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Original article

Rules of artillery employment in combat operations

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ABSTRACT

The article presents evolution and formation of rules of artillery employment in combat operations. The first part of the article addresses a process of shaping the rules of artillery employment over hundreds of years of its development. The second part is devoted to a doctrinal approach currently adopted by the Missile Forces and Artillery. In the final section, the author proposes adopting new rules shaped during recent armed conflicts and still have a significant impact on combat effectiveness of artillery.

KEYWORDS

rules, artillery, combat operations, armed conflicts

Introduction

Any organized activity, in order to assure optimal realization of objectives, should be conducted based on certain regulations, canons, regularities and norms typically known as principles. It also refers to, perhaps even primarily, military operations that are associated with risk to life or health of soldiers and in extreme cases – to existence of a nation or a state. Conducting a military operation contains a significant risk of failure and must be grounded on deliberate planning, organizing, coordinating and synchronizing of all components it comprises of, based on established rules of conduct, known as regulations.

The purpose of the current study is to present a process of shaping and evolving rules of employment of the land forces' fire support basic component, which is artillery, having a significant combat capability which requisites to be rationally utilized in an operation. The author attempts to review doctrinally binding rules of artillery employment and indicates prospective directions their contents changes in order to adopt them to a changing picture of the modern battlefield.

1. Shaping the rules of artillery employment

Activity of man in all life aspects is determined by universal natural laws of nature and physics, affecting their surrounding reality, independent from man, which he does not any impact on. A human being forced to adhere to natural laws, defines rules of behavior that allow his surviving or achieving a particular objective. His rules of behavior are based on gained experience and results of observation of surrounding reality, which are subject to modification whenever changes in environment appear. Man attempts to act in accordance to adopted norms considered by him as an assurance of success. Since the dawn of time, by waging wars, people have intuitively commenced to formulate rules of military art required for a victory. In antiquity the military art was a part of philosophy and was examined by Greek and Roman scholars. In the 6th century BCE, a great Chinese thinker Sun Tzu defined rules of the military art, which due to their universality and timelessness are regarded today as principles of praxeology and reinterpreted with respect to other disciplines. In the 17th century the military art was shaped as the war study and the process of formulating and modifying the military art principles began together with it. Contemporarily, they can be defined as historically shaped procedures of rational and effective actions executed by commanders, staffs and activities of forces which while applied, can contribute to achieving victory, however without providing a guarantee. The basic principles of the military art, most frequently mentioned in contemporary doctrinal documents, include: purposefulness of actions activity, economy of force, mobility, surprise and maintaining combat capability [1, p. 19].

The rules of artillery employment obviously stem from the military art principles that condition a method of artillery activities in wars. These are artillery best practices in military operations shaped by combat and training experiences gained over the years. Compliance with them should assure an appropriate usage of artillery units in a majority of combat situations occurring in modern military conflicts. The rules of artillery employment formed alongside with its birth and development, obtaining present-day appearance after hundreds of years. As mentioned above, adhering to the rules of artillery employment should, but does not have to, bring success in combat, however ignoring them leads to an imminent defeat.

Surprise constitutes one of elementary principles of the military art, which in artillery translates into the surprise fire. It was not until The Romans when an attempt to utilize field artillery in this manner appeared, namely projectile machines mounted on horse two-wheel undercarriages, located behind own troops line, striking an enemy with a drum fire as soon as it reached the range of fire and was incapable to cover against projectiles. The Roman troops were able to organize a close coordination of artillery with advancing or defending legionnaires. The tactics of artillery consisted mainly in striking an enemy by a frontal attack with a hail of artillery projectiles and attacking it by infantry from flanks [2, p. 117].

