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ANALYTICAL METHODS IN THE ISTAR SYSTEM:
FROM OBSERVATION TO BATTLE FORECASTING

The article argues that today, the information component is the driving force in Ukraine's security and defence sector (SDSU). In the Armed Forces of Ukraine (AFU) and the National Guard of Ukraine (NGU), the main element of information acquisition and analysis is intelligence agencies (units). It is substantiated that by adopting the experience of NATO member states, we can see an element of their intelligence system and adopt the effective ISTAR system. Thanks to technology and training, the SDSU is deterring the enemy and conducting successful Kinzhal missions.

Keywords: intelligence; ISTAR; combat support; information; information and analytical activities; forecasting.

Statement of the problem. Today, the Security and Defence Sector of Ukraine (SDSU) performs the main task of repelling Russia's armed aggression against Ukraine. One of the main parts of the SSU is a military formation with law enforcement functions that belongs to the system of the Ministry of Internal Affairs of Ukraine - the National
Guard of Ukraine (NGU). According to the Law of Ukraine on the National Guard of Ukraine, one of the main functions of the units of the National Guard of Ukraine is to participate in the implementation of measures of the legal regime of martial law, as well as to perform tasks to stop the activities of illegal armed groups or paramilitary groups, terrorist organisations, organised groups and criminal organisations [1, p. 5-6].

Warfare is a complex and multidimensional process. The main factors of warfare can be divided into several key aspects: 1. Intelligence; 2. Technological superiority; 3. Human resources; 4. Support of the population; 5. Material resources; 6. Strategy and tactics. These factors interact and determine the success of warfare. It is important to consider the complex nature of modern conflicts and adapt strategies to rapidly changing circumstances.

According to analytical data, experts raise specific issues in reforming and restructuring the CSDP, while with the help of NATO countries, we are mastering the latest technological means and gaining an advantage in their use over the enemy. It is happening with stable human resources for Ukraine and the motivational work of competent authorities to support the population, providing incredible material resources and developing strategies and tactics for victory.

Intelligence is the primary type of combat support, collecting information about enemy troops or other objects using various methods and means [2, p. 4-7]. The primary purpose of intelligence is to provide reasonable and reliable data for strategic and tactical decision-making. At the same time, it should be noted that intelligence and the intelligence cycle in Ukraine remain outdated, which is a significant problem in achieving our strategic goals.

Looking at the armies of many countries worldwide, we can see a significant difference between our intelligence processes. It is the presence of the ISTAR system, a term used to describe various actions and technologies related to information gathering on the battlefield.

Thus, the existence of a contradiction in military practice between the modern combat experience of intelligence units - the requirements of guiding documents - and a scientifically sound definition of intelligence support indicates the relevance of the research topic and determines the need to solve the relevant scientific problem.

Analysis of the latest scientific research and publications. The analysis and implementation of the ISTAR system aim to generalise and combine many intelligence elements, such as space, air, computers, and other types of intelligence. In the context of our research and to increase the effectiveness of our units, scientists pay special attention to the study of intelligence and the intelligence process.

The issues of intelligence processes in Ukraine have been studied by Y. Gulak [3], M. Popov [4], I. Aristova [5], and S. Emelianov [6].

However, the issue of intelligence development and the introduction of the latest technologies and systems in the conduct of general combat has not been sufficiently developed.

The purpose of the article is to ensure the improvement of the intelligence process in the units of the NGU in the context of a general military battle by introducing the ISTAR unit into the modern organisational and staffing system of the NGU.

Presentation of the main material. To achieve the goal, the main components of the ISTAR system will be considered (Fig. 1.)

Source: developed by the authors according to [8, p. 17-18].

«Intelligence" is the process of analysing the information received, summarising and transforming it into intelligence, "Surveillance" observation and tracking of particular objects and activities (passive surveillance), "Target Acquisition" detection and tracking of enemy objects with the specific purpose of their fire damage, "Reconnaissance", an active collection of information about the enemy or the environment to determine a further course of action. The functions of communications and analytics as important components of ISTAR systems will also be analysed [7, p. 25-28].

