

DEVELOPMENT OF THE IT SYSTEM SUPPORTING THE MANAGEMENT OF THE TRANSPORT AND MOVEMENT SYSTEM OF THE ARMED FORCES OF THE REPUBLIC OF POLAND

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Abstract

For almost a decade since joining NATO, the armed forces did not have an information system supporting the management of their own transport system. For military logistics, the implementation and operation of an IT system supporting the work of transport and army forces was of significant importance from the point of view of improving the efficiency of the logistics system. The progressiveness of this article is manifested in the fact that in addition to the characteristics, role and tasks of the system presented in previous studies, the author additionally carried out research, evaluated the functioning and presented directions of development of the IT system code named CONVOY. The significance of the system has even increased since NATO decided to strengthen its eastern flank in 2016. Consequently, this has resulted in an increased number of convoys on the roads that must be accompanied by competent transport and troop movement in order to be there. IT system CONVOY allows this process to be speeded up by electronic reconciliation, development and issuance of road traffic permits and monitoring them in real time.

Key words: management, transport and movement system, information system.

Introduction

The system of transport and movement (M&T) of troops in the Ministry of National Defence (MND), with its specificity and complexity of tasks, has for many years remained without an IT system that would provide at least minimum support for managing one of the most important subsystems of the Polish Armed Forces system. The implementation of the ICT system under the code name CONVOY resulted from the real needs of the army in the implementation of increasing transport needs of non-standard vehicles and transporting hazardous materials and the incremental increase in the number of moving columns of military vehicles on public roads.

In order to cope with the growing needs of military units, in this important area of logistic security, this has meant an increasing number of tasks for the transport and military movement authorities, in particular the development and issuing of permits for their displacement and real-time displacement monitoring.

The subject of the research included in the article is an evaluation of the teleinformation system used in MND, supporting the management of transport and the movement of troops. Ignorance about this subject has led to a problematic situation that has demanded analysis and evaluation of the ICT system used in MND, used to develop and issue permits for road movement of military vehicles and ongoing monitoring of this movement. The content of this article is related to this problematic situation, which assumes the examination and evaluation of the functioning of the IT system in the MND transport system in terms of its improvement in the efficiency of the management of the military transport system.

The detailed objective of the article is to assess the functioning and presentation of IT development directions of CONVOY in the field of relocation of the army's resources and monitoring them during the movement. The cognitive goal of the article is a theoretical broadening of knowledge about the CONVOY IT system being used in the Polish Armed Forces.

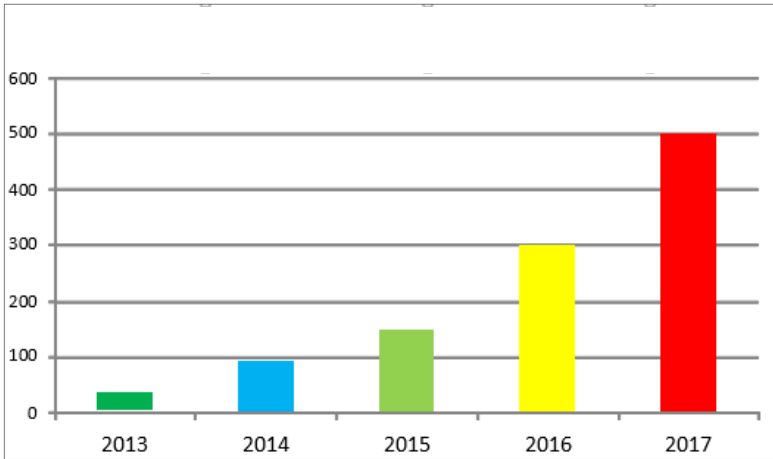
The implementation of such outlined objectives of the article required answering the following research questions: What factors appealed for the implementation of the IT system supporting the management of cargo shipments and the movement of troops in the Ministry of National Defence? What are the experiences of RON resulting from the needs of the army in the field of planning and monitoring the movement of military supply resources on public roads? How much does IT CONVOY support the management of the transport system? What are the prospects for the development of the system in terms of improving its functionality?

Due to the research problems formulated in this way, the following research methods were applied: the method of analysis and criticism of the subject matter of the research, and the method of examination of military instructional documents and theoretical methods: analysis, synthesis and methods of inference.

