

A Change in the Way Artillery is Used, Based on the Russia-Ukraine Conflict

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Abstract— Artillery for the execution of firing tasks is deployed in a battle order, which from a long time ago was aimed at massed fire and hitting targets with the use of a large amount of ammunition from the force for artillery support. Different configurations were applied to the means of defeat, depending on the probable threats and countermeasures against the artillery during the period of time that can be specified as expired. This tactic is also used in the initial phase by both sides of the conflict between Russia and Ukraine since 2022.

The introduction of new means of countermeasures against artillery systems and the improvement of existing ones impose changes on the battlefield, concerning the determination of data for firing per hit and the number of guns used.

One of the important elements affecting this is the time, both for preparation and for staying at firing positions on the guns. No less important is the amount of artillery systems used, which practice shows that reduced to one or two units from batteries and divisions used in the past, gives the desired effect, combined with improved accuracy of fire and increased survivability on the battlefield for artillery.

The combination of all this with a timely and covert maneuver provides direction for the development of artillery tactics in recent years, which reflects both the requirements for artillery systems and the ability to Fire for Effect.

Keywords— *artillery, artillery battle formation, firing data and firing method, conflict between Russia and Ukraine.*

I. INTRODUCTION

The role of artillery is its participation in the fire-strike of the targets and objects of the opposing forces on the battlefield, with the conflict in Ukraine being its most significant use in the modern era in terms of rifled and rocket artillery [1].

In the armed conflicts of recent years between conventional armies, artillery has been a key tool for adapting to counter enemy tactics and is a major factor in slowing or stopping offensive actions [2]. This statement follows from the analyses of the war in Ukraine [3] and the conflict in Nagorno-Karabakh between Armenia and

Azerbaijan [4]. However, artillery alone cannot propel any side to victory [5], but together with other areas of military affairs, its importance to the innovations and technological developments that found their way into the Ukrainian conflict of 2022 [6] is significant.

In this context, the limited use of aviation by the Armed Forces of Ukraine (AFU) and the Russian Federation (RF) in the armed conflict in Ukraine from 2022 to the present day is a litmus test that has led to an increased role for artillery [7], [8].

Various analyses indicate that The king of battle [9] has caused the most casualties on both sides, reaching 70-80% from indirect fire, artillery, multiple launch rocket systems, and mortars [10] - [11].

Artillery has acquired a new look with the changing dynamics of the battlefield, especially with the use of electronic warfare, which has further increased its share in combat operations. This is due to combat performance, which shows the advantage as a means of fire destruction in modern conflicts. Artillery units have the ability to fire in all weather conditions, regardless of the time of day or night, and to perform fire missions over wide areas and at great depths. Use different various technologies for detecting targets, correcting fire, assessing damage, and increasing the effectiveness of the use of unguided munitions, it has led to a logical change in its use.

In the paper, the author analyzes the change in the order of battle of artillery formations, imposed by modern battlefield dynamics, in combination with innovative intelligence tools, and emphasizes the change in the use of methods for determining firing data on both sides of the Ukrainian conflict.

II. MATERIALS AND METHODS

The use of literary sources and the data indicated in them from direct participants in the conflict between Russia and Ukraine, related to the combat use of artillery, is the basis for an analysis of the imposed changes in the

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practical application of the issue under consideration, combined with other statements. The data traces the object of the study by dividing the changes in the order of battle and determining the data for firing to hit targets and objects, influenced by the specifics of the conflict and the transformation of artillery in the analyzed directions.

Various scientific methods have been used to analyze the transformation of artillery in the conflict – scientific analysis and synthesis, argumentative analysis, analysis of individual statements. The temporal change from the beginning of the conflict to the practical applications of the indicated data has been traced.

III. RESULTS AND DISCUSSION

A. Battle formation

The Armed Forces of Ukraine are changing the tactics of using artillery formations at the front [12]. The choice of firing positions based on the experience of the war has shown that it has undergone a transformation in relation to tactical standards [8] regarding the line of contact of the warring parties.

One of the reasons is the introduction of various artillery systems with greater range, and on the other hand, protection from enemy counterattacks. It is characteristic to carry out fire missions from firing positions, allowing to defeat the enemy and quickly change the battle order of the firing units in areas beyond the reach of the enemy artillery.

When saturating the battlespace with more places for firing positions, artillery reconnaissance groups play a primary role in their selection and preparation [8].

The destruction of targets (objects) by artillery formations is carried out by the warring parties with one maximum of two guns [8], thanks to the greater range and equipment with ground-based or satellite navigation systems and computerized automated fire control systems, which are capable of reducing activities to fire from a single gun (combat vehicle) [13].

Other factors influencing this choice are protection from enemy fire and the need to reduce the time spent at the firing positions, which are skillfully compiled with the natural shelters of the area in combination with engineering facilities and compliance with radio discipline (emissions control - EMCON) with limited use of mobile phones.

