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Original article

Concepts of deploying engineer troops in military operations in the classified *Mysl Wojskowa* publications from the years 1970-1981

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ABSTRACT

The purpose of this paper is to present the concepts of deploying engineer troops in military operations in the late 1970s and early 1980s, on the basis of the publications contained in the classified *Mysl Wojskowa* journal. The publications concerned the main tasks of engineer troops in basic tactical operations, including in particular those consisting in crossing water obstacles or establishing barrier minefields in that period. The article analyses also the needs of engineer troops in the discussed period and describes the basic principles of using this type of arms for performing engineering tasks. Furthermore, the attention is drawn to the wide use of engineer troops in that period, which were responsible, to a considerable extent, for providing support for the fighting elements, including in particular armoured and mechanised units.

KEYWORDS

engineer troops, tactical operations, combat support, engineering support

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Introduction

Mysl Wojskowa was a bi-monthly journal focusing on military issues, published from 1950 to 2006[1]. It was divided into an unclassified part (with a white cover) and a classified part (with a red cover). The latter was edited on a quarterly basis in the years 1966-1989. The unclassified part of *Mysl Wojskowa* discussed mainly the issues related to the state's security, military economics[2], training of the Armed Forces or education-

[1] The contemporary *Kwartalnik Bellona* periodical continues the tradition of this journal.

[2] Military economics is a field of knowledge focusing on the country's economic possibilities of satisfying economic needs of the waged war.

al and scientific matters. The classified part of *Mysl Wojskowa* concentrated chiefly on the following problems:

– conclusions drawn from national and allied exercises,
– modernisation problems of the armed forces and directions for their development,
– assessment of equipment and training of respective types of arms,
– strategic and defensive issues of the state,
– analysis of selected armies of the NATO member states.

Among numerous topics covered in the classified part of *Mysl Wojskowa*, a group of the articles was devoted to the training of engineer troops and their deployment in combat operations. The authors of the articles were first of all senior officers, mainly lecturers of the General Staff Academy (Akademia Sztabu Generalnego – ASG), including the Department of Engineer Troops Tactics, as well as commanders of engineer troops. In that period engineering issues were often discussed, mainly because engineer troops represented an important type of arms, both in the Warsaw Pact and in the NATO. It was caused by the continuous technical advancement taking place in the 1970s, which made it necessary to introduce fundamental changes into the doctrine documents in their part concerning the performance of engineering support tasks. In the discussed period the authors of classified *Mysl Wojskowa* treated the engineering support for combat operations as the whole of engineering undertakings carried out by all types of arms and services [1, p. 49] to perform the planned tactical operations. The fundamental tasks of such support included the following undertakings [1, p. 50]:

– engineering reconnaissance,
– maintaining roads and crossings,
– building engineered barriers and destroying barriers,
– clearing gaps in the enemy's system of engineered barriers,
– extending field fortifications,
– drawing and purifying water,
– supplying troops with engineering equipment and consumable materials.

Furthermore, considerable attention was devoted to such training issues as the engineering development of the terrain, proving support for the mobility and manoeuvrability of own troops under difficult geophysical conditions, along the seacoast direction of the Western European Theatre of War in particular[3], and also maintaining the integrity of water barrier crossings [2, p. 82]. In addition, new training problems emerged, such as crossing the opposing force's engineered barriers with nuclear mines and providing support for operations in the mass destruction zone. It is also worth emphasising that the significance of time in the battlefield was constantly stressed, which generated the need for further improvements in the methods of completing by engineer troops their different tasks, the range of which was highly diversified. The basic tasks and challenges faced by engineer troops in that period included, among others [2, p. 82]:

[3] The area of Western Europe, i.e. the territory of the NATO member states.

– continuous preparations of troops to ensure their ability to cross engineered barriers as well as various terrain obstacles,
– forcing[4] water obstacles and construction of temporary crossings,
– ability to hide fighting equipment quickly (digging in) and to conceal it effectively,
– continuous upgrading of professional qualifications by commanding officers,
– preparations of engineer troops enabling them to recognise mine barriers in which nuclear means were used and, then, to destroy them,
– mechanisation of earthworks needed to develop field fortifications,
– taking part in the works to tackle the effects of natural disasters,
– strengthening of defence lines and provision of engineering support being a part of the performed tactical operations.

It should be underlined that the scope of such engineering support depended, to a considerable extent, on the methods of carrying out combat operations, and, hence, in classified *Mysl Wojskowa* specialists very often directed attention to one essential problem, namely, the unceasing technological development. Such attitude resulted, for example, from the appearance of scatterable minefields in the battlefields, which generated the need for developing detailed procedures of engineering reconnaissance regarding this type of barriers and also clearing a line in such minefields. Moreover, the need for proper training and preparing engineer troops to tackle the effects of attack with weapons of mass destruction was emphasised many times [3, p. 37]. It was also stressed that organisational structures of engineer troops and their detailed command rules should be improved on a continuous basis [3, p. 41].

Therefore, it is clearly visible that the issues related to the use of engineer troops in combat operations represented an important research problem, resulting in detailed analyses conducted by numerous military specialists in that period, which was reflected in many publications in various journals, including the *Mysl Wojskowa* journal. As there was a huge number of such publications, this paper focuses exclusively on the analyses presented in classified *Mysl Wojskowa*, as these publications were of greater substantive significance for the training of engineer troops. They discussed the broadly understood issues of military engineering, including in particular the analysis of main tasks of engineer troops in defence operations and attacks as well as when crossing water obstacles or barrier minefields. Furthermore, they directed attention to the wide use of engineer troops units for providing support for the fighting elements, including in particular armoured and mechanised units.