Analysis of statistical data justifying the implementation of the CONVOY IT system - research results

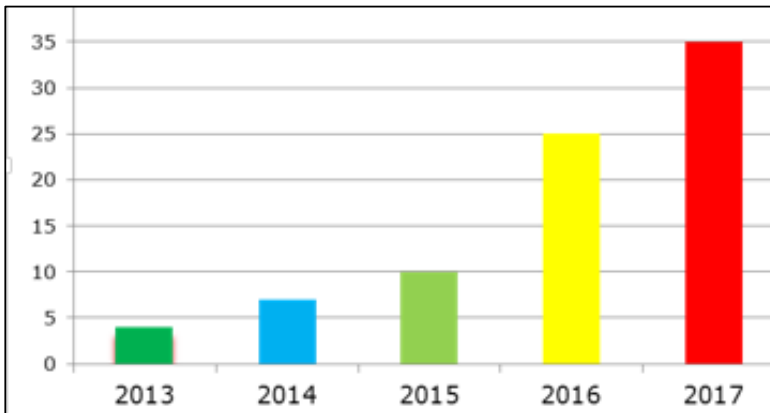
In the Armed Forces of the Republic of Poland, the high level of needs in the area of preparing and issuing permits for journeys and transport on public roads has been maintained for many years. Military Transport Headquarters develop and issue about 10,000 permits for non-normative movement, dangerous transports and the movement of military columns, carried out within the country and abroad. Over 4000 trips are subject to piloting, and the total kilometres travelled by MND vehicles is about 40 million kilometres.

Figure 1 shows a list containing only the number of soldiers of allied troops moving and staying on the territory of Poland (Figure 2), for which arrangements had to be made and permits issued.



Source: Information materials of the General Staff of the Polish Army. Ed. MND. Warsaw 2018.

Figure 1. Increase in the number of transit movements of allied troops in Poland in 2013–2017 (pcs.)



Source: Information materials of the General Staff of the Polish Army. Ed. MND. Warsaw 2018.

Figure 2. Increase in the number of allied troops in Poland in 2013–2017 (in thousands of soldiers)

The above-mentioned comparison shows that in recent years, the number of soldiers of allied and partner troops (participating in the partnership for peace programme) has been successively increasing, both in the case of their stay in Poland and those passing through our territory. This is the result of threats created in Ukraine (Crimea and Donbass) from Russia.

In response to the emerging threats, the number of soldiers on the eastern flank of NATO has been increasing, including in Poland. Figure 3 shows the basic locations of allied troops in Poland as of the beginning of 2017.

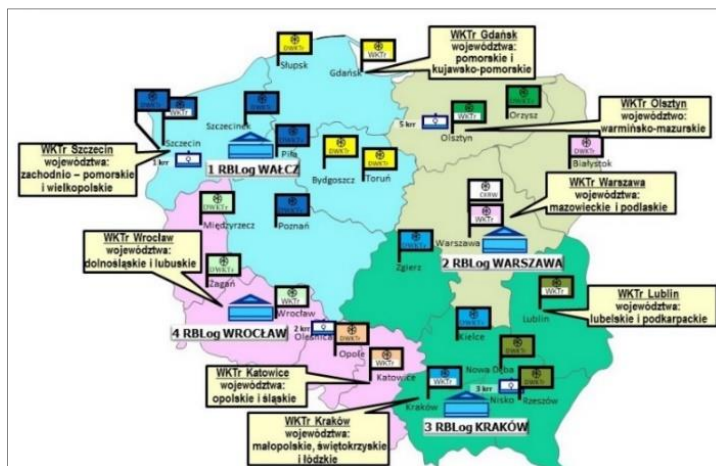


Source: Information materials of the General Staff of the Polish Army. Ed. MND: www.mon.gov.pl. [accessed on 19/05/2019].

Figure 3. Location of allied troops in Poland - status for 2017

In connection with the above, both the number of soldiers and military equipment of allied troops staying on our territory is increasing. This automatically results in an increased number of journeys and transport on public roads related to the operational movement of allied troops (including rotation of changes and participation in exercises) and with supplies of means for their own needs.

Figure 4 shows the distribution of transport and army forces participating in the process of preparation of permits and arrangements and the implementation of military columns moving on roads for both their own and allied troops.



Source: Information materials of the General Staff of the Polish Army. Ed. MND: www.mon.gov.pl. [accessed on 19/05/2019].

Figure 4. Location and areas of responsibility of the transport and movement of troops

The units participating in the process of securing the movement of the Polish Armed Forces with the use of SI CONVOY include: the Head of Transport and Military Movement; Transport Planning and HNS Division of the General Command of the Armed Forces; Regional Logistic Base; Military Transport Command and traffic regulation company.