These so-called facilities are in most cases created with improvised materials, having a wood-earth character, but necessarily covered with a net to counter unmanned aerial vehicles.

Colonel Baranov was selected by the Chief of Defence staff to prosecute the Artillery war, specifies that there should not be one common area for all guns in one formation, but it is necessary for the battery command post to be in a protected place between the firing positions, preferably in a dugout (or on a mobile base), calling the battle formation a dispersed battery [14].

This tactic is also confirmed by Serhii Musiienko, deputy commander of the Ukrainian Armed Forces Rocket and Artillery Forces, pointing out that the platoon commander, a senior officer of the battery, no longer controls all the guns of the battery or platoon at the location of the firing position, and the artillery is dispersed, because such an arrangement leads to the disclosure of the positions and is threatened by enemy counterattack [12].

The characteristic of this battle formation is the firing positions of individual guns, characterized by autonomy for the execution of fire tasks from one means of destruction, directly communicating with another gun from a distance. The ability to fulfill the task of dispersing fire positions is through the use of automated fire control systems (AFCS) and the availability of means for determining the coordinates of each gun, and the data transfer is through various communication channels. The AFCS calculates individual data for each gun that has received a fire destruction task, determining the corrections for the data for hitting targets from the same or other guns in the unified fire control system for a division, battery or platoon for a specific area for the execution of the assigned tasks.

To perform a fire mission, the gun (or guns) receive the data from the AFCS for firing, take up firing positions, perform the task in a short time frame and leave the position, taking up the next one or taking cover. During this time, the battery command post does not change its covert location. Data transmission can be carried out in several ways:

- From the battery command post to the guns of the artillery formation;
- From one gun to the others (in some countries that have provided artillery systems to Ukraine, the platoon commander is located in one of the guns of the platoon, therefore there is no separate battery command post;
- The guns receive a list of target data that they can call from the AFCS individually without the intervention of communication channels, so as not to reveal the lines of communication and compliance with radio discipline.

Determining the coordinates of each gun's locations can be determined by:

- GPS receiver in the gun, connected to the AFCS;
- GPS receiver of the radio station in the gun;
- Other methods (geodetic tasks) in case of impossibility of using GPS, which always require more time, but still cannot be ruled out.

This battle formation, indicated by the Ukrainians, was applied after analyzing the experience of the combat operations of the opposing side in the conflict, using artillery in a classic battle formation, linear deployment with a distance between the systems of 20-50 m. and 200-300 m from them of the vehicles for transporting ammunition. When hitting these trucks, which are 5-6 in number, piled up in one place with shells, it led to chaos in

the firing position and to the incapability of the entire formation (battery or platoon).

To fulfill their tasks, Ukrainian artillerymen prepare up to 8-9 firing positions for one battery (platoon) in one area for combat use, and also replace the firing positions from towed artillery, which analysts [13] define as an innovation.

To protect against counterfire, the Russians in certain cases do not change the positions of the guns, and the crews hide in previously prepared places, and in other cases they also switch to a dispersed arrangement [15] of the firing position.

Analyzing the actions of the Russian artillery formations, it can be stated that they (according to data from an interview with a commander of a 152 mm self-propelled howitzer Msta-S, participating in the operation) first take up a firing position, prepare the gun for firing, carry out the firing task and leave the firing position, returning to their permanent cover, which is repeated about 5-6 times within one combat day [15]. The Russian artillerymen define the above actions as an artillery carousel, the analysis of which was carried out by the author in the report "Is the method for use self propelled and multiple rocket launcher systems new – artillery carousel" [16].

Other data indicate that the order of execution of a fire mission is reduced to determining the firing data of the gun(s), their transmission, taking up a firing position, firing to defeat, in a time range of 2-3 minutes for the guns or volley fire from combat vehicles from MLRS for up to 20 seconds [8], leaving the firing position, calculating data for the next firing mission and taking up the next firing position or concealing the firing guns in relation to the terrain and their mobility.

The differences in the two methods can be distinguished in several key points. The first of these is receiving the firing mission. From a theoretical point of view, this should be done before any movement of the gun is made in order not to violate its camouflage and after readiness, with known data on hitting the target, to take up the firing position and open fire, as indicated by the data of Orkushpaev and his colleagues in the report "Combat work of artillery fire units in modern armed conflicts" [8]. On the other hand, there is the practical application, in which receiving the task after taking up and preparing the firing position will unmask the actions of the calculation earlier and expose them with a greater probability of counteraction from the opposing side, which points to the second key point – the time of stay in the firing position. Taking up a firing position without a fire mission assigned can be defined as an error in the command and control system, because taking up a prepared firing position and preparing it for fire will increase the total gun dwell time by at least one minute.