1. Deployment of engineer troops in defensive operations

In the history of military science defence has always been a fundamental type of tactical operations. Engineer troops, including the tasks of providing engineering support,

[4] In accordance with the then contemporary standards the term “forcing” was defined as an attack combined with crossing the water barrier the opposite bank of which was defended by a potential foe. In the Warsaw Pact the potential opposing military force was called a foe.

have played a particularly important role in these operations. In classified *Mysl Wojskowa* of that period the engineering support for defence focused on three basic undertakings, namely the engineering development of the terrain, preparation and establishment of engineered barriers and carrying out demolitions [4, p. 15]. In the fortification development of the terrain particular attention was paid to the construction of the so-called field fortification structures. Their main task was first of all to make it possible to conduct surveillance and to protect troops and fighting equipment. It was important insofar as the developed fortifications and appropriately concealed guns increased to a considerable extent their effectiveness in fighting the potential opposing military force. The period of World War II was given as an example, as on the basis of the conducted analyses of this war it was determined that one dug-in tank was able to destroy or immobilise two or three enemy's attacking tanks [4, p. 15]. Furthermore, the properly prepared fortification structures (shelters, hideouts, etc.) were to protect troops from the effects of attack with weapons of mass destruction, which was emphasised several times by specialists in classified *Mysl Wojskowa*. To achieve this the full development of fortifications was necessary. To this aim all types of arms and services were involved as well as indispensable equipment with which engineer troops were furnished (e.g. earth-moving machines, explosive materials or specialist demolition materials kits) [5, p. 53].

Another aspect discussed in the journal was the necessity of gaining the knowledge of principles of fortification development, including in particular the sequence of erecting fortification structures, by commanders at the relevant level of command. Defensive operations carried out by an infantry company, being in direct contact with the enemy, served as an example. On the basis of the conducted analyses it was determined that first the following fortification works should be carried out [5, p. 56]:

- preparation of positions for the main means of fire (e.g. infantry fighting vehicles or armoured infantry combat vehicles), and their effective concealment afterwards,
- making rifle pits for individual riflemen and machine gun crews (it was assumed that in the first stage these were made for the lying position and in the second stage – for the kneeling position),
- proper preparation and clearing of the terrain to improve visibility in order to conduct surveillance and detect targets,
- construction of structures for conducting surveillance at the command posts of platoon and company leaders,
- preparation of gun positions for cannons and mortars and gaps for their crews,
- establishment and concealment of positions for equipment and logistics means.

The basic reason for the use of engineer troops in the above-mentioned undertakings was to prepare positions for the main means of fire. It was assumed that these tasks were to be carried out employing two methods, i.e. with the use of explosives or manually [5, p. 57]. The explosive method consisted in using the appropriately calculated amount of explosive charge to be blown up on the ground, which resulted in preparing

a position. Then, the position thus prepared had to be graded and levelled. The manual method consisted in digging a given fortification structure by soldiers using the so-called on-hand equipment, i.e. entrenching tools, sapper shovels, pickaxes, crowbars, etc.

The planning of an effective system of engineered barriers and demolitions to be carried out was another engineering task forming a part of defensive operations to which attention was paid. Among others, the purposefulness of minelaying as part of manoeuvring[5] and minelaying as part of preparations[6] was considered on the basis of the experience of using engineered barriers during World War II. These analyses showed unambiguously the necessity of using a system of engineered barriers on the battlefield, as they increased the effectiveness of conducted operations. The Battle of Kursk was given as an example, as during this battle minefields eliminated about 60% of all German tanks from further fights [4, p. 24]. On the basis of this experience the assumption was made that the majority of barrier minefields should be established already during the battle itself, because only when the battle was in progress it was possible to determine the main direction of operations and combat capabilities of the potential military opponent. Therefore, experts directed attention in classified *Mysl Wojskowa* to the great significance of minelaying as part of manoeuvring, which, according to the commander's decision, was to be carried out depending on the potential tactical situation on the battlefield (by planting mines in the given regions) and in the way ensuring the freedom of movement for own troops.

Another issue described in the journal concerned the proper link between the engineered barriers in the defence and the fire base of the defending units, because the correct integration of the barriers and the base increased their effectiveness. The most important objective of the established fire base was to protect these barriers from being detected by the enemy and from clearing a line in them. Most often classical barrier minefields were established with the use of anti-tank and anti-personnel mines [5, p. 64]. It resulted from the relatively easy transport and storage of mines, which later could be quickly planted by means of minelayers placed on the carriers or vehicles equipped with ramps [5, p. 64]. The speed of planting mines can be described by the fact that a platoon of PMR-3 type minelayers was able to plant three rows of the minefield within a distance of about 1 km during 10-25' [6, p. 151]. What is more, in the area inaccessible for tanks barrier minefields represented the basic element of defence against the potential enemy's attacking infantry. It was assumed that the link between barriers and demolitions should be established by a battalion of engineer troops, acting for the defending all-force troops [4, p. 24]. For example, while preparing a given structure for defence it was planned to plant mines in it to minimise the possibilities of it being effectively recognised and approached by the enemy. Because of the advanced level and difficulty of the performed works (e.g. destruction of a bridge, construction of engineered barriers, etc.) these tasks could be carried out exclusively by specialist engineer units.

[5] Minelaying as part of manoeuvring consisted in establishing a minefield while carrying out defensive operations.

[6] Minelaying as part of preparations consisted in establishing a minefield immediately before defensive operations were started.

The decision on planning the system of barriers and demolitions was taken by the overall commander. The commander's tactical considerations focused mainly on the deployment of engineer troops in the proper way and as intended. Hence, while carrying out defensive operations at the army level, the overall commander had the following engineer elements available [5, p. 69]:

– 2-3 groups for engineering and road operations,
– 1-2 units for barrier operations,
– army's engineering reserve,
– 1-2 units (groups) for crossing and bridge operations.

Each of the above-listed elements had specific engineering tasks to complete. In the case of groups responsible for engineering and road operations, they were separated from the engineering and road operations company, and their main task was to maintain movement routes for higher tactical units intended to perform a counter-attack. Units responsible for barrier operations were formed from the minelaying and demolition battalion and their task consisted in constructing barrier nodes and carrying out demolitions along the main directions of action. The engineering reserve was responsible for remedying the effects of attack with weapons of mass destruction and providing support for other elements of engineer troops. The reserve was separated either from the camouflage company or the company responsible for drawing and purifying water, or from the engineer battalion. Tasks of the last element, i.e. groups responsible for crossing and bridge operations, comprised the arrangements for bridge or rafting crossings along the main directions of action (movements), including in particular the operations of withdrawing from defence positions [5, p. 70].