Approximately 1,000 users use the SI CONVOY system at the moment. The system consists of both stationary and mobile stations. For the purposes of Military Police, 60 stationary stations and 400 BlackBerry terminals are used. Table 1 contains information on the location of SI CONVOY positions in the Polish Armed Forces.

Table 1

List of deployment of stationary positions of the CONVOY IT system

No	The name of the military command	Military units equipped with IT system CONVOY	The number of locations
1.	Command of transport and movement of troops	Bureau of Transport and Military Movement	1
		Regional Logistics Bases	4
		Military Transport Headquarters	8
		Delegation of the Military Transport Headquarters	16
		Traffic regulation companies	4
2.	Headquarters piloting the displacement	Main Headquarters of the Military Police	1
		Units of the Military Police	6
		Departments of the Military Police	9
3.	Command monitoring displacement	Center for Crisis Management of the Ministry of National Defence	1
		Armed Forces General Command	1
		Operational Service of the Operational Command of the Types of Armed Forces	1
		Operational Service of the Support Inspectorate of the Polish Armed Forces	1
		Operational service of the Warsaw Garrison	1
4.	Units of the Polish Armed Forces Inspectorate Support	1 Logistic Brigade	1
		10 Logistic Brigade	1
		Logistics Training Center	1
5.	Total	Services, organs and military units involved in the planning, implementation and monitoring of shipments	57

Source: Own study.

The above-mentioned statement shows that many services, organs and military units are involved in the process of planning and implementing displacement on the roads of non-standard vehicles, vehicles with hazardous materials and military columns as well as their ongoing monitoring. In total, in the transport and army traffic units, the system was installed in 33 locations, in pilot units in 16 locations and, additionally, the system was installed in five monitoring services of journeys and transport, and in two units and one logistics center reporting to the Head of the Polish Ministry of Support Inspectorate.

Experience of the Ministry of National Defence in the use of the CONVOY IT system

The real test of the efficiency of the CONVOY IT system was carried out in 2016, the priority for the Polish Armed Forces enterprise: the Anakonda-16 military exercise (31,000 soldiers), World Youth Days, and the NATO Summit in Warsaw, which intensified to an unprecedented level (since the Warsaw Pact) the number of military transports traveling on public roads across Poland. Another breakthrough challenge for TiRW authorities, due to the commencement of allied forces being stationed in Poland, took place in 2017. Since then, allied troops, especially American, have been implementing an increased number of transports related to, among other things, the performance of operational tasks and the rotation of people and equipment. The most important tasks completed in 2010-2018 with the use of the CONVOY IT system (Table 2) are included in the table below.

Table 2

List of priority undertakings using the CONVOY IT system

No	Year	The name of the enterprise	Place
1.	2010	Monitoring of road displacement over 100 items 80-ton sets for the transport of non-standard vehicles with the transport of armoured equipment	Poland
2.	2011	Monitoring of displacement with the use of forces and resources of the Military Police during protection of the passage of about 40 delegations of European Union countries	Wroclaw
3.	2012	Monitoring displacement with the use of forces and resources of the Military Police in securing the European Football Championship „EURO 2012”	Warsaw, Wroclaw, Poznań, Gdańsk
4.	2012-2017	The displacement of the wheel rolls mission of the Polish Military Contingent for „Baltic Air Policing” - protection of the airspace of the Baltic States	Latvia, Lithuania, Estonia
5.	2016	International military exercise with the participation of allied and partner troops „Anakonda-16”	Area of polygons, Warsaw
6.	2016	31. World Youth Day	Cracow
7.	2017	Operating displacements and rotation of allied troops (Battle Tank Brigade Combat Group, Multinational Battalion Combat Group, Multinational Division North-East)	Area of polygons and location of troops: Zagań, Świętoszów, Bolesławiec, Orzysz, Elbląg
8.	2010-2018	Cyclical military exercises with the participation of allied troops: Dragon, Baltops, Steadfast Jazz, Noble Jump, Bison, Cobra	Area of polygons

Source: Own study.

One of the basic tasks of military transport commands is to issue road transport permits for military vehicles that need to be agreed. Thanks to the CONVOY system operating since 2011, the work of officers and employees of transport and army forces was significantly simplified. After many years of using the CONVOY system, it is currently difficult to imagine work without the use of an IT tool that would improve the work of MND transport cells. Nobody wants to go back to manual development of an authorisation, without electronic databases, or an SI graphic package associated with the CONVOY system, improving the monitoring of the location of objects during their movement.