Born over a thousand years later fire artillery, initially very heavy, was purely suitable for towns and fortresses sieges of the late Middle Ages. Artillery in a battlefield was firstly applied by the Hussites who mounted heavy guns on appropriately adjusted horse carriages. By the end of the 15th and in the first part of the 16th century shaping

the rules of artillery employment was influenced by the French. The ruler of France Charles VII created field artillery which was massively used during the Italian wars (1491-1544), whereas artillery as a separate branch of the armed forces was established by Francis I. Artillery commenced to be the force decisive for outcomes of wars. In the Battle of Ravenna (1512) the King of France Louis XII by maneuvering a part of artillery to flanks and shooting Spanish positions from the flanks and the center, won the battle applying fire and equipment maneuver.

Significant changes in organization and methods of artillery employment were introduced at the beginning of the 17th century by the king of Sweden Gustavus Adolphus. He put a significant impact on development and implementation of cannons characterized by mobility and rate of fire. Detaching regimental artillery that remained at the disposal of infantry regiments commanders is to be regarded as a bold step of that time. Thereby, the principle of cooperation between artillery and infantry was shaped. Gustavus Adolphus understood the utmost importance of artillery fire concentration and for that reason both in defense and attack created large artillery groups comprising even dozens of cannons.

Artillery was very competently used by Napoleon Bonaparte who in 1786 after finishing education at the l'Ecole Militaire Military Academy in Paris as the second lieutenant was assigned to serve in artillery. After the outbreak of the French Revolution, Bonaparte was sworn as the captain of revolutionary forces during the Toulon siege, which was taken from the Brits owing to skillfully employed artillery. As the emperor of France, Napoleon commanded the forces in a significant number of battles, mainly victorious ones, in which artillery played a crucial role. The principle of concentration the fire effort at a decisive point and time was widely applied by the emperor. At an initial stage of a battle only a certain number of guns assigned to a division was engaged, whereas the majority of artillery remained in reserve. It was not employed until an enemy's main resistance point had been identified and then large batteries were formed (at Borodino such the battery consisted of 80 guns) which by their fire prepared a final attack carried out by infantry, destroying an enemy on the main direction of an attack [2, p. 119].

Polish General Jozef Bem turned out to be a master in horse artillery employment. In the battle of Ostroleka fought on May 26, 1831, by applying the principle of fire and equipment maneuver, conducted a raid of artillery battery in front of attacking Russian forces, halting them by accurate fire which gave an opportunity to rescue retreating Polish troops.

In the 19th century the dynamic technical development of artillery commenced. Implementation of threaded barrels, larger calibers, fixed projectiles or a recoil mechanism allowed for extending the weapon radius, the firepower and the fire rate. During the Italian war of 1859 fought between Austria and France, artillery began to be used to provide cover for deploying infantry that was feasible due to its significant range of fire. A part of artillery marching at the front of a column opened the long-range fire earlier and the remaining part engaged in the fight at the later stage. After a successful attack, the entire artillery executed the fire in pursuit. At that time, the principle of the sustained fire support emerged [2, p. 121]. During this war artillery played a particular-

ly essential role in the battle fought on June 24, 1859 when at the turning point, Napoleon III decided to attack Solferino village frontally which was proceeded by the concentrated artillery fire strike opening a path for attacking infantry. As a result of the constructive cooperation between artillery and infantry, the Austrians were forced to abandon the key position and suffered defeat.

The beginning of the 20th century is regarded as a period of artillery flourishing and primarily as its domination on the fields of WW I. It was the time of applying mass surface fire and long-lasting artillery fire preparations. At this point the principle of cooperation with infantry was strictly complied with as well as armored subunits at the final stage of the war. The power of artillery fire was capable of determining outcomes of battles. Since the very first days of fights on the Western Front both German and French sides were surprised by the scale of losses sustained from artillery fire. During the Russian-Japanese war losses from artillery fire constituted 16.4% of total fatalities while in the Balkan wars their proportion doubled to reach 54% of all losses [5, p. 377] at the initial stage of WW I. Lethality of artillery must have had the influence on the rules of its employment. The German army equipped with well-developed heavy field artillery during offensive operations in France always aimed at surprising by fire and implemented powerful artillery groupings subordinated to a higher echelon's commander (centralization of artillery). The German command attempted to dominate enemy's artillery by combating it with fire of heavy guns. Whereas France was for a long time affected by the lack of heavy field artillery as the basic and the most numerous 75 mm guns perfectly suitable for flat-firing and destroying uncovered manpower were entirely useless as far as destruction of field fortifications is concerned. Therefore, regularly preventative fire was conducted by artillery, consisting in immediate responding to any German activity aimed towards destroying groupings deploying for an attack and fighting off artillery, for example carrying out fire preparation. The maneuver of equipment was also conducted with an attempt to redeploy artillery to endangered areas. The French paid significant attention to barrage fire, halting infantry and cutting it from reinforcements. Both parties strived for multiplying effectiveness of artillery through establishing artillery commands, improving observation and communication technics, further modification of artillery equipment as well as methodical preparation of shooting execution, fire control and division of responsibilities in artillery units [5, p. 400-1].

