



The Growing Importance of Military Special Road Transport in the Context of the Conflict in Ukraine

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Abstract

Special-purpose road transportation is beginning to account for an increasing share of total road transportation. The dynamic social and economic developments in recent years have fostered a rising need for special cargo transportation. This article focuses on the growing importance of military special road transport in the context of the conflict in Ukraine. It presents the main processes occurring during the implementation of military special transport and describes the military equipment used in military over-the-road transport, pointing out its key features and functions. In addition, this article analyzes the functioning of a selected Military Transport Command (JKTr) and identifies development trends in this institution's operations. The final part of the paper makes a comparative analysis of selected technical equipment used by the Armed Forces of the Republic of Poland to transport oversized materials.

Keywords: lowbed trailer, Military Transport Command, payload, safety, special transport, trend function

1. Introduction

Global economic development over the years has led to a situation in which the places where products are produced do not coincide with the target places they are sold. This means that products manufactured in one place in the world must be transported to another location to be sold. In modern times, it is difficult to imagine transport without a well-developed network of transport infrastructure, enabling importers, exporters, producers, and customers to import goods from almost anywhere around the world. A potential buyer does not have to wonder whether a given product will reach its destination. There are many definitions of transport. In Janusz Neider's book "International transport", transport is described as the provision of services aimed at moving cargo or additional services directly related to it. At the same time, he emphasizes that transport is a broad concept and covers many activities, thanks to which the cargo reaches its destination from the place of origin. This is a set of activities involving the movement of, among others, material goods in time and space, using appropriate technical means. The definition of transport according to Ilona Urbanyi-Popiołek is very similar and reads as follows: "Transport is a branch of the economy that meets the needs of moving people and goods. Cargo transport is a basic element of logistics systems, performing tasks related to the movement of materials, components and finished products in the supply, production and distribution subsystems. From the point of view of trade participants, efficient transport may determine the effectiveness of a commercial transaction, both in international

and domestic trade” (Urbanyi-Popiołek, 2013, p. 7). It should be noted that both definitions are similar and refer to the transport relationship between the customer and the manufacturer. When transporting special cargo, the rules applicable to transporting this type of goods must be followed. These are special types of materials whose physical, biological and chemical properties may cause damage to human health, death or destruction of material goods and environmental pollution. During their transport, situations arise in which the level of danger increases. All actions taken to increase safety during the transport of special loads are aimed at ensuring the safety of people participating in the transport of these loads, as well as other road users, and minimizing the risk of possible damage during transport and ensuring the safety of the natural environment (Urbanyi-Popiołek, 2013).

This article aims to present the increasing importance of military special transport, especially in the context of the dynamic geopolitical and military situation in Ukraine. In this context, Military Transport Commands play a key role in ensuring the mobility and logistics of our country’s armed forces. As the main executive bodies in the subsystem of transport and movement of troops, JKTr are responsible for planning, coordination and execution of complex logistics operations, which include the processes of movement, and loading and unloading of specialized equipment and materials. The increasing importance of military special transport is directly related to current security challenges.

2. The dynamics of military transport operations

Military Transport Commands operate within the transport and troop movement subsystem. These units actively ensure movement, loading and unloading. Transport of special goods in the Polish Army requires a transport permit. These permits are issued by the Military Transport Commands located in the territory of the Republic of Poland. The executive body of the subsystem of transport and movement of troops at the tactical level is the Military Transport Command (Neider, 2015, p. 10). They are responsible for planning and ensuring the smooth operation of troop transport. The units subordinated to JKTr are the Delegations of Military Traffic Regulation Commands and traffic regulation companies.