It provides a general overview of ISTAR systems and defines the purpose and scope of the study. The following sections will discuss in more detail the roles and responsibilities of each component, as well as the requirements and needs on the battlefield that

Figure 1. The ISTAR abbreviation
are placed on ISTAR systems.

Understanding the role and significance of ISTAR systems will allow us to assess their effectiveness and potential on the modern battlefield.

**Intelligence Analysis.**

The information provided by intelligence sources is a critical component in the decision-making process of unit commanders. In NATO countries, the ISTAR system is essential in providing intelligence support on the battlefield. It covers the collection, processing, analysis and transmission of various information that allows the commander and staff to analyse the situation and make effective decisions in real-time.

**Information intelligence functions.**

Information intelligence has several key functions that help the team obtain the necessary information for intelligence and analysis. The main functions of information intelligence include:

- **Information gathering.** Information reconnaissance involves gathering the necessary information from various sources, such as satellites, UAVs and BACs, electronic equipment (EW), visual observation, information from the local population, etc. The main goal is to collect high-quality and up-to-date information.

- **Information processing.** Once information is collected, it is processed and systematised for further analysis. Intelligence units use special algorithms and software to transform the raw data into structured and accessible information products.

- **Information analysis.** After processing, the information is analysed to identify trends, dependencies and significant factors. Analysts use research methods and technologies to study the collected data in detail and understand the situation on the battlefield.

- **Transfer of information.** After processing and analysis, the information is transmitted to the necessary elements of the decision-making structure. It involves transmitting information via radio, communication systems, mobile networks and other means of communication.

There are specific requirements for information intelligence on the battlefield. Based on the ISTAR principles, battlefield intelligence must meet certain requirements to complete various tasks successfully. Some of these requirements include:

- **Speed.** Information should be transmitted to the team in accurate or near real-time so that they can respond quickly to the situation during the battle.

- **Accuracy.** Information must be accurate and reliable to provide the team with reliable data to make decisions. Incorrect or inaccurate information can lead to inappropriate decisions.

**Confidentiality.** Information must be protected from unauthorised access as it may contain confidential and sensitive information.

Therefore, information intelligence is an important component of ISTAR systems that collects, processes, analyses and transmits information to the team. It helps the team obtain the necessary information to make effective decisions on the battlefield.

**Surveillance.**

Surveillance is one of the main ways of conducting intelligence and an essential component of ISTAR systems, which uses various technologies to monitor objects and territories continuously. Modern surveillance capabilities can detect changes in real-time, facilitate the timely detection of potential threats and provide the ability to intervene effectively.

Types of surveillance technologies:

1. **Video surveillance.**

   Modern video cameras are equipped with high-quality lenses and real-time data transmission. They can be used in fixed and mobile applications to monitor objects on the ground and in the air. For example, camera systems installed at borders or critical infrastructure allow operators to respond to emergencies promptly.

2. **Drones and UAVs.**

   Unmanned aerial vehicles are used for real-time aerial surveillance (aerial reconnaissance). They can cover large areas and capture images from inaccessible locations. For example, drones can detect illegal activities at borders or explore hard-to-reach areas [8, p.73-80].

   An example of effective use.

   The coastline of a NATO country uses a surveillance system that includes high-quality video cameras placed on the shore and special drones. This system ensures continuous monitoring of maritime areas and the rapid detection of illegal ships or other potential threats to the country’s security. Operators can respond to events promptly, and the implementation of artificial intelligence algorithms helps automate the process of identifying suspicious objects. While surveillance technologies are effective, they also face challenges such as protecting against system intrusions, processing large amounts of data, and ensuring confidentiality. The development of artificial intelligence systems and blockchain technologies can help address these issues and improve the efficiency of surveillance systems.
Target Acquisition.

Target identification in ISTAR systems detects, identifies, and selects targets that can be struck or monitored. This system component allows for precisely identifying potential targets, their characteristics, and their locations.