A very important task assigned to engineer troops in defence was to prepare the routes for movement, provision of supplies and evacuation. As engineer troops had the relevant equipment, they had to maintain these routes in a proper technical condition and to rebuild them if necessary. Engineering and road operations subunits were entrusted with the task of maintaining the routes outside the division's defence lines and also to prepare evacuation routes for wheeled and tracked vehicles.

Another, equally important, task of engineer troops in defence was to remedy the effects of the use of weapons of mass destruction. In the case of such attack, engineering units were responsible, among others, for [5, p. 66]:

– extinguishing fires,
– removal of collapses and demolitions,
– preparing detours and bypasses,
– clearing the way,
– preparation of crossings,
– restoration of own damaged engineered barriers to defend own troops,
– technical rescue operations, evacuation of damaged equipment or assistance in repairing such equipment.

For remedying the effects of attacks with the use of nuclear weapons or other weapons of mass destruction the pontoon regiments and the following battalions were in-

volved: engineering and road operations, engineering equipment, minelaying and demolitions and sappers. It is also worth emphasising that it was very difficult to plan under what conditions the tactical operation would be carried out. Therefore, it is clearly shown that preparations had to be undertaken with respect to different variants of action. Furthermore, an attack with weapons of mass destruction could be carried out against the troops fighting not only in the open plains or forest areas, but also in the urban development areas. The latter would require even greater involvement of engineer troops. It resulted from the fact that fighting in the city posed (and it still does) a huge challenge for each type of forces as any operations in the urban area were dependent to a considerable extent on the presence and location of civilians. It was assumed in advance that only after the efficient evacuation of civilians it was possible to prepare the effective defence of cities. It entailed a considerable involvement of engineer troops (e.g. construction of evacuation roads, planting mines on the ways of the expected enemy approaches, preparation of the selected elements of infrastructure for demolition, etc.). Therefore, in classified *Mysl Wojskowa* considerable attention was paid to the use of engineer troops during the defence of urban areas.

Thence, it is clear that the use of engineer troops in defensive operations was of crucial importance, resulting, to a considerable extent, from the fact that they were equipped with the appropriate specialist equipment and were able to complete the tasks for which these troops had been specifically trained. It was assumed that these troops would be used at each stage of the conducted defence operations, both in the area accessible for tanks and in the urban area. Furthermore, it was assumed that engineer troops would be involved in case of attacks with weapons of mass destruction to remedy the effects of using such weapons, which additionally highlighted the significance of these troops in the discussed period.

2. Deployment of engineer troops in attack

In classified *Mysl Wojskowa* the issue of using engineer troops in operations aimed at breaking through the enemy's defence, i.e. in attack, was of crucial importance. For this purpose they were most often employed for the following engineering tasks: engineering reconnaissance, clearing gaps in the minefields, breaching the constructed obstacles or preparation and maintenance of the routes for the needs of own troops [7, p. 35]. Engineering reconnaissance was a very important or even key element during the initial stage of preparing the operation. The fundamental tasks completed as part of engineering reconnaissance included the following determinants [8, p. 17]:

- determination of the composition, equipment and capabilities of carrying out engineering tasks by the enemy,
- determination of the system and nature of the enemy's engineered barriers situated in front of the forward edge of its defence,
- identification of the structures that were prepared for destruction by the enemy's subunits,
- establishing the possibilities of carrying out bypasses for areas that are contaminated and subject to mass destruction,

– determination of technical condition of the road infrastructure,
– establishing the possibilities of preparing crossings and evaluating the serviceability of roads and the traffic capacity of bridges in the direction of attack carried out by own troops.

Engineering reconnaissance was carried out by subunits of engineer troops which formed the basis for organising reconnaissance elements, together with the specialist equipment. To complete reconnaissance tasks most often the following reconnaissance structures were designated: engineering surveillance posts, engineering posts for taking photos, engineering attack groups, engineering reconnaissance patrols and individual sappers – spotters [8, p. 15]. The main purpose of these groups was to establish the enemy's engineering capabilities, identify the boundaries of the minefields established by the enemy and the minefield density as well as plan the potential bypass routes. One of the most effective methods of reconnaissance conducted to this aim was surveillance, carried out under conditions of both good and limited visibility. It was often emphasised that helicopters should be used for surveillance and reconnaissance. It was assumed that their use could accelerate the process of gaining information, e.g. about the enemy's fortifications being under development, deployment of its troops or establishment of possible routes bypassing its minefields [7, p. 36]. Unfortunately, engineer troops were not equipped with such air assets.

Another important task requiring the use of engineer troops was to clear the gaps in the enemy's potential barrier minefields, and it is worth emphasising that to complete this task it was necessary to carry out detailed engineering reconnaissance, for which engineering subunits were responsible. The acquisition of indispensable data about the enemy's engineered barriers made it possible to take the right decisions regarding the way of clearing the gaps, which ensured the appropriate speed of attack for own forces. In classified *Mysl Wojskowa* three methods of clearing lines in the minefields were presented, namely: explosive method (making use of mine-clearing line charges and point charges), mechanical method (making use of sweeping gear) and manual method (making use of mine-clearing kits) [8, p. 18].

The explosive method consisted in projecting a mine-clearing line charge onto the enemy's established minefield. It was definitely the fastest and most effective way of clearing a gap about 5-6 m wide [7, p. 38]. In the mechanical method mine sweepers of KMT-4 and KMT-5 types were used by armour subunits to clear gaps. The last one of the listed methods, i.e. the manual method, was the most labour consuming way and, therefore, least often used. It was caused by the possibility that the sapper group, carrying out the potential gap, could be affected by the enemy's firing weapons[7]. The selection of a suitable method for clearing a gap depended on the commander's decision, tactical situation, enemy's firepower and also on the knowledge of the location of minefield boundaries. In addition, it was also presumed that the so-called combined method would be employed, consisting in projecting a mine-clearing line charged and,

[7] In accordance with the then contemporary instructions one sapper team was responsible for making one gap. A minefield gap was to be carried out by engineer troops under night conditions.

afterwards, widening the created gap by making use of mechanical sweeping gear. Furthermore, the authors publishing in classified *Mysl Wojskowa* stressed that for the effective breaching of these barriers it was necessary to mark the gap properly and to set up the so-called order-keeping and protection posts composed of three to four soldiers[8]. Finally, specialists would often underline that the enemy might also use constructed obstacles. Hence, to overcome natural terrain obstacles and barriers in the form of ditches or embankments it was necessary to use engineering machinery, such as heavy bulldozers (e.g. BAT type) [8, p. 24], earth-moving machines (e.g. BTM type[9]) or other engineering equipment (e.g. a span of an assault bridge of BLG type).