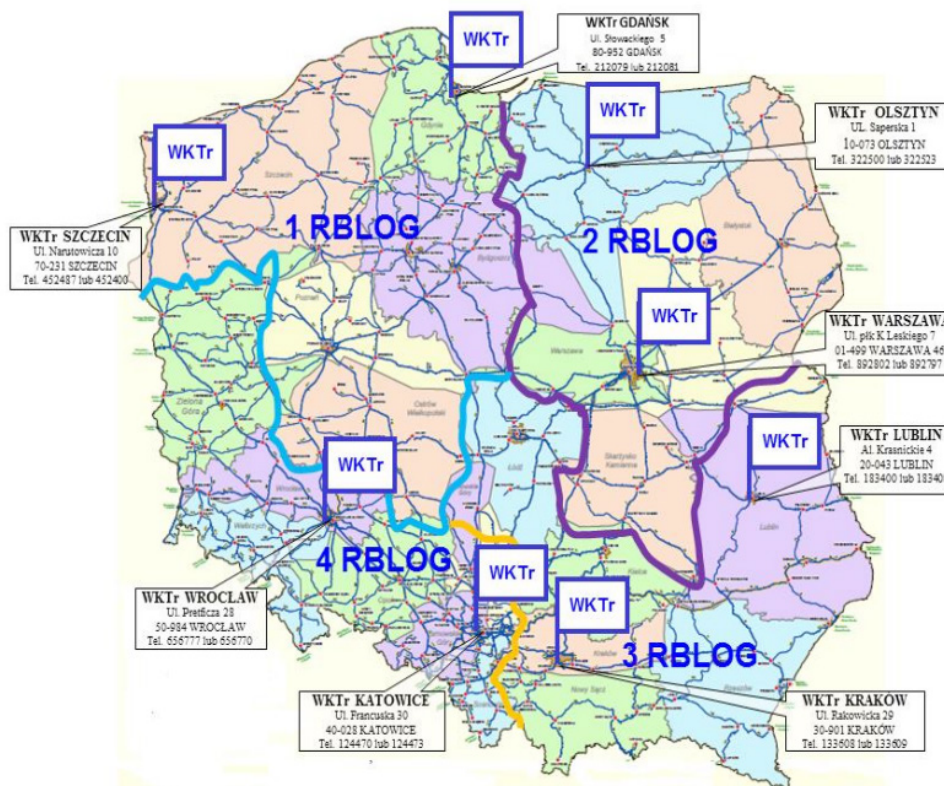


Figure 1. The distribution of Military Transport Commands in Poland. Adopted from: “Zasady przewozu wojsk transportem kolejowym DU-4.4.1(B). Szef. Kom. 183/2014” by The Ministry of Defense, General Headquarters of the Armed Forces. Copyright 2014 by The Ministry of Defense.

Figure 1 shows the location of Military Transport Commands in the territory of the Republic of Poland, taking into account the division of the country's territory into areas of responsibility of individual Regional Logistics Bases. There are four Regional Logistics Bases in Poland. There are two Military Transport Commands in each of their areas of responsibility. For example, in the area of three Regional Logistics Bases, the Military Transport Command is located in Lublin and Kraków. Both of these units operate and carry out the tasks entrusted to them in their area of responsibility. In the case of transport in two or more areas of responsibility of different JKTr, these units cooperate closely with each other. This cooperation results, among other things, from assistance in obtaining the necessary information and assistance in escorting and supervising transports. JKTr are most often located in city centers. They are responsible, among other things, for granting permits for special transport of troops and control the course of transport, closely cooperating with their subordinate Delegations of Military Transport Commands and traffic regulation companies. Additionally, JKTr units are directly responsible for transporting troops in their area of responsibility. There are a total of eight Military Transport Commands and seventeen subordinate Delegations of Military Transport Commands in Poland. It is worth noting that in each of the 16 voivodeships of the Republic of Poland, at least one of the 25 JKTr or DJKTr units is located. This is not a random situation. This method of locating this type of units is intended to help in the efficient and appropriate management of military transport, while continuously monitoring the transport process (Ustawa z dnia 19 sierpnia 2011 r. o przewozie towarów niebezpiecznych, 2023). The main purpose of the operation of the JKTr and DJKTr units is to make arrangements and supervise, with the help of the civilian traffic and transport administration, the conditions and rules for the movement of troops, the implementation of cargo operations (loading and unloading), the use by troops of the transport infrastructure located in its area of responsibility, as well as all formalities related to crossing state borders. Traffic control companies are the last executive body at the tactical level and are part of the transport and movement subsystem of the Polish Armed Forces. They are responsible for ensuring the efficient course of troop movement in accordance with the command's intention and plan. They achieve their goals through appropriate preparation to assist in transport and by appropriately controlling and regulating the movement of troops on the road sections indicated to them. They are responsible for the proper preparation of roads for special transport operations, and, if necessary, for additional road markings. The companies carry out their activities in such a way as to eliminate or reduce the effects of road traffic congestion and help make traffic smoother for other participants (Kaźmierczak, 2019).