For example, only one Military Transport Command in 2016, selected for research, issued over 670 awards and carried out 1,700 agreements. In order to visualise the laboriousness of manually developing a single permit, it should be known that it may take up to several days. This is a long-term and labor-intensive task, and the data presented in Table 1 illustrates with what magnitude of work the casts of the Military Transport Commands measure every day.

A quick analysis of source materials¹, contained in the synthesis of geonimal traffic measurement, issued by the General Directorate of National Roads and Motorways, leads to the conclusion that the volume of traffic in Poland does not decrease, but indeed grows significantly. The presented data shows that when comparing the traffic loads of the national and motorway roads from 2010 and 2015, one can observe an increase in the average daily traffic of motor vehicles from 9888 vehicles / day in 2010 to 11,178 vehicles / day in 2015 (an increase of more than 12%). A similar trend occurs in the case of the military transport system. This is illustrated in Table 3, on the example of the list of permits in the selected Military Transport Headquarters.

Table 3

List of issued and issued permits and arrangements in 2016

Type of permit	Total number Authorisation	Including:		Number arrangements
		Developed permit projects	Issued authorisation	
Transport of dangerous cargo	83	62	21	1201
Carriage of normative vehicle	469	262	207	317
Moving column	124	66	58	212
Total	676	390	286	1730

Source: own study based on: *Informational materials of the Military Transport Headquarters*. Ed. Military Transport Command, Lublin 2017. ppt presentation.

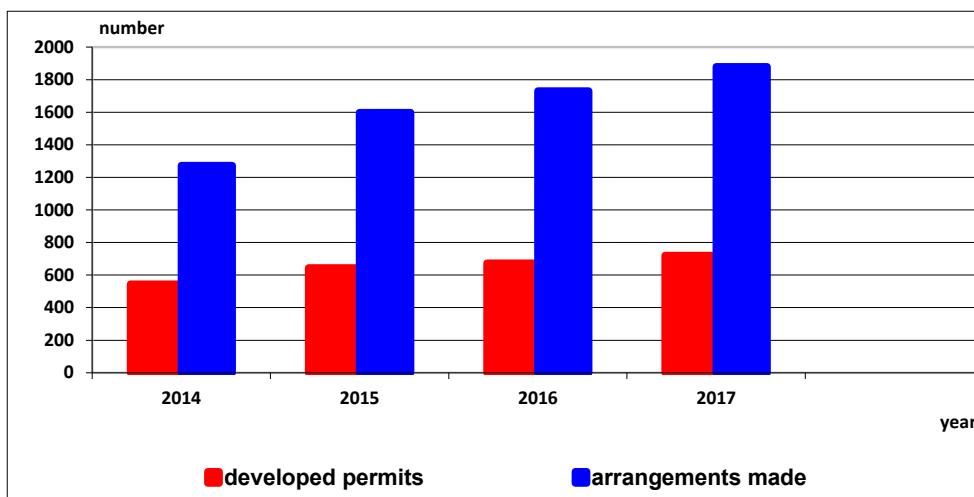
1 K. Opoczyński, Synteza wyników GPR 2015 na zamiejskiej sieci dróg krajowych. Wyd. GDDKiA, Warsaw 2016.

Analysing the materials obtained from the selected Military Transport Headquarters regarding issued permits and agreed permit projects from the last 4 years, one can notice a clear increase both in terms of reconciliations with other organs of transport and military movement as well as the number of road permits issued and, thus, also the increased traffic of military vehicles on public roads.

Conclusions from the analysis of source materials received from the Military Transport Command confirm the general upward trend in the number of requests for authorisation. It follows from it that in the first quarter of 2017 alone, the above-mentioned Military Transport Command received 30% (by 47) greater demand for road transport than in the corresponding period of 2016 (from 124 needs in 2016 to 171 in 2017).

At the same time, it is worth noting the fact that military units are more and more often keeping the set deadlines for sending demands. In 2016, as many as 31% of requests were received by the Military Transport Commands after the deadline for the demand for passage. In the first quarter of 2017, however, a significant downward trend in the non-observance of the deadline was observed (only 21% of complex needs). In spite of this, the transport and movement authorities of the troops regularly train both their own employees and military units to raise awareness in this regard.

Figure 5 shows the number of prepared and agreed permits for passage in the last few years, on the example of a selected military transport command.



Source: own study based on: *Informational materials of the Military Transport Headquarters*. Ed. Military Transport Command, Lublin 2017. ppt presentation.