The last task performed during the attack was to prepare and maintain the routes for own troops. The basic equipment used for this purpose included assault bridges of BLG and SMT types, whose spans were to ensure the serviceability of the roads where pits were formed in the road crown. The preparation of the routes during the attack was the responsibility of the movement securing unit. Also the pontoon and raft subunits were planned to be employed to ensure the continuity of movement of the forces through the medium-wide and wide water obstacles, making use of PP-64, pontoon parks, and PTS-M, self-propelled amphibious carriers.

Therefore, it can be clearly seen that the role of engineer troops during the attack was of major importance. The diversity of tasks, such as: clearing gaps, mine clearance, road construction and maintenance or bridge operations, required commanders to gain a huge specialist knowledge and soldiers, to be considerably involved and disciplined during their training. Moreover, engineer troops were provided with specialist engineering equipment the operation of which made it necessary to maintain it in proper technical condition. The deployment of engineer subunits for engineering reconnaissance is also worth mentioning. Their main task was to provide engineering information about the topography and the possibilities of making use of it and to acquire the necessary engineering information about enemy forces. The tasks entrusted to respective engineering reconnaissance elements were highly responsible, as the information collected by these elements was decisive for the further planning and execution of other engineering tasks, which, in turn, increased the chances of accomplishing effectively the tactical objectives.

3. Use of engineer troops in city warfare

In classified *Mysl Wojskowa* considerable attention was directed to the deployment of engineer troops during the defence of urbanised areas (cities). From the engineering point of view, in the discussed period, defence in the urbanised area was influenced by such factors as the developed road network, availability of material resources[10], possibilities of making use of canals and rivers or involvement of civilians in preparing de-

[8] The persons were appointed from among the sappers making the gap. Their task was to maintain the gap and direct the traffic, and they were responsible, if necessary, for its quick closing.

[9] These were multi-bucket excavators.

[10] Local materials could also be used for the engineering development of the city defence.

fence. To investigate the above it was very important to conduct engineering reconnaissance, the objective of which was, among others [9, p. 63]:

– to determine the suitability for defence of respective buildings and structures,
– to identify the regions where selected buildings or structures should be demolished,
– to establish the possibility of making use of municipal water mains,
– to identify the regions for establishing the system of barriers (minefields or fortifications) and demolitions.

To gain the above-mentioned information engineering reconnaissance patrols were organised and entrusted with the task of acquiring the indispensable engineering data. This information was to be used to draw up the defence plan for respective cities as well as to deploy engineering surveillance posts whose task was to conduct surveillance in all sectors, both during the day and at night. The next task, after the necessary reconnaissance data were acquired, was to plan the development of engineered barriers designed to defend these cities. It was presumed that barrier minefields had to be established between the strong points of resistance, at the intersections, in the parks or in the public yards. The areas regarded as the most convenient ones for planting mines were the places without tightly packed buildings. Moreover, it was assumed that mines should be planted in all directions of possible approaches of tanks or other combat vehicles of the potential enemy, which involved using a large number of antitank mines, land mines against non-armoured vehicles and antipersonnel mines at the main traffic routes. It should be emphasised that the construction of these barriers under such conditions would always entail some organisational problems, since these routes were most often covered with concrete or asphalt pavement. In the areas with hard pavement mines were planted on the surface and masked with debris or other objects found in the terrain. Also booby traps were set up to make it difficult for the enemy to clear the main direction of approach for its troops.

It should be stressed that a defensive combat in the city imposed the necessity of having and using by engineering subunits a large amount of explosive charges intended for demolishing traffic and technical structures of special significance (e.g. bridges, overpasses, culverts, etc.), which, in turn, necessitated the use of specialist equipment for planting mines and building barriers and involvement of appropriately trained soldiers. The decision on blasting off a given structure was taken by the commander at the relevant level of command [9, p. 67], and this task was carried out by engineer troops (sappers). Moreover, in classified *Mysl Wojskowa* it was emphasised several times that in the structures planned to be abandoned controllable mines[11] and booby traps should be set up.

The construction of barrier nodes and demolitions involved not only the establishment of barrier minefields, but also the completion of defence works. These were mainly barricades formed from debris, sand bags, on-hand materials as well as Czech hedgehogs

[11] A special type of mines whose destructive effect is oriented in a specified direction, depending on its setting.

and steel or concrete trestles. Apart from carrying out fortification works, constructing barrier nodes and making demolitions, the deployment of engineer troops for city defence involved also the so-called special undertakings, including, among others [9, p. 68]:

– carrying out rescue tasks,
– extinguishing fires,
– supplying water to the fighting units,
– making use of and adapting municipal devices and structures to conduct defence operations.

Theoretically, the above-mentioned tasks could be performed by all types of forces and services. However, these tasks were entrusted to engineer troops because of the specialist equipment they had. The employment of engineering machinery facilitated the adaptation of urban structures or buildings to conduct defence operations. Subunits responsible for drawing and purifying water were tasked with preparing, masking and protecting an independent water source and also with extinguishing potential fires [9, p. 69]. Fires would be extinguished most often with the use of engineering machinery and explosive charges. The method of extinguishing fires by means of explosive charges consisted in making use of the propagating shock wave to put out a fire. Engineering machinery was used to build special fire barriers, preventing the fire from spreading. It was assumed that engineering subunits could carry out a part of these tasks in cooperation with other types of forces and services.