3. The impact of war on the growth of military special transport

In recent years, as a result of the changing geopolitical situation in Eastern Europe, especially in connection with the conflict in Ukraine, we have observed significant changes in the field of military road transport. Military Transport Commands play a key role in adapting and responding to these changes, reflected in the number and nature of road crossing permits issued. Analysis of data from recent years indicates a significant increase in the number of permits, which can be directly attributed to the increase in military activity in the region. On the one hand, Table 1 shows the number of road crossing permit documents developed, which increased from 1,314 in 2019 to 1,798 in 2022. On the other hand, Table 2 illustrates the increase in the number of permits actually issued from 907 in 2019 to 1,437 in 2022. This increase indicates an intensified need for military mobility and logistics in response to dynamically changing security conditions. It is also interesting to look at the types of transport operations carried out and the different piloted journeys used in the permitting process (Kaźmierczak, 2019). Operations such as the passage of oversized vehicles, military columns, and transporting hazardous materials require detailed coordination and supervision, which is reflected in the number of permits issued (Transport, 2024). Transporting oversized vehicles constitutes the largest part of these operations, which emphasizes their importance for military logistics in the region.

Table 1. Prepared "Road crossing permits" documents in the selected JKTr for individual periods (the author's own study based on expert interviews)

In.	Type of piloted ride	Quantity in the period (January 1-December 31, 2022)	Quantity in the period (January 1-December 31, 2021)	Quantity in the period (January 1-December 31, 2020)	Quantity in the period (January 1-December 31, 2019)
1	None	1287	956	914	896
2	Traffic execution company	361	357	341	329
3	Military	132	105	83	64
4	Gendarmerie	18	19	21	25
Total		1798	1437	1359	1314

In.	Type of operation				
1	Passage of non-normative vehicles	1176	1021	1002	983
2	The passage of the column	460	276	214	181
3	Transportation of hazardous materials	162	140	143	150
Total		1798	1437	1359	1314

Note. The author's own study based on expert interviews.

Table 2. "Road crossing permits" issued by the selected JKTr in individual periods

In.	Type of piloted ride	Quantity in the period (January 1-December 31, 2022)	Quantity in the period (January 1-December 31, 2021)	Quantity in the period (January 1-December 31, 2020)	Quantity in the period (January 1-December 31, 2019)
1	None	1079	687	672	619
2	Traffic execution company	263	249	237	230
3	Military	88	55	46	41
4	Gendarmerie	7	13	14	17
Total		1437	1004	969	907

In.	Type of operation				
1	Passage of non-normative vehicles	908	745	711	675
2	The passage of the column	393	209	178	148
3	Transportation of hazardous materials	136	50	80	84
Total		1437	1004	969	907

Note. The author's own study based on expert interviews.

Based on Table 1 and Table 2, a number of conclusions and connections can be made. First of all, there is a significant increase in the number of both developed "Road crossing permits" and issued "Road crossing permits" in the period from January 1, 2022 to December 31, 2022. This situation is mainly related to the outbreak of the war in Ukraine. As a result of the armed conflict in Ukraine, the traffic of military vehicles on public roads increased significantly. Comparing 2022 with the previous year, the difference in road crossing permits issued in the area of responsibility of the selected JKTr was 433. This number can be compared with the difference between 2021 and 2020. In these years, it was 35 in favor of 2021. Additionally, the growth trend of permits issued in 2019-2021 increased steadily. However, 2022, with an increase of as many as 433 permits issued and 361 permits developed, was a major exception to the steady upward trend (Matejczyk et al., 2014). Although the growth trend has been maintained, its size cannot be considered uniform when compared to previous years. The noticeable increase in the number of permit documents prepared and permits issued has its justification. Every year, expenditure on the development, modernization and strengthening of the Polish army has increased. For this reason, the development and improvement of the Polish Army in many of its elements is noticeable. This also has a huge impact on the troop transport and movement subsystem. All activities aimed at developing the Polish army are reflected in the number of trips made by military vehicles on public roads. For this reason, over the years, the number of military vehicle transport operations has steadily increased. This increase is visible in Table 2, and the same situation occurs when it comes to developed road crossing permit documents (Kaźmierczak, 2019). This allows us to assume that there is an increasing demand for military transport on public roads.