At an initial stage of the war, still led by experience gained in the 19th century, the French infantry attacked without adequate artillery preparation which exposed it to enormous losses and defeat, however together with prolongation of military activities and further stabilization of the front increasing importance started to be paid to preparatory fire. The duration of artillery preparation systematically extended to reach up to two weeks during the series of French-British summer attacks in 1917. At that period of time the allies adopted a regulation of saving infantry through multiplying artillery fire to a maximum extent. However, efficiency of long-lasting artillery preparations can be doubted as they caused a vast destruction of the terrain without significant losses among infantry and machine guns crews hiding in deep shelters or deployed beyond shelled line. In 1917 in Flanders, French-British artillery destroyed by fire a melioration system of wetlands on vast areas causing its flooding and uselessness for both

parties. Likely for those reasons, as well as to gain an element of surprise the Germans during their last offensive in 1918 limited the duration of fire preparation of artillery to several hours [5, p. 397].

The period of WW II was characterized by the growth of artillery mobility and strive for cooperation not only with infantry but also with armor and air forces. A principle of centralization with the possibility of decentralization of artillery command and continuity of fire support throughout entire depth of an executed task was prevailing. During the so-called blitzkrieg introduced in the Polish and French campaigns as well as at initial operations in the East by the German army, an emphasis was put on centralization of artillery and air force fire effort on selected breakthrough sectors, thus enabling armored spearheads breaking through enemy's formations in depth. In the second phase of the war, especially after the Stalingrad breakthrough, when the Soviet army launched its victorious march to the West, concentration of artillery on narrow front sectors where possibility of disruption existed was used. The striking power of artillery increased even more significantly with wider application of missile launchers. Growing production of military industry allowed for saturation of key sectors of the front with artillery which for example, amounted to 40 guns per front kilometer in the battle of Moscow and up to 350 guns and launchers during the Berlin operation. Following WW I experience, the duration of artillery preparation of an attack was limited which depending on organization of an enemy's defense ranged from 3 hours in the battle of Kursk to 44 minutes during the summer operations of 1944 [2, p. 118].

The post-war period brought the development of self-propelled guns and missile launchers resulting in increasing the mobility and fire power of artillery. One can see a struggle for providing fire support at the lowest levels through decentralization of artillery command and its detaching to fighting units within the framework of clearly specified command and fire control relations. The Israeli artillery in the wars against Arab states and the US artillery in the Vietnam and the Gulf wars operated in this manner. During an attack, a short fire preparation carried out by artillery subordinated (centralized) to a commander of a higher echelon was executed. The enhancement of fire accuracy was obtained through the implementation of precision-guided ammunition and reduction of the natural dispersion of projectiles whereas surprise by fire – through applying methods of fire setting preparation without registration. The implementation of automated command and fire control systems reduced fire response time of artillery and facilitated its integration with other striking assets in combined fire support.