Classified *Mysl Wojskowa* discussed also the issue of deploying engineer troops during attacks in urban areas. The basic aspect of deploying engineer troops during this kind of tactical operations was to incorporate sapper subunits into the shock groups. They were entrusted mainly with engineering tasks under street combat conditions. During the street fights engineer troops most often provided support for infantry and tank units. The main tasks carried out by sappers as part of their engineering functions performed during the assault on the city included [10, p. 18]:

– engineering reconnaissance of the enemy and the terrain,
– evaluation of the extent of preparation of fortification works by the enemy,
– determination of the level of readiness of barrier minefields established by the enemy,
– breaching the enemy's barriers and fortifications,
– restoration and, then, maintenance of road serviceability in the selected directions of action,
– crossing water obstacles (if any),
– securing and fortifying the captured points of resistance,
– adaptation of more significant traffic facilities for the needs of own troops (assaulting forces),
– preparation and maintenance of sources of potable water to supply the troops.

It should be emphasised that during the assault on the city engineering subunits were considerably involved, because their reconnaissance elements were tasked with updat-

ing the engineering information on a regular basis. It concerned first of all such elements as engineering barriers established far into the assaulted city, the enemy's prepared fortifications and constructed obstacles, evaluation of the technical condition of road infrastructure facilities and also detection of all types of booby traps, directional mines or retarded mines. Furthermore, each operation of assaulting the enemy's fortified buildings and points of resistance required the deployment of engineer troops, as they cleared the gaps in the enemy's potential barrier fortifications and minefields. The following engineering elements were designated to complete this task [10, p. 21]:

– 1-2 reconnaissance and gap clearing groups (allocated to the infantry company),
– sapper groups responsible for gap clearance (allocated to the tank company),
– special sapper teams allocated to the assault groups.

During the urban operations gaps in the barrier minefields were most often cleared by the so-called reconnaissance and gap clearing groups and sapper groups responsible for gap clearance. To ensure the fast clearing of gaps mine-clearing line charges[12] were used as well as sweeping gear[13] (most often attached to the tanks). Under conditions where it was impossible to use specialist equipment it was necessary to clear a gap employing the manual method[14]. However, this method was rarely used, as the sapper group, carrying out the potential gap, could be affected by the enemy's firing weapons. The cleared gaps were to ensure mobility for own troops during the assault. An important issue related to these operations was to identify the barriers properly, as each detection of a booby trap or retarded mine required the involvement of a sapper subunit to disarm such mines, which, in consequence, slowed the progress of the assault.

In the urban warfare the disarming and clearing of mines in the buildings and structures prepared for destruction by the potential enemy represented also a very difficult task. Operations of this type required a very detailed planning on the part of the commanders (regarding the selection of equipment and personnel) as well as experience, qualifications and "courage" on the part of the sappers. Such operations were often carried out in cooperation with all-force subunits, as a security detachment had to be posted to cover the soldiers taking part in such operations, which ensured the level of security as high as possible. It was assumed that on the approaches to the mined buildings and structures there would be mines set to be non-removable, directional mines or booby traps. It shows that mine clearing was a very difficult task for subunits of engineer troops. However, the efficient operation of mine clearing significantly facilitated taking control of the urban area.

In the situation where the city was controlled by own troops, subunits of engineer troops were tasked with preparing the captured positions and posts to resist the enemy's possible counterattack. Such tasks were carried out by the reconnaissance and

[12] A special type of explosive charges designed to clear a line in the enemy's barrier minefield by employing the explosive method.
[13] A device attached to the tank to clear the mines planted in the area. Its operating principle consists in hitting the cleared ground, ploughing or exerting pressure on the set up mines.
[14] One of the methods for clearing gaps in the enemy's barrier minefield, consisting in clearing a mine by means of on-hand sapper equipment (line with an anchor).

gap clearing groups, units performing barrier operations and platoons responsible for engineering and road operations. These tasks included, among others [10, p. 25]:

– constructing engineered barriers (most often barrier minefields, but also fortification obstacles) along the probable directions of the enemy's counterattack,
– preparing a convenient region for resisting a counterattack,
– preparing the routes for own units to make a flanking attack on the counterattacking enemy.

Therefore, it can be clearly seen that the range of tasks for engineer troops was very wide during both the assault and defence of the city. The performance of these tasks undoubtedly required good training, high discipline and, first of all, keeping the employed equipment operable and in good technical condition. Despite the fact that in accordance with the binding instructions sappers were not intended to take part in the direct combat in the city, their involvement in carrying out tactical operations was at a high level, because ensuring the proper engineering support for the fighting units was an important issue in the planning of the whole operation in the discussed period.

4. Role of engineer troops in crossing water obstacles

Another important issue discussed in the analysed journal was the crossing of water obstacles, including in particular their crossing by assaulting units, i.e. the hasty crossing of a water obstacle. During the completion of this task engineer troops played a special role, as they were the only units with specialist bridging equipment and pontoons. The proper deployment of the units responsible for bridging and pontoon operations depended not only on the terrain conditions but, first of all, on the so-called tactical and operational indicators, which in the discussed period included, among others, the following [11, p. 125]:

– the speed of crossing water obstacles was to be 2-3 km/h,
– when water obstacles had to be crossed the capability of the crossing units was to be: 1.5-2 h for a regiment, 5-6 h for a division and 12-16 h for an army,
– pontoon bridges could be operated for the maximum of 14-18 h during one day of combat as they were affected by the enemy's firepower.

The analyses conducted in the discussed period most often focused on the overall time of the crossing, which depended on the width of a water obstacle, amount of rafting and bridging equipment available and also on the enemy's firepower [12, p. 167]. In accordance with the standards in effect in the discussed period, pontoon regiments were to build three to four pontoon bridges on the medium-sized water obstacles, which represented a sufficient number of crossing sites for an army to cross a water obstacle. A pontoon company, being a part of the divisional sapper battalion, was capable of preparing two to three bridge crossings on one narrow water obstacle [11, p. 131]. The above assumptions are only theoretical, as during the combat operations losses in both lives and equipment had to be taken into account. In addition, engineer troops were equipped with assault bridges, making it possible to cross efficiently narrow terrain obstacles which were not more than 30 m wide. Thence, it can be clearly

seen that the fundamental task of pontoon subunits was to prepare and maintain temporary crossings for the moving first echelon units of own troops.