The passage of oversize vehicles constitutes the largest part of road journeys, which require a permit to be issued by JKTr. In this case, there is also a noticeable increase in the number of journeys made each year. In 2022, 908 permits were issued for the road passage of non-standard vehicles. However, the total number of permits issued for all types of operations was 1,437 in 2022. This means that non-standard journeys in 2022 accounted for 63.2% of the total number of journeys. In the previous year, this percentage was even higher, as much as 74.2%. In other years, this percentage was 73.4% in 2020 and 74.4% in 2019. This leads to

the conclusion that the crossings of non-standard vehicles constitute the vast majority in relation to other types of operations that require a road crossing permit.

4. The development trend of the processivity of the operation of the selected Military Transport Command

A trend (otherwise known as a development trend) is a unidirectional, systematic change (decrease or increase) of a certain phenomenon over time, observed over a sufficiently long period of time while being the result of the main causes of these changes. Periodic fluctuations are changes that recur periodically. The interval during which all phase fluctuations occur is called a cycle. One of the most commonly used trend functions is the linear trend function. This function is defined by the formula:

$$\hat{y}_t = a + bt \quad (1)$$

Where:

- t – denotes consecutive numbers of periods or moments of the time series, $t= 1, 2, 3, 4, \dots, n$.
- a – denotes the state of the phenomenon in the initial period, $t=0$;
- b – denotes the periodic rate of increase ($b>0$) or decrease ($b<0$) in the size of the phenomenon under study, with no change in the development trend.

In order to determine the overall development trend, it is necessary to smooth the time series. This means eliminating the influence of random factors. The basic methods for smoothing time series are the method of least squares and the method of moving averages.

According to the method of least squares, the best fit to the empirical data is the line that minimizes the squares of the empirical deviations of the points lying on the line. This means that the lines satisfy the following condition:

$$\sum_{t=1}^n (y_t - \hat{y}_t)^2 = \min \quad (2)$$

Assuming a linear trend function, we get:

$$\hat{y}_t = a + bt \quad (3)$$

$$\sum_{t=1}^n (y_t - (a + bt))^2 = \min \quad (4)$$

Assigning the partial derivatives after a and b to zero, we get the following system of equations:

$$\begin{cases} \sum y_t = na + b \sum t \\ \sum y_t t = a \sum t + b \sum t^2 \end{cases} \quad (5)$$

n – denotes the number of observations

Solving the system due to a and b we have:

$$b = \frac{n \sum y_t t - \sum t \sum y_t}{n \sum t^2 - (\sum t)^2} \quad i \quad a = \frac{\sum y_t - b \sum t}{n} \quad (6)$$

Coefficients of the linear trend function $\hat{y}_t = a + bt$ can also be determined based on the formulas:

$$b = \frac{\sum (t - \bar{t}) y_t}{\sum (t - \bar{t})^2} \quad i \quad a = \bar{y} - b \bar{t} \quad (7)$$

where

$$\bar{t} = \frac{1}{n} \sum_{t=1}^n t = \frac{n+1}{2} \quad i \quad \bar{y} = \frac{1}{n} \sum_{t=1}^n y_t \quad (8)$$

Testing the match between empirical and theoretical data can be checked by calculating the average residual error. The smaller the residual error is, the better there is a theoretical fit of the trend line to the empirical data, i.e., the real data. We calculate the average residual error by using the formula:

$$S^2(z_t) = \frac{\sum(y_t - \hat{y}_t)^2}{n-2} \quad (9)$$

Table 1 shows data on the number of developed “Roadway Permits” in the selected JTCr in 2019-2022. In this table, the figures indicating the total number of permits issued in a given year are highlighted. This summary can be seen in Table 3 below. An auxiliary variable “t” was introduced to determine the assigned numbers for subsequent years. In addition, it was necessary to determine the product of y*t and the power of t^2 and calculate their totals for the years 2019-2022. The average for the sum of the developed permits and the average of the sum of the auxiliary variable “t” were also calculated.