2. Rules of artillery employment in a doctrinal approach

Currently, adopted rules of artillery employment had to be adjusted to the modern battlefield conditions which are affected by technical development and progressing effectiveness of armament and military equipment. Contemporary artillery is characterized by substantially greater mobility, range and fire accuracy, simultaneously using various types of ammunition, including precision-guided one. Nevertheless, the basic rules of its employment have not lost their value. According to the doctrine of the Missile Forces and Artillery employment, the main rules of artillery employment include:

– concentration of fire effort,
– decentralization of artillery employment with the possibility of its centralization,
– surprise by fire,
– broad fire and equipment maneuver,
– resolute, constant and reliable command of artillery,
– sustainability of fighting units support,
– precision and simplicity of planning and execution of combat operations,
– accuracy and timeliness of fire [4, p. 11-3; 5, p. 11-2].

Concentration of fire effort consists in competent concentration of fire on a direction of key importance for obtaining the success by the own troops. Focusing of the fire effort is realized after taking into consideration tasks and courses of actions of own troops. To provide it, an adequate order of battle of artillery units (subunits) enabling usage of greater amount of artillery on a main course of action and striking the key targets is to be adopted. At the limited number of artillery assets in a tactical formation, an adequate fire support of each fighting brigade cannot be executed, notwithstanding the type of combat operation. In an attack, it will be more beneficial to concentrate the entire fire effort on a key direction opening a path to success at the expense of other – less important ones. Whereas in defense, the emphasis should be put on flexible artillery employment, maintaining the capability of its concentration after the center of gravity of an enemy's attack had been identified.

Decentralization of artillery employment with the possibility of its centralization consists in artillery usage to assure supporting of forces at the lowest levels of command paving the way for efficient fulfilment of tactical tasks. However, in decisive moments of a struggle the possibility should be provided for centralization of artillery command providing consolidation of fire effort on main directions or accomplishment of fire tasks during key phases of fire support. A textbook example of the execution of this principle of artillery employment is preparatory fire of the attack (OPA), conducted during own offensive maneuvers when artillery realizes planned striking of enemy's targets crucial for achieving a breakthrough of the first enemy's position by a division or a brigade. While planning an OPA, a divisional artillery section determines the composition of forces and assets of fire support adequate to requirements and possessed capabilities. In an OPA, the border between the doctrinal interaction area of division and brigade artillery becomes blurred and selected artillery subunits (of a division, a brigade and a battalion) pass under the command of a division's (brigade's) Chief of the Missile Forces and Artillery and execute fire tasks according to the adopted plan. As soon as an OPA is completed and fire support of the attack (OWN) commences, artillery units of brigades and battalions detach centralized command and execute tasks in favor of their own fighting units, most frequently calls for fire from a battlefield. Whereas divisional artillery (artillery battalions from artillery regiments) fulfils fire tasks for forces as a whole according to a division commander's intention or reinforces artillery of brigades. It is to be underlined that also in an OWN the necessity of re-centralization of artillery can occur, i.e. during breaching the second line of defense, entering reserves into combat or supporting tactical raids.

Surprise by fire consists in striking a totally unprepared enemy, operating in an open area, incapable of employing protection measures or commencing countermeasures. Artillery fire inflicts the most significant losses in manpower and equipment solely in the first several seconds after the fall of shells because during the further period of the shelling, the enemy finds covers or leaves a killing zone. The surprise by fire generates the most substantial psychological effect, causing disorientation, panic and fear which can deprive an enemy of ability of efficient operation throughout the key time required for its combating by the supported forces. It is achieved through a preparation of the fire settings with the most precise method, eliminating the necessity of registration, having accurate and reliable data of targets, selecting assets which allow for execution of fire strike within the shortest time, conducting fire for effect control, strict complying to the secret command of troops demand and concealed maneuver and deployment of artillery into the combat formation. Executed fire tasks should be short-termed but simultaneously bringing significant destructive power, which also results in decreasing the number of consumed artillery ammunition.