Classified *Mysl Wojskowa* discussed also the issue of the fast and organised regrouping of pontoon regiments to the area where the task had to be carried out, i.e. to the place where the regiments were to prepare and maintain crossing sites for own troops. It was a difficult and complex task, because moving to the area where the task had to be carried out, in accordance with the adopted tactical assumptions, entailed the crossing of numerous terrain obstacles, including watercourses (independent crossing[15]). Therefore, to keep the marching pace by a pontoon regiment at a high level the commander had to have the relevant specialist knowledge to organise the movement in a proper manner, make specialist preparations and ensure the required security. It should be also emphasised here that the key role in this case was played by the engineering reconnaissance of a water obstacle as such, the responsibility for which rested with the separated reconnaissance element, whose task was to verify the engineering information about a given watercourse, e.g. its width, depth, flow rate of the current, type of ground at the bottom, presence of tributaries, shoals, etc. This information formed the basis for taking important tactical decisions, including in particular a decision on adopting the march formation in which the regiment subunits were to approach the water obstacle. The main assumption in this case was to regroup the march column so that the subunits building the bridge structure were at the head of the march formation.

In the crossing performed independently by a pontoon regiment the selection of an appropriate bridge structure represented a very important issue. This structure depended, to a considerable extent, on the width of a water obstacle, flow rate of the current and adopted tactical objective. In accordance with the standards in effect in the discussed period and the relevant calculations it was assumed that the total time of making the crossing by the regiment should be 3.5 h, including the time needed to disassemble the bridge and load it onto the vehicles [12, p. 171]. These assumption were, however, purely theoretical and had to be confronted with the real conditions of the test site. For this purpose engineer troops were improving their capabilities of performing the crossing and bridge operations over the time "P"[16] and they were undergoing training in line with the binding training programmes. In addition, the staffs of engineer troops conducted regular analyses and amended the programmes in their part concerning time and space calculations and also organised regular tactical exercises. For example, during the exercise under a code name "Rys 79"[17] the aspects of subunits' coordination were improved in respect of crossing water obstacles. What is interesting, the crossing of the Kwisa river turned out to be a huge challenge for the crossing subunits, since the exercise took place under adverse weather conditions,

[15] In the standard documents of the discussed period an independent crossing was understood as the crossing by the troops where the water obstacle was crossed using own personnel and means.

[16] Time "P" – time under peace conditions.

[17] Tactical exercise which took place within the area of the Silesian Military District (Slaski Okreg Wojskowy, SOW), in 1979.

during which the water obstacle was freezing [13, p. 139]. It was observed then that there was a significant need for improving the operations of engineer troops with regard to preparing crossings under low temperature conditions. Some other problems were also noticed, such as the presence of quicksand caused by high water levels, difficulties in towing bridge members and in guiding them [13, p. 147]. It is worth underlining here that the authors publishing in classified *Mysl Wojskowa* thought that such exercises had a considerable influence on improvements in the training of engineering subunits and enabled the officers' corps to gain valuable experience, as many of the theoretical assumptions could be verified in practice. Furthermore, the exercises made the superiors aware of the need for changes in the training and operational standards and necessitated changes to the tactical and operational indicators.

The crossing of water obstacles was connected with another task which was important for both engineer troops and other types of forces in the 1970s, namely protection against contamination. In classified *Mysl Wojskowa* it was stressed numerous times that the crossing of a water obstacle might take place under conditions where the enemy used the weapons of mass destruction (mainly nuclear or chemical weapons). It was presumed that radioactive contamination or a chemical attack could permanently exclude from further combat own assaulting subunits, which included also engineering subunits and subunits preparing and maintaining the crossing sites [14, p. 134]. Moreover, it was also analysed that out of all units the pontoon units, staying in the crossing area for the longest time (because they would build and maintain a bridge), would be the ones most exposed to harmful radiation or other poisoning agents. Thus, it was an important issue to undertake appropriate protection measures, including, among others [14, p. 139]:

- quick (early) detection of radioactive or other contamination in the area of the crossing site,
- making use by soldiers of engineering subunits (maintaining the crossing) of personal protection equipment safeguarding them from contamination,
- periodical decontamination of major equipment used for respective crossings (according to the orders given by the commanders of respective crossing sites),
- regularly relieving soldiers who were exposed to the doses exceeding the tolerable limits,
- observing the rules on behaving in the contaminated area.

Every time a crossing had to be prepared in the contaminated area appropriate measures were to be taken, depending on the type of a combat asset used by the enemy. It concerned in particular the operations in the contaminated area, as it required regular decontamination of military equipment, which was performed on the basis of a decision taken by the commander who was informed about the degree of contamination. In connection with the above, carrying out the crossing under such conditions was a relatively complex task which required the use of specialist equipment and involvement of numerous subunits, including also subunits of chemical troops.

Thence, it can be clearly observed that the crossing of water obstacles or other terrain obstacles was a very important issue from the training perspective. Exercises organised

in that period served as the best test for the subunits participating in them. For the staffs of such subunits the exercises provided the basis for updating the standards and training instructions. The use of engineering subunits in the crossing of obstacles was also important from the point of view of all-force units. Owing to the organised crossings these units were able to move efficiently, attack or carry out delaying tasks. In addition, a newly identified threat such as the use of chemical weapons resulted in the need for amending the standard procedures and training instructions and also for modernising military equipment. Therefore, the issue of crossing water obstacles was discussed many times by the military specialists in that period, as it required the cooperation of many types of forces and services.

5. Deployment of engineer troops for breaching barrier minefields

The breaching of barrier minefields is one of the fundamental tasks of engineer troops, which was also reflected in classified *Mysl Wojskowa*. Like today, it was presumed that one of the most important success factors in performing tactical operations in the battlefield is the time of completing a barrier breaching task. Therefore, an assumption was made that the breaching of the enemy's barrier minefields had to be performed in the shortest possible time, i.e. by employing either the explosive method or the combined method (i.e. mechanical and explosive) [15, p. 143]. However, the gaps in own minefields were to be cleared employing the manual method. These tasks were to be fulfilled by reconnaissance and gap clearing groups, while the detection of the enemy's barrier minefields was entrusted to the engineering reconnaissance patrols and engineering assault groups. The above tasks made it necessary to provide the engineering subunits with appropriate equipment and to train them, which, in turn, necessitated taking into account the following tactical factors, namely [16, p. 49]:

- means employed for reconnaissance and breaching engineered barriers were to be characterised by a high resistance to the impact of combat assets used by the enemy,
- assaulting forces had to be equipped with the sufficient amount of means necessary to clear gaps in the enemy's barrier minefields,
- means required to breach engineered barriers under conditions where weapons of mass destruction were used were to be adapted to remedy the effects of the attack with such weapons and to secure the manoeuvre of own troops,
- level of training of engineer troops had to match the requirements resulting from the tasks related to the clearing of gaps in the scatterable minefields.

