy weapons (including anti-tank weapons, heavy machine guns and mortars);
- the amount of ammunition for each of them;
- firepower of the salvo of the SIG;
- probability of being struck.

(CCweap sab) will be measured by the potential losses of the enemy after the execution of the sabotage actions equated to the combat potential of the battalion.

The combat capabilities of the group's personnel (CCpers) will be determined by the losses inflicted on the enemy because of the individual capabilities of the SIG fighters which depend mainly on their training. Here, the indicators that influence the result are:

- personnel numbers in the group;
- depth of combat tasks;
- manoeuvrability and pace of movement;
- ways of transfer;
- time for planning and preparation of actions;
- the level of combat training, physical training, and moral and mental status of the group.

The last three indicators depend on the following factors:

- group integration taking into account: assembly and cohesion, psychological compatibility, pride in belonging to the group, attitude to the nation and the armed forces, correctness in relations, common ritual available, presence of kinship and other relationships;
- leadership taking into account: the need for coercion, the interests of the group, the individual interests of each fighter, the degree of need for leadership;
- physical fitness taking into account: the age of the soldiers, their training (complex factor), the dependence of the fighters on food and water, their ability to survive in extreme conditions, stress resistance, mobility, etc.;
- training taking into account: the combat experience of the group, sustainability of knowledge and skills (a complex factor accounting for the difference in the training of an SIG fighter compared to the fighter from a conventional infantry unit), the degree of automaticity in the operation with weapons and special equipment, knowledge of the tactics of action of the SIF and the enemy, individual medical training;
- personal qualities that take into account: the fighter's patriotism and fanaticism, his religiosity and hope for a favourable outcome of the fight, a sense of his need for the group, independence, firmness and readiness for sacrifice, courage, etc.

The groups of factors listed above strongly influence the personnel combat capabilities, but they can only be accurately quantified as a result of the work of an expert subsystem.

It is possible to use a second-generation ExS [6] based on a model and the heuristic knowledge of experts [7] to solve modelling tasks for combat capabilities of military groups. Taking into account the factors affecting combat capability, their numbers and functional relationships, though with some weaknesses, this would improve knowledge [8] about the real truth of their combat capabilities.

CONCLUSIONS

1. As a summary quantitative indicator of the personnel combat capabilities, it is proposed to use the time indicator for the combat task tct(exs), as well as a function of the above indicators and factors.

2. The following key indicators are offered to determine the combat capabilities CC(exc):

- mathematical expectation of the intelligence area and of the part with open sites in the area;
- working capacity and operational range of available communication equipment;
- value of material costs for intelligence and material resources spent.

3. Modelling losses caused by the combat capabilities of the SIG refer to the so-called available combat ability of the group. For it to be real, the Kct(exs) must be determined using the ExS, taking into account the following conditions:

- whether the combat capability in question applies to tasks specific to the group, each of which is addressed in the typical or not variants and conditions (day, night, offensive, defence, etc.);
- the maximum combat pressure in solving these tasks, with a length typical for each of them, for which all systems must be activated;
- the enemy's actions.

4. The presented study examines the possibility of organizing the fight against enemy subversive-reconnaissance groups in an army setting and modeling the combat actions in which they participate, offering estimates of the combat capabilities of SIGs. In the absence of regular units to meet and counter the first strike of enemy SIGs and subversive-intelligence units (SIS), significant help can be provided by specialized software products that ensure proper organization, planning and combating subversive-intelligence formations (SIF) of the likely adversary.

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