Broad fire and equipment maneuver comprises fire execution in a particular place and time combined with relocation of forces and assets which enable avoiding enemy's artillery counterstrikes and occupying a position convenient for execution of further fire support tasks. Artillery is the only type of military branches that is able to quickly shift fire in depth of an enemy's formation and on its flanks, striking at frequent intervals, targets located far from each other. This feature allows for striking many key elements with forces and assets reduced to the minimum. Realization of this principle is fostered by: increasing fire range of barrel and missile artillery and high mobility of guns and launchers. Maximum range of contemporary fire assets is 30-40 km (guns), 70-90 (artillery missile launchers) and even up to 300 km (tactical missile launchers). Their time of fire reaction depending on a command level ranges from 1 min. (artillery platoon) to 5-10 min. (artillery battalion). An average road speed fluctuates between 60-90 km/h, whereas in a terrain – 20-30 km/h. A self-propelled artillery battery is able to fulfil a fire task and leave a firing position before first shells hit a target. It is obtained owing to the sequential shooting function during which subsequent projectiles are shot at a different elevation angle in order to hit a target simultaneously. At this point, the application of an automated ammunition loading system plays a key role as a significant rate of fire can be provided by it.

Resolute, constant and reliable command of artillery subunits resolves itself to consistent striving for an assumed objective through realization of an adopted intention and received tasks. It is fulfilled due to situational awareness, making decisions that change a concept of operation in timely manner, precise issuing of tasks to subunits, personal initiative and commanders' responsibility for decisions taken as well as maintaining seamless communication with subunits. This principle is adhered to by the implementation of modern command measures, including computerized command and fire control systems and steadfast communication assets.

Sustainability of fighting units' support is the principle concerning timely and effective striking of an enemy by artillery fire in entire depth of their combat tasks. It is executed

through adaptation of an appropriate combat formation and organization of fire system, timely planning and conducting fire tasks taking into consideration the development of the situation on the battlefield as well as rapid redeployment of artillery along with entire forces or with their echelons. In this case, it is essential to maintain close cooperation between artillery and supported forces that is established and monitored by fire support coordinators (officers), empowered with essential authorizations and measures. Fire support coordinators are artillery officers who play advisory role for a commander, participating in his command process when they propose optimal methods of fire support assets employment. Cooperation can be also regarded as one of the rules of artillery employment.

Precision and simplicity of planning and execution of combat operations consists in precise and understandable issuing of tasks, order and directives that at the same time are not complicated. In an information chaos of combat operations only a simple and clear for everyone course of action can be effectively executed. Concurrently, it should be precise to an extent providing fulfilment of tasks according to a higher commander's intention.

Accuracy and timeliness of fire is achieved by application of the most accurate measures and methods of determination of targets coordinates, fire for effect settings and through an appropriate organization and realization of geodetic, meteorological, ballistic and technical preparation. The timeliness of fire is assured through maintaining the constant readiness of artillery units for execution of fire tasks, timely planning of artillery fire and maneuver, timely issuing of fire tasks, reliable and flexible command and fire control. Principle of maneuverability is of crucial importance while fighting maneuvering targets because in case of prolonging time devoted to open fire they will always manage to leave an area exposed to fire [5, p. 12-4].

In recent specialized publications a significant attention is paid to adhering to rules of artillery employment as a precondition for achieving success. The following principles have been proposed for newly implemented 155 mm self-propelled howitzer Krab artillery units:

– targeted operations,
– activity,
– economy of force,
– maneuverability,
– surprise,
– maintaining combat capability [11, p. 1-1, 1-2].

The principle of artillery **targeted operations** is emphasized in various specialized publications [See: 7, p. 13]. Artillery belongs to units supporting activities of fighting forces and should fulfill only their objectives. In recent armed conflicts, the striking priority of artillery was given only to those targets which could affect continuity of organized struggle by an enemy. Artillery ceased to be the military branch "spraying an enemy with iron in a random manner" with the aim of its maximal attrition as in battles of WW I. Instead, artillery is the means to achieve an objective of a military operation,

namely to deprive an enemy of combat capabilities, not to physically eliminate him. Owing to modern reconnaissance systems and more and more precise striking systems, striking crucial enemy's elements that determined its combat capability became possible. To eliminate an artillery battalion from a fight it is no longer necessary to strike its each fire battery, as destruction (incapacitation) of its fire control point, detected and marked by an unamend aerial vehicle is sufficient.