It was just the breaching of scatterable minefields, which appeared in the tactical operations in the 1970s, which posed a serious problem. To a considerable extent it resulted from the fact that the technological development of equipment employed for scattering mines occurred in that period. It was particularly noticeable in the late 1970s and early 1980s, where the means and methods of scattering mines were undergoing very intense development in different armies [17, p. 50]. In consequence, it was necessary to draw up relevant procedures covering the problems related to the breaching of barriers of this type. Classified *Mysl Wojskowa* took account of the follow-

ing methods of breaching these barriers: bypassing, independent crossing and clearing a gap. Bypassing was the easiest way, consisting in bypassing the detected minefield. This method was to be employed in each tactical situation if the terrain conditions permitted. Making an independent crossing was possible only in the case of minefields with a low density. This method consisted in driving a vehicle (e.g. a tank or carrier) between the mines in the barrier minefield, by one soldier, most often a spotter or a driver/mechanic. The gap clearance consisted in removing, disarming or exploding mines by a sapper subunit. This method was most often employed if it was impossible to cross the minefield independently or to bypass it. It should be stressed that scatterable minefields posed a new type of threat which required appropriate preparations, not only in terms of providing additional equipment for engineering subunits, but also in terms of organisation. Lt K. Szajding directed attention to this problem by pointing to the need for improving the training programmes and, in particular, introducing to them the classes focusing on the detection of scatterable minefields and their breaching already at the stage of elementary (unitary) training, since such issues had not been included in the programmes before [17, p. 66].

Nuclear barriers were another problem connected with the breaching of minefields and discussed in classified *Mysl Wojskowa*, as they were used in the second half of the 20th century. It was assumed that such barriers would fulfil the following functions [18, p. 126]:

– creating zones of mass destruction,
– creating barriers preventing own troops from assaulting,
– causing severe losses in the attacking units.

From the potential enemy's point of view the above tasks posed a significant problem for training. To prepare for this the Main Office of Engineer Troops recognised the need for introducing changes in the training programmes to take account of the breaching of this kind of barriers. In classified *Mysl Wojskowa* it was emphasised that in the case such means were used by the enemy the following difficulties had to be taken into consideration: presence of irradiated zones, severe damage to hydrotechnical structures (e.g. damaged facilities could cause considerable flooding of the neighbouring areas), complete destruction of bridges or the possibility of fires occurring on vast areas. In connection with these problems, attention was directed to the need for effective detection of such barriers. For this purpose the following reconnaissance methods were distinguished: ground, air and radar reconnaissance. It was presumed that their reconnaissance capabilities would be as follows [18, p. 130]:

– ground – unmasked nuclear mines could be detected by ground surveillance posts from the distance of 500 m,
– air – reconnaissance carried out over the own state territory (along the front-line) could make it possible to determine the location of minefields from the distance of 10-15 km,
– radar – could make it possible to detect nuclear mines from the distance of 25-30 km.

The so-called special elimination groups (at a sapper team strength) were designed to destroy nuclear mines. To clear gaps in the minefields where the enemy used nuclear means two to three gap clearance groups were designated, supporting the assaulting all-force subunit. Such group was designed, among others, to transport indispensable equipment, materiel and soldiers, specialists of engineer and chemical troops, to the danger zone. Their task was to identify the location and neutralise nuclear barriers and, then, clear gaps in them. Furthermore, in classified *Mysl Wojskowa* the need was emphasised for training in detection of nuclear mines provided not only to engineering and chemical subunits, but also to the other types of forces. In addition, it was pointed out that it was necessary to provide engineer troops with specialist heavy equipment, suitable for operation in the "atomic" battlefield. It was important insofar as the use of weapons of mass destruction was a realistic threat because of the "cold war" waged in the discussed period. In connection with this threat the armed forces had to be prepared for such "bleak scenario".

It should be highlighted that the conclusions drawn from the analysis of the developing nuclear threat were presented, among others, in classified *Mysl Wojskowa* published in the 1980s, where the issue of detecting and destroying nuclear mines was discussed in detail. For example, Lt. Col. Pudlowski emphasised that the threat was very serious. He listed the facilities which could be first to be destroyed with the use of nuclear charges. These included, among others, command posts (central and regional posts and communications centres), ordnance depots, missile launching sites, airports, military bases, plants important for the national economy (in particular those connected with the armaments industry) or main traffic and hydrotechnical structures and facilities [19, p. 108]. In connection with these threats the production of equipment for engineer troops was started, to detect and neutralise nuclear mines (charges). This equipment included mainly mine detectors, ferromagnetic detectors[18] and the so-called mine detection feelers[19], depth and trip wire feelers. In accordance with the instruction binding in the discussed period nuclear mines were to be destroyed at the place where they had been detected or in the areas specifically designated for this purpose by means of shaped charges. When a mine of a known design was detected, the procedures allowed soldiers to disarm it. However, if charges of an unknown design or operating principle were used, the procedures instructed to destroy them immediately at the place of their detection. It should be highlighted that Lt. Col. Pudlowski stressed in his considerations the need for training in destroying mines for not only sappers but also for all-force subunits. As a result not only engineering subunits started to be trained in neutralising nuclear mines, but also other types of forces, making use here of the already trained sappers.

In conclusion, it should be stated that the level of sapper training in the scope of breaching barrier minefields had to be raised on a continuous basis, because apart from the completion of specialist tasks related to barrier minefields, sappers were entrusted with additional tasks connected with the training provided for other types of

[18] A piece of equipment used to detect devices (mines, charges) generating a magnetic field.
[19] A tool used by sapper to detect mines.

forces. It required not only the proper preparation of specialist engineering equipment but also improvements in the procedures for training engineer troops. Furthermore, it is worth emphasising that engineer troops were the avant-garde of land forces in the discussed period, which was manifested not only by providing these troops with modern technical means or specialist engineering equipment to establish and breach engineered barriers, but also with equipment for moving quickly in the terrain with difficult access. Furthermore, engineer troops were carrying out very dangerous tasks, i.e. detection and neutralisation of nuclear mines, which additionally emphasises their significance in the discussed period.