Table 3. Data needed to determine the trend function for the developed permits in the selected JTCr

Year	y - the number of developed permits	t - (auxiliary variable “time”)	y*t	t^2
2019	1314	1	1314	1
2020	1359	2	2718	4
2021	1437	3	4311	9
2022	1798	4	7192	16
TOTAL	5908	10	15535	30
<i>Medium</i>	1477	2,5		

Note. The author’s own work.

Calculations:

$$n = 4 \quad (10)$$

$$b = \frac{n \sum y_t t - \sum t \sum y_t}{n \sum t^2 - (\sum t)^2} = \frac{4 * 15535 - 10 * 5908}{4 * 30 - 10^2} = 153 \quad (11)$$

This means that from year to year, the average number of permits developed increased by 153 units.

$$a = \bar{y} - b\bar{t} = 1477 - 153 * 2,5 = 1094,5 \quad (12)$$

This means that the theoretical number of developed permits in the year (t=0), i.e., 2018, was approximately 1095 units. The formula for the linear trend function for the number of developed “Roadway permits” in the selected JTCr is presented as follows:

$$\hat{y}_t = a + bt = 1094,5 + 153 * t \quad (13)$$

Based on this formula, a forecast of the number of permits developed for the following years can be calculated. It is necessary to enter the next periodic number in place of “t”. In the case of 2025, this number will be 7.

$$\hat{y}_{(2023)} = 1094,5 + 153 * 5 = 1860$$

$$\hat{y}_{(2024)} = 1094,5 + 153 * 6 = 2013$$

$$\hat{y}_{(2025)} = 1094,5 + 153 * 7 = 2166$$

$$\hat{y}_{(2026)} = 1094,5 + 153 * 8 = 2319$$

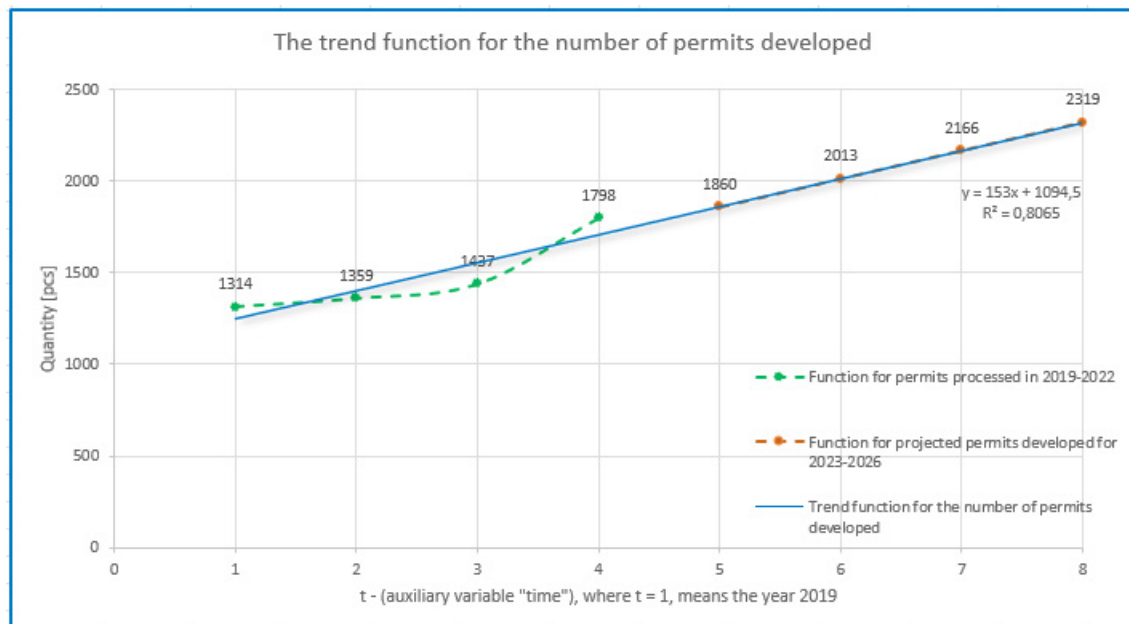


Figure 2. Graph illustrating the trend function for the number of permits developed. The authors' own work. Note. R2 – stands for the fit. In this case, the fit is R2 = 0.8065, which means that the fit is 80.65 percent.