The third pillar of the analysis is the artillery system commander's statement that "we are returning to our permanent location" [15]. It is easiest to point out problem

areas when someone else is performing the tasks, but constantly occupying the same hiding place also leads to the disclosure of the locations of not only one, but also several artillery systems, as a result of the adopted method of maneuvering in the firing position area, although indicated by an assessment of the situation or imposed by various factors. In this context, if something can be observed and defined as a target on the battlefield, the impact from the opposing side is almost possible in a short time interval, evident in the Second Nagorno-Karabakh War in 2020, but with a huge emphasis for the war in Ukraine from 2022, because indications show that the Ukrainians are destroying Russian guns at a significantly increased rate. If this data is correct, this could mark a turning point in the war. This may also be a sign that traditional artillery is vulnerable, not only to new types of weapons [1], but also to traditional ones [2] when accumulating various beams, affecting factors - time for the execution of fire tasks and unmasking one's own positions.

B. Determination of firing data and firing method

In the initial phase of the Ukrainian conflict, the determination of firing data and firing method was carried out uniformly by different methods [19], [20], a statement from an analysis based on the theoretical documents of both sides of the conflict. The presence of artillery fire shows the historical commitment to the Warsaw Pact and the available unified system in its member states. The author of this report is not a supporter of the methods for determining firing data through them, because their implementation does not correspond to the dynamics of modern combat and the reasons are:

- Unmasking the positions of the gun, performing the task of firing at a target or creating benchmarks;
- Significantly increasing the stay at the firing position by over 7-10 minutes;
- Using reconnaissance forces and means that can be detected by the opposing side with subsequent impact (laser rangefinder);
- Blocking a fire resource (gun) to perform this task;
- Need for additional quantities of ammunition.

It is true that using data from various methods of adjustment (of fire) from one target is the most accurate way to determine the days for firing at other targets in artillery, but analyzing its shortcomings, it is preferable to initially use AFCS with calculation through full preparation, and subsequently use data from fire strikes from other targets with the same or other firepower, as indicated by the authors in the report "Combat work of artillery fire divisions in modern armed conflicts" [8]. The same analysis for both the Second Nagorno-Karabakh War in 2020 and the armed conflict in Ukraine in 2022 is also made by Leonid Nersisyan, indicating that traditional approaches to artillery fire control are not particularly effective on the modern battlefield compared to digital solutions [21]. Research shows that without a certain level

of digitalization, too much reliance is placed on the mass of fire to achieve the necessary effect. Legacy systems used in large batteries become much easier targets in counter-battery combat, especially when staying in firing positions for a long time.

In this line of thought, by adopting software-defined warfare, Ukraine has gained an advantage in two areas where Russia was thought to have a decisive superiority: artillery and cyberwarfare [22]. By using software applications, Ukraine's artillery has carried out significant fire missions with great accuracy against Russian forces, despite the superiority of the opposing troops. This was also achieved through the use of modern means of reconnaissance and target data acquisition (various types of drones, counter-battery radar systems (1L221E), etc.), as well as the skillful application of the same in counter-battery combat. Ukraine has also successfully dealt with Russian cyber threats, thanks to the IT sector, which has received a favorable development environment, leading to development and innovation.

IV. CONCLUSIONS

Artillery has undergone many transformations from its initial adaptation in 618 BC, according to ancient Chinese chronicles, to the present day artillery. Changes marked by victims from various conflicts have left their mark on the methods of its use.

The concepts of the order of battle of artillery formations established since the end of World War II were long established as postulates, but the dynamics of the development of the modern digital battlefield led to a perhaps expected breakthrough in breaking the icy traditions of this arrangement.

The use of the cannon alone, at least for the post-Soviet military school, was for performing tasks to mislead the enemy, but with ambiguity in the operational picture of the battlefield, but the armed conflicts after 2020, to a greater extent between Russia and Ukraine, led to the transformation analyzed in the report, written with the blood of hundreds of thousands of victims from the opposing sides. The battle formation in various geometric shapes was washed away like a sand figure by the waves of the ocean, to give way to the power of using one or two firepower to defeat the enemy with the full support of digitalization and automation of the processes of detecting artillery fire on a target or object.

The changes imposed in the artillery order of battle are a consequence of the new concepts of hitting targets with reduced ammunition consumption at the expense of increased accuracy. The application of the method of firing with one or two guns is successfully combined with the use of covert maneuver and an increased number of free fire resources (from the rest of the artillery formation) for performing other tasks in the fire support system, as well as reducing the vulnerability of the formation in counter-battery combat.

The stealth, surprise and accuracy of artillery are now a priority for those using it, with the element of surprise

coming not from the "beautiful" target exchanges, as the traditionalists called them, but from the use of AFCS data, which apply in real time corrections for the various factors affecting the accuracy of artillery fire.

The advent of various means of determining the location of targets has had a beneficial effect on the large number of observable targets, drastically changing the concepts of planning fire strikes on both sides of the conflict. This in turn has an impact on the procedures for determining the method for determining firing data, due to the provision of real-time data on the state of damage and the resulting effect.

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