Means of defining goals.
1. Radar systems.
   Radar can be used to determine the location and characteristics of targets in real-time. For example, radar systems on ships or aircraft identify targets in the air or on the ground.
2. Optical systems.
   Optical systems, such as telescopes or binoculars, provide visual data on targets. They can be used to identify objects, their shape, and potential threats.

An example of effective use.

Let us look at an example of how radar systems are used in military aircraft. The aircraft is equipped with a modern radar that detects the movement of enemy aircraft and ground targets. When the radar detects a hostile aircraft, the system automatically determines its type, speed and direction of movement. This information helps pilots detect and respond to potential threats promptly, determining whether to use defensive systems or launch an attack on the target. Target detection systems are very effective but face challenges, such as pseudo-targets that can be artificially created to confuse. Developing algorithms for recognising and using different types of sensors can improve target identification accuracy and provide reliable information for military strategies.

Reconnaissance.

Intelligence in ISTAR systems collects information about enemy forces, objects, and situations for further analysis and strategic decision-making. This stage aims to provide a complete and objective picture of the situation. Intelligence is divided into many types, the most important of which are human and technical intelligence.
1. Human intelligence (HUMINT).
   It involves using agents or intelligence officers who obtain information from people in enemy structures. Agents may also interact with sources in another country to obtain confidential information.
2. Technical intelligence (OSINT).
   It involves using technical means, such as drones, video cameras, radar systems, etc., to provide objective information. For example, drones can be used for aerial reconnaissance of hard-to-reach areas.

To understand the purpose of ISTAR, it is necessary to identify certain components. Allied experts have identified three main components of this process.
1. Standardised processes and procedures;
2. Tools and protocols for working with these tools are defined;
3. Trained and qualified staff.

One of the most important components is the so-called ISTAR toolkit, which includes Ukrainian software such as DELTA, Kropyva, Ochi, Vezha, NaDoloni and others.

Let us take a look at DELTA. It is a system for providing Ukrainian defenders with up-to-date, verified data on the enemy and the coordination of defence forces, developed by the Defence Technology Innovation and Development Centre of the Ministry of Defence of Ukraine. DELTA includes five primary services (DELTA MONITOR - a tool for collecting, processing and displaying information about enemy forces, coordinating defence forces, and providing situational awareness by NATO standards.

ELEMENT – is a secure messenger for defenders to interact and coordinate actions with other units.

DELTA TUBE – is a secure way to stream video from UAVs (copters, wings), fixed cameras, and any other video sources to any interested users and units in Delta, etc.) that help ISTAR units conduct the above-mentioned intelligence cycle.

The stages of the work cycle coincide with the generally accepted intelligence cycle, which covers information gathering—processing (analysis)—and dissemination, but certain differences affect the process itself [8, pp. 84-86].

Planning and preparation. This stage is carried out 24/7 during combat operations, helping the JFC dispatch ground and air reconnaissance assets, assign specific tasks, and prepare performers for direct execution in various parts of the frontline.

Execution (collection of information). At the execution stage, intelligence actors (elements) collect information directly. Each performer must perform a specific task according to an algorithm previously devised for the unit's coherence.

Processing. The performers send or transfer the information to analytical units, which review it independently and with the help of software such as NaDoloni. The typical concept of such software is to concentrate a million patterns of equipment from different angles and to match these patterns to battlefield records, which makes it possible to identify, refine and verify the analysis of the material. This information is then used to
create intelligence data and upload it to Delta.

Dissemination. If a requestor needs information, he or she checks the Delta database and finds the RI of interest. Or, if not, he submits a request for information.

Conclusions and Prospects for Further Research. ISTAR is the latest chapter in the intelligence support of troops. It guarantees timely dissemination of information, accelerates decision-making, and increases the effectiveness of NGU units’ hitting enemy targets. Therefore, this confirms the need for further research and implementation of the ISTAR system in the arsenal of the intelligence process within the NGU.

A further promising area of scientific research is the study and transformation of the organisational and staffing structure of NATO ISTAR units into the formations of the NGU units.

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