Average residual error:

$$S^2(z_t) = \frac{\sum_{t=1}^n (y_t - \hat{y}_t)^2}{n - 2} = \frac{(1314 - 1247,5)^2 + (1359 - 1400,5)^2 + (1437 - 1553,5)^2 + (1798 - 1706,5)^2}{4 - 2} = 14044,5$$

$$S = \sqrt{14044,5} = 118,509493 \approx 119$$

In summary, the linear trend function formed on the basis of the number of road transport permits developed in the area of responsibility of the selected JTCr in 2019-2022 allows us to assume that there will be an upward trend in the coming years. This means that the number of developed permit documents and, consequently, the number of military special trips performed will increase. The growth should be noticeable from year to year and remain at a similar level until the end of the conflict in Ukraine. A fit of 80.65% and an average residual error of 119 is acceptable and leads us to believe that we will see a trend of further growth in the coming years. In addition, as a result of increasing demand for special transportation, it will be necessary to increase transport capacity. To this end, a greater number of low-loader sets for carrying out special transportation should be put into service. Increasing the number of low-loader sets can be realized by purchasing new equipment of this type or transferring them from the areas of responsibility of other Military Transport Commands.

5. A comparative analysis of the technical equipment used by the Armed Forces of the Republic of Poland for transporting oversized materials

A comparative analysis is to be carried out on the technical equipment used in the Polish Armed Forces for the realization of road transportation of oversized materials. For this purpose, three low-loader sets were selected, which are the foundation in the realization of transport of equipment or oversized materials in the Polish Army. The selected low-loader trailers are:

- PK-2-24t semi-trailer;
- ZREMB NS 600W semi-trailer;
- ST775-20W semi-trailer.

The technical equipment outlined above allows the implementation of special transportation in the Polish Army and is the foundation for the movement of military equipment transported across the Polish territory. Each of these trailers has a payload limit,

which is the limit of the weight of the cargo transported on them. The higher the limit, the more types of military equipment they are capable of transporting. On the other hand, however, the higher loading capacity of the semi-trailer increases its dimensions and, at the same time, reduces the mobility of the entire low-loader set. The PK-2-24t semi-trailer is capable of transporting two 10-foot containers or one 20-foot container. In addition, it allows the carriage of Class C swap bodies. Structurally, the semi-trailer allows loading a loading platform or hook container no longer than 6.65 meters with a device called MULTILIFT MK IV. This device can be mounted on the chassis of a heavy-duty truck with a self-loading system. Such an operation is carried out by pulling the load from behind onto the trailer.



Figure 3. General view of the PK-2-24t semi-trailer. Adopted from: <https://zamet.figero.net/12/>.

The ZREMB NS 600W low loader trailer is part of a set for transporting tanks and heavy-tracked equipment with a capacity of 60 tons. It is designed to work with truck tractors to form transport sets together with them. The trailer has six axles and 24 load-bearing wheels. The design of the semi-trailer allows for loading, transporting and unloading of military equipment such as Leopard 2PL tank or Challenger 2 tank, among others (Zestawy niskopodwoziowe dla czołgów, 2024).



Figure 4. General view of the ZREMB NS 600W semi-trailer. Adopted from: <https://www.polska-zbrojna.pl/home/articleshow/31123?t=Zestawy-niskopodwoziowe-dla-czolgow>.

The ST775-20W semi-trailer is designed for transporting wheeled vehicles, tracked vehicles and containers in various configurations. The purpose of the semi-trailer is to load, transport and unload technical equipment weighing up to 70 tons, i.e. tanks of the Abrams, Challenger and Leopard families, among others (Zestawy niskopodwoziowe dla czołgów, 2024).