However, it should not be prejudged that in prospective armed conflicts operational objectives will be achieved solely by execution of pointed fire. It is even denied by the Ukrainian conflict in which a key role was played by mass surface fire strikes, carried out by means of artillery guns and missile launchers, mainly directed at destruction of manpower and combat equipment. Furthermore, experience gained in asymmetric wars indicates that forces equipped in modern manner regularly become powerless facing outnumbered and weaker armed combatants who use the artless fight methods. Forces not equipped with sophisticated command systems and weaponry are not particularly vulnerable to precise fire strike as they do not possess elements of operational or strategic importance, elimination of which prevents their further operation. This was experienced in the second part of the 20th century by such states as France and the USA in Indochina or the Soviet Union in Afghanistan. Therefore, it can be assumed that in the predicted time perspective, implementation of state-of-the-art means of fire support will not replace a close infantry fight with an enemy and traditional close fire support.

The **activity** principle is expressed by constant impacting on an enemy, independent of terrain and weather conditions. The provision of manifesting activity by artillery is achieved by the continuous gathering of data regarding enemy's objects from own and other reconnaissance sources. It is tightly combined with the aforementioned principle of resolute, constant and reliable command according to which a commander constantly aims at fulfilling tasks by all available means. The activity primarily includes initiative, ingenuity, striving for inflicting losses to an enemy, decreasing its morale and depriving of capability of efficient operation. A good example of execution of this principle was activities of the USA artillery in the First Gulf War in 1991 where during a preparation phase for a land attack, artillery units conducted rallying operations against Iraqi units remaining at defense positions and harassed them by fire. Activation of enemy's artillery was not passively awaited but on the contrary, it was provoked to fire by exposing an artillery battery "as a decoy" which commenced dire activity and immediately changed the position. As soon as Iraqi artillery attempted to have it incapacitated, it was registered by intentionally prepared artillery radiolocation stations and destroyed by fire of the MLRS batteries directly coupled with them.

Due to the perceptible reduction of armed forces and increased financial contributions to defense in various countries, the principle of **economy of force** has become of significant importance for artillery. Artillery employment on a battlefield currently brings considerable logistic costs, since it consumes substantial amount of ammunition and materials. As a result, commanders of all levels are obliged to rationally dispose of the possessed potential. Minimal but sufficient number of fire assets is to be assigned for the execution of tactical and fire tasks. Artillery employment should be focused on de-

cisive stages of a battle, when it has the utmost impact on reaching operational objectives. For that matter, balanced artillery engagement in all stages of activities, regardless the character of their development seems to be ineffective. Wherever possible, precision-guided projectiles whose use proves to be relatively cheaper should be executed. The economy of force also means their efficient utilization that in artillery is manifested by striking high pay-off targets as the first priority, elimination of which allows executing a task by own forces.

Two subsequently mentioned principles, namely **maneuverability** and **surprise** do not significantly differentiate from previously addressed principles of the broad maneuver of fire and equipment and surprise by fire. However, it is to be underlined that 155 mm self-propelled howitzer Krab will be carrying out tasks in even more dynamic manner than its older predecessors. It is assumed, that the execution of fire tasks will not exceed two minutes followed by a counter-fire maneuver. Autonomous guns are to realize tasks by a platoon and in pairs, remaining in considerable dispersal, continually maneuvering, progressively following forces in an attack, whereas in defense, occupying maneuver areas in depth of the battle formation. The increased range of fire will provide a fire maneuver at large areas and distances and simultaneously creation of real risk for an enemy's elements both remaining in the first echelon and the rear combat zone. Having automated fire control systems, weather and ballistic stations at disposal facilitates rapid preparation of a shooting without the necessity of registration that allows fulfilling the principle of surprise by fire.