Conclusions

Analysing the deployment of engineer troops presented in the classified *Mysl Wojskowa* journal in the late 1970s and early 1980s, it can be seen clearly that engineer troops represented an important "link" of the Armed Forces in that period, as they performed numerous specialists tasks, most often including, among others, the construction and detection of engineered barriers, fortification works, preparation and maintenance of crossings, maintenance and repair of roads or clearing gaps in engineered barriers. These tasks emphasised the increasing significance of engineering subunits in the then contemporary battlefield, which entailed taking appropriate actions in the area of planning the engineering support system. It resulted predominantly from the development of military arts, changes in the engineering technique and different tactical requirements. Moreover, because of the increasing dynamics of the then contemporary battlefield it was presumed that the time needed to complete engineering support tasks had to be gradually reduced, which, in turn, entailed the development of engineer troops through the training of specialists engineering subunits.

The basic determinants of the development of engineer troops discerned in classified *Mysl Wojskowa* included, among others, the possibilities of exerting a versatile impact by the enemy and terrain conditions which determined the fulfilment of tasks, needs resulting from tactical and operational requirements regarding engineering support for tactical operations or new trends in the development of engineering technique. Furthermore, the constant development of engineer troops necessitated the continuous improvement in and standardisation of organisational structures and equipment, aimed to ensure a considerable independence of action for tactical units and all-force units and to increase combat and manoeuvre capabilities of own troops while performing engineering tasks. Classified *Mysl Wojskowa*, on the basis of the experience gained from different armed conflicts, would always stress the need for continuous modernisation and practical training of engineer troops to meet the requirements of the then contemporary battlefield. The authors of respective articles referred, among others, to the conclusions drawn after World War II (e.g. the Battle of Kursk) or to the conflicts which occurred after this War (e.g. the Vietnam war). Analysing the already finished and ongoing armed operations of that period, specialist would present conclusions for the then contemporary functioning of engineer troops. They proposed certain training and methodological solutions to be implemented in the test sites, making it

possible to confront theory with practice in the most realistic conditions possible, as the training of sappers was an important issue, because of the necessity of performing effectively the tasks supporting all-force units.

Classified *Mysl Wojskowa* analysed also the preparedness of engineer troops for new challenges of the then contemporary battlefield, which included, among others, the advancing development of scattered minelaying and realistic threat of using nuclear mines. Furthermore, the authors emphasised numerous times the need for changes in training to meet these challenges and for developing the equipment appropriate for their implementation. The detailed rules of deploying engineering subunits in the case of a nuclear conflict can serve as an example of such issue broadly discussed in the journal. It shows that the range of tasks for engineer troops was continuously widening in the 1970s.

In the journal considerable attention was also paid to the analysis of deploying engineer troops in urban warfare. A great emphasis was placed on the rules of deploying sappers during both the assault on the city and its defence. It was a very interesting presentation of urban warfare issues, where the main task of sappers was to become a part of assault groups and complete specialist engineering tasks, supporting the assault carried out by own troops. For fulfilling these tasks a high level of training was required as well as the knowledge of principles of general tactics and tactics of engineering subunits.

In conclusion, it should be stated that the deployment of engineer troops in combat operations was a very broad issue. The main reason for this could be attributed to the increasing combat capabilities of the potential enemy, resulting, among others, from the emergence of new threats. Because of this fact the support for tactical operations provided by engineer troops gained a special significance. The proper training of these subunits increased the chances for success in actions undertaken by operational forces. Therefore, the priority task for engineering subunits consisted in ensuring mobility for own troops and blocking the manoeuvrability of opposing forces (countermobility), carried out through cooperation between sappers and other types of forces as part of the command system. Furthermore, the performance of numerous tasks by engineering subunits, such as drawing and purifying water, construction and maintenance of roads, mine clearance, demolitions, camouflage and field fortifications and many others generated the need for continuous training, improving procedures and care of good technical condition of equipment. It should be emphasised that any arising problems were examined and analysed in practice during the great manoeuvres and exercises. On the basis of the exercises the staffs analysed actions of the potential enemy and verified in practice the level of preparedness of own troops, thus combing theory with practice. All the above showed clearly that engineer troops represented an important link of the Armed Forces of the Polish People's Republic.

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The authors declared no conflict of interests.

Author contributions

All authors contributed to the interpretation of results and writing of the paper. All authors read and approved the final manuscript.

Ethical statement

The research complies with all national and international ethical requirements.

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Biographical note

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Koncepcje użycia wojsk inżynieryjnych w działaniach bojowych w publikacjach tajnej *Myśli Wojskowej* z lat 1970-1981

STRESZCZENIE

Celem niniejszego artykułu jest przedstawienie koncepcji użycia wojsk inżynieryjnych w działaniach bojowych na przełomie lat 70. i 80. XX w. na podstawie publikacji zawartych w czasopiśmie *Myśl Wojskowa* o klauzuli „tajne". W publikacji zostały zawarte główne zadania wojsk inżynieryjnych w podstawowych działaniach taktycznych, w tym szczególnie w ramach pokonywania przeszkód wodnych, czy zakładania zapór minowych w tamtym okresie. Przeanalizowano również potrzeby wojsk inżynieryjnych tamtego okresu oraz pokazano podstawowe zasady użycia tego rodzaju wojsk w aspekcie wykonywania zadań inżynieryjnych. Ponadto zwrócono uwagę na szerokie wykorzystanie wojsk inżynieryjnych

w tamtym okresie, które były w dużej mierze odpowiedzialne za wspieranie pododdziałów walczących, w tym szczególnie pododdziałów pancernych i zmechanizowanych.

SŁOWA KLUCZOWE wojska inżynieryjne, działania taktyczne, zabezpieczenie bojowe, zabezpieczenie

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