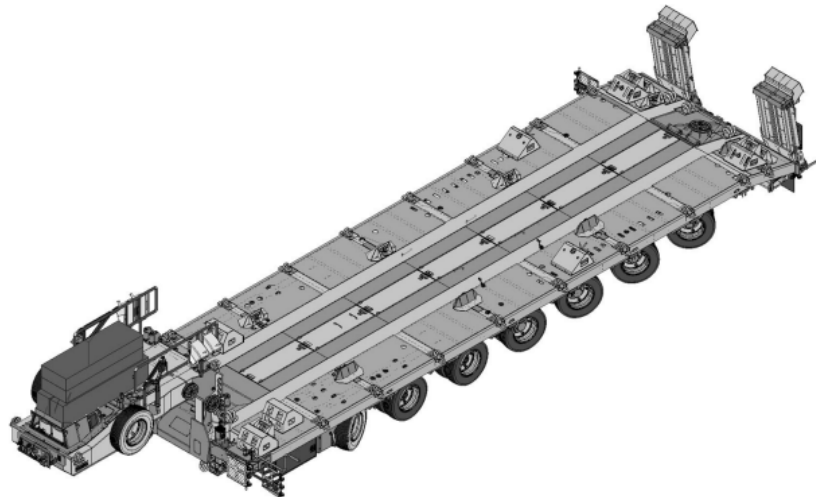


Figure 5. An isometric view of the ST775-20W trailer. Adopted from: “Instrukcja użytkownika (IU) naczepa niskopodwoziowa DEMARKO typ ST775-20W do transportu czołgów i ciężkiego sprzętu wojskowego” by the Ministry of Defense. Copyright 2022 by the Ministry of Defense.

Table 4 presents the most important technical data of the three low-loader semi-trailers described earlier, which the WP uses to carry out abnormal transport. These data are the basis for determining the usefulness and applicability of the trailers in the transportation of military equipment to Ukraine. Depending on the individual values of the technical parameters presented in Table 4, the possibility of realization of transport by the selected technical equipment in relation to the cargo’s dimensions, weight and specificity is evaluated.

Table 4. Summary of key statistics of selected low-loader trailers used by the Polish Army

	PK-2-24t	ZREMB NS 600W	ST775-20W
Payload	19 400 kilo(gramme)s	60 000 kilo(gramme)s	70 000 kilo(gramme)s
Unladen weight	5 200 kilo(gramme)s	18 500 kilo(gramme)s	23 000 kilo(gramme)s
Overall length	9 500 millimeters	15000 millimeters	15530 millimeters
Overall width	2 550 millimeters	3350 millimeters	3450 millimeters
Target operating standard in kilometers	200 000 kilometers	400 000 kilometers	400 000 kilometers
Target operation norm in years	20 years	20 years	30 years
Preferred vehicle for trailer cooperation	Jelcz P862D.43 G9	Iveco Eurotrakker	Jelcz 8x8 type C882.62.

Note. The author’s own work.

The most important value presented in the table above is the load capacity. It refers to the maximum load weight that can be transported. At the same time, it is the difference between the permissible total weight and the curb weight of the trailer. The higher the trailer’s load capacity, the more types of loads a given trailer can transport. Additionally, large loading capacity allows you to transport more loads at the same time. In this respect, the ST775-20W semi-trailer looks the best. It allows you to transport loads of up to 70,000 kg (Instrukcja użytkownika naczepa niskopodwoziowa DEMARKO typ ST775-20W, 2022). This enables the transport of virtually any technical equipment, including the latest version of the SEPv3 Abrams tanks. On the other hand, there are some limitations related to the high load capacity. The greater the trailer’s load capacity, the larger its