In line with the principle of **maintaining combat capability**, artillery units ought to be incessantly ready for the execution of fire tasks. A certain percentage of the ammunition assigned to an artillery unit should always be maintained for the execution of unplanned fire tasks, crucial for obtaining assumed objectives. It provides a commander with a capability of responding to a changing tactical situation. It is also essential to undertake concealment and enemy-misleading activities that provides increased sustainability of artillery units, and maintain their combat capability throughout an operation.

3. What else is to be taken into consideration in combat operation of artillery?

The above-addressed rules of artillery employment, implemented in the current doctrine of the Missile and Artillery Forces of the Polish Armed Forces should be complemented with several others, shaped and adopted based on the changing operational environment as well as resulting from experienced gained in contemporary armed conflicts. Among these, the following can be underlined:

– flexibility,
– cohesion of effort,
– steadfastness,
– human factor.

Flexibility consists in the capacity to react to unpredictable combat situations. This is facilitated by issuing of tasks through achieving objectives, a modular organizational

structure and efficient command and fire control systems. Flexibility also means an ability to adopt and adjusting to a certain conditions. Employment of artillery in stabilization operations in which the method of execution of tactical and fire tasks differs radically from doctrinal one can serve as the example of adjusting to new conditions. Frequently, indirect fire tasks were executed by one or a pair of guns, which was not envisaged in the "Shooting and Fire Control Instruction", as it was considered inefficient. Paradoxically, in activities that are not aimed at inflicting material losses to an enemy, but rather at its discouraging and preventing a hostile action, execution of fire tasks by an incomplete composition of artillery has achieved its objective.

The Russian artillery, fighting in the Chechen wars in the 1990s, to which it was organized in prepared in the "Cold War' manner, faced various problems with adjusting to the new situation. The then prevailing doctrine still required establishing of large groups of artillery which did not fulfill its role in the internal and local conflict, and, and what is worse – execution of fire tasks with ammunition norms exceeding limited logistic capacities was ordered. Devastating surface fires damaging infrastructure and bringing significant losses among civilians, which should have been avoided in this type of operations, were carried out in urbanized areas. It was not until the implementation of the flexible approach to the doctrine and its optimal adjusting to the newly occurred conditions when the Russian artillery entered the development path and adapted to the changing reality.

In the resent years, artillery has been integrated to a bigger extent with the other means of fire support, namely with the land and air forces aviation, electronic warfare systems and others within the combined fire support system. Artillery plays the key role in it as the supporting military branch, characterized by the high availability and the lethal combat capability. Artillery officers perform a function of fire support coordinators, responsible for its planning, organization, synchronization and efficient execution. Therefore, artillery conducts intentional tasks with the framework of the combined system, being its integral part. This imposes an obligation to maintain the principle of the **cohesion of effort** of all the components. It primary focuses on achieving common goals and coordinated striving for them by all the executors of fire support. The cohesion of effort also includes synchronization of the fire support with operation of the fighting forces, its complete coordination with their maneuver and fight in such a way to become an integral part of the operational plan of a general military commander [8, p. 27].

Steadfastness understood as an ability to conduct tasks over an extended period of time with maintaining sufficient capacities and combat potential. Combat operations can be characterized by high tempo and intensity that exhaust physically and psychologically both commanders and subordinates. It requires significant effort in commanding and adequate support of manpower, maintaining efficiency of armament and ammunition stockpiles [8, p. 31].

A human factor, playing frequently a decisive role in the fight, is a determinant occasionally mentioned while addressing rules of artillery employment. It can be hardly named a principle, but it is important to such an extent that cannot be omitted in the

study regarding conditions of the efficient artillery employment. The human factor can be referred to military truism saying that only appropriately trained and motivated soldiers can fully take advantage of combat capabilities of the equipment. As banal as it can sound, it is a basic condition of achieving a success in military operations. For instance, the Iraqi Army in 1991, despite having modern artillery fire and reconnaissance systems, was not able to use their values effectively. The lack of motivation to fight led to a situation where after the first shooting from the opponent side, soldiers left combat positions, doubting efficiency of own armament and not seeing the sense of continuing to fight. Abandoned on the battlefield by the Iraqis, artillery radiolocation stations which were not even set to the combat mode indicated a complete lack of capacities to operate them by untrained operators, so that the Iraqi artillery was incapable of striking an enemy's artillery by which it was rapidly dominated.