dimensions. As the load capacity increases in individual trailers, the total length and width also increase. This means that the larger dimensions of the trailer limit its maneuverability (Barcik, 2018). It is also worth noting that as the load capacity increases, not only the size of the semi-trailer increases, but also its own weight. As with the dimensions of the semi-trailer, its own weight also reduces maneuverability. Additionally, as the weight and dimensions increase, its use in field conditions becomes more difficult. Although all three semi-trailers, PK-2-24t, ZREMB NS 600W and ST775-20W, are adapted to off-road conditions, the PK-2-24t semi-trailer has the greatest predispositions due to its cubic capacity. The basic criterion for the service life of technical equipment is the previously established target operating standard in kilometers and operating standard in years. After exceeding the assumed operating standard, technical equipment should be withdrawn from service in the Polish Armed Forces (Przyczepy Wojskowe, 2024). This means that the longer the operating standard of a given semi-trailer in terms of time or kilometers traveled, the longer it can be used for transport. The values presented in Table 4 mean that the ST775-20W semi-trailer has the longest operating standards compared to the others. It allows a driving distance of 400,000 km or 30 years of operation. The ZREMB NS 600W semi-trailer has a similar result. However, its operating standard in years differs and is 20 years, which is 10 years shorter than in the case of the ST775-20W semi-trailer. On the other hand, the operating standards of the PK-2-24t semi-trailer are the worst. As for the operating standard in kilometers, it is 200,000 km, while the operating standard in years is 20 years. Due to the characteristics of the semi-trailer, its use over long distances is smaller than in the case of other semi-trailers. This allows us to assume that a lower value of the target kilometer operating norm is justified. However, 20 years of operation until it is withdrawn from use is too small, as in the case of the ZREMB NS 600W semi-trailer. Each of the trailers presented in Table 4 was designed to work with a particular type of vehicle, creating a set together with it. The set includes a semi-trailer and a tractor unit preferred for use with it. In the case of the PK-2-24t semi-trailer, it is Jelcz P862D.43 G9., for the ZREMB NS 600W semi-trailer, the preferred vehicle is the Iveco Eurotrakker, while for the ST775-20W semi-trailer, it is recommended to use the Jelcz 8x8 type C882.62 tractor unit. Each of these vehicles has different technical specifications and different transport capabilities (Barcik, 2018). For this reason, a useful solution would be to introduce a tractor unit into service in the Polish Army that would be able to work with each of the above-mentioned semi-trailers. Such a technological solution would make it possible to make non-standard transport in the Polish Armed Forces more dynamic while facilitating the entire process of implementing special road transport. Of course, it should be noted that implementing such a technological solution involves high costs. However, the benefits of its implementation could be disproportionately greater.

6. Summary

Based on the calculations and analyzes performed, an increase in the importance of military special road transport can be noticed. Its dynamic growth in recent years is primarily due to the intensification of military operations in Ukraine. The increasing demand for this type of transport also increases the need to implement more advanced platforms for transporting special cargo. In order to improve military special transport, appropriate institutions are being created to ensure safety and coordinate the entire process of moving cargo. The Military Transport Commands are such institutions operating in this way within the territory of the Republic of Poland. An important element of the proper functioning of JKTr is the technical equipment used for transport. In the calculations to prove the increase in the importance of military special road transport, statistical data relating to the number of road crossing permit documents developed and the number of road crossing permits issued in particular years were used. By means of a dynamics analysis, and more precisely by developing a linear trend function, an increasing tendency was presented in relation to the number of road crossing permits developed in the area of responsibility of the selected Military Transport Command. The developed linear trend function illustrated the impact of the conflict in Ukraine and its dynamics on the number of military transport operations carried out in Poland. It was proven that the demand for the use of special road transport is increasing, and it was shown how much this was influenced by the intensified dynamics of military operations caused by the conflict in Ukraine. Additionally, the forecasted further increase in the number of permit documents prepared and, consequently, in the number of trips of military vehicles with special cargo on the territory of Poland was presented. Carrying out an analysis of the technical equipment used to carry out non-standard transport by the Polish Armed Forces allowed for the preparation of a summary of the most important technical data of low-bed semi-trailers used by the Polish Army. The load capacity factor in transport allowed us to determine the currently most important direction of technological development in constructing semi-trailers intended for oversized transport. This direction concerns increasing the trailer's load capacity in order to enable the transportation of the largest and heaviest loads possible. However, the main factor determining the direction of development in the Polish Armed Forces is the geopolitical situation in our immediate surroundings. In recent years, the dynamics of development have been generated by the armed conflict in Ukraine.



Declaration of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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