In contrast, well-trained and highly motivated Chechen combatants during the first war with Russia fought effectively against much larger and better-equipped enemy forces, forcing them to withdraw from the country.

People, not computers and machines determine efficiency of any system, therefore qualifications of soldiers manifest the most fundamental determinant of the efficiency of a military unit. Consequently, an efficiency level of the execution of tasks by subordinates depends on a commander, and primary on his knowledge, skillsets, maturity, motivation and authority. Obviously, the aim should be to execute tasks with the application of modern computerized command and fire control systems due to the fact that they provide the accuracy and the timeliness of fire. However, under no circumstances does it release artillerymen from having knowledge related to traditional computing of fire settings and fire control. Similarly to navigation systems installed on guns, launchers and command vehicles, they cannot cause declining the ability of orientation in the terrain, reading a map and geological measurements. A high level of training and maintaining knowledge and abilities to act without electronic systems, which in current battlefield conditions can be easily incapacitated or jammed, constitutes a basic prerequisite of an efficient operation of artillery. Therefore, the human factor is of key importance for the efficient operation even for ideally armed and equipped forces.

Conclusion

The article presents the evolution of the rules of artillery employment in the historical context and addresses the contemporary doctrinal approach towards the utilization of artillery in combat operations. The rules of artillery employment are subject to modification alongside the changing surroundings. The modification of the method of artillery operation is mainly influenced by:

- character and objective of a military operation (peace, stabilization, warlike),
- technological development of armament (including a type of ammunition, fire range, tactical, operational and strategic mobility) and possessed reconnaissance, command and communication assets,

– environment of conducted activities (climate, terrain layout, flora, water obstacles and road network),
– principles of the use of firearms, primary the restrictions on their usage imposed for humanitarian reasons (the most important include absolute prohibition of shooting at targets located in an inhabited area, prohibition of destruction of infrastructure and cultural heritage).

A thorough analysis of experiences gained from armed conflicts waged in the world as well as from national research and artillery training will definitely allow for the verification and configuration of the rules of artillery employment for subsequent years of its development.

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Author contributions

The author contributed to the interpretation of results and writing of the paper. The author read and approved the final manuscript.

Ethical statement

The research complies with all national and international ethical requirements.

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Biographical note

Norbert Swietochowski – Lt. Col. Dr. Hab. Eng., a graduate from the General J. Bem Missile and Artillery Forces Military Academy in Torun (1994), Nicolaus Copernicus University in Torun (2002) and the National Defence University (2007) where he obtained a doctor's degree (2006). Since 2006 he has worked as a lecturer and thereafter as an adjunct at the gen. Tadeusz Kosciuszko Land Forces Military Academy. Since 2016 he has exercised the function of the head of the Combat Support department at the Military University of Land Forces. The author of various publications related to the issue of artillery employment in armed conflicts as well as non-lethal weapons and its relevance for the national security.

Zasady użycia artylerii w działaniach bojowych

STRESZCZENIE W artykule przedstawiono ewolucję i kształtowanie się zasad użycia artylerii w działaniach bojowych. W pierwszej części opisano proces kształtowania się zasad użycia artylerii na przestrzeni setek lat jej rozwoju. Druga cześć poświęcona jest ujęciu doktrynalnemu przyjętemu współcześnie w Wojskach Rakietowych i Artylerii. W ostatniej części Autor proponuje przyjęcie nowych zasad, które ukształtowały się w ostatnich konfliktach zbrojnych i mają duży wpływ na skuteczność bojową artylerii.

SŁOWA KLUCZOWE zasady, artyleria, działania bojowe, konflikty zbrojne

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