Figure 5. The number of permits and arrangements in 2013–2017 in the selected MNC

Taking into account the above data, illustrating the enormity of work that is performed by military personnel of transport commands, it can be clearly stated that the SI CONVOY programme is indispensable for proper and timely performance of

imposed obligations. With the current full-time composition of the Military Transport Command, i.e. about 10 soldiers, the process of issuing permits without IT support is practically impossible to implement.

Evaluation of the purposefulness of the development of the convoy system

From the above conclusions from the conducted research and analysis on the functioning of the CONVOY system, it appears that it performs utility functions from the very beginning of its implementation. However, this does not mean discontinuation of development work. Among other things, the system has an application that allows users to present their comments and wishes, which are taken into account in the development work on improving its functionality. One of the goals is to obtain coupling between the CONVOY system and the military Internet network (MILNET-I), which will make it easier for individuals to submit demands and to monitor moving vehicles. Another goal is to equip the units with mobile monitoring stations.

Bearing in mind the current problems regarding the limited number of mobile terminals in operation, the question is whether the SI CONVOY system could not be a tool for imaging the position of all vehicles in the armed forces? The system currently applies solely to vehicles that carry out journeys in columns, transport dangerous goods and those which, by transporting cargo, become non-standard vehicles.

The experience of the NATO summit in Warsaw (2016) has shown that it is possible to replace mobile terminals with an interface for easy to use locators, which are many times cheaper than currently used mobile terminals. Clearly assigning a specific locator to the vehicle by building it in, and later creating a vehicle database at the unit level, would simplify the generation of traffic demand, which shortened the entire task execution process (from generating the need to travel to the moment of the journey itself).

Such a solution would exclude onerous rental of mobile terminals between units or from military resources of transport commands and, hence, generate savings in the operation of vehicles connected with travel to collection and return of the terminal.

Implementation of the portal for the registration of permits in the convoy system

The need to implement the portal of permits for the shipment of cargo results from objective needs that occur in some units, above all in those that carry out the most journeys throughout the year. These include the logistics brigades reporting to the Inspectorate of Support for the Armed Forces, which cover half of the country with their area of responsibility. The implementation of the portal would facilitate internal supervision and monitoring of transports carried out by logistics brigades. In addition, insight into the system would allow employees of the transport sections

to observe progress, respond to the comments of military transport commands and to correct needs or comment on draft transit permits.

Meeting these needs is the Portal of Permission Records - SI CONVOY WWW, recently managed by the Resort Center for IT Project Management. The portal is intended for monitoring the process of issuing a permit and printing a ready-made document for road tolling (Figure 6).

The user of the portal, after logging in, has the opportunity to see both permit projects and ready permits, grouped in the form of tabs for various categories to be agreed and the tab contains the permits whose projects have been created and sent to the server. At this stage of the document's life cycle, people directly involved in the process of carrying out the journey may submit their comments and consent to arrangements:

- to be approved - there are permits in the tab waiting to be confirmed and given a number by the management body;
- approved - a group of documents ready for implementation and approved by the governing body;
- in implementation - the tab contains the permits whose implementation has started and the date of departure has actually been entered;
- completed - the group in which the permits are completed and the end date is entered;
- closed - a group of closed documents, transferred to the archive.

The screenshot displays the main interface of the 'SI KONWÓJ' system. At the top, there are logos for 'Szefostwo Transportu i Roadu Wojsk' and 'Resortowe Centrum Zarządzania Projektami Informatycznymi'. The main title is 'TELEINFORMATYCZNY SYSTEM MONITOROWANIA PRZEMIESZCZANIA WOJSK SI "KONWÓJ"'. Below the title is a navigation bar with status filters: 'Do uzgodnienia', 'Do zatwierdzenia', 'Zatwierdzone', 'W realizacji', 'Zrealizowane', 'Zamknięte', and 'Kosz'. A user login 'Domena J. Kowalski' is visible on the right. The main content area shows a table of transit permits with columns: ID przejazdu, Nr zezw., P., Plan.rozp., Org.sporządz., Org.wyd.zez., Org.pilot., Zlec., R., and Pkt.wyjsc.. A detailed view of a permit is shown on the right, including fields for ID przejazdu, Nr zezwolenia, Zarejestrowal, Data rejestr., Modyfikowal, Data sudyf., Pkt.wyjsc., Pkt.kone., Planowane term. rozpoczecia, Planowane term. zakonczenia, Faktyczny term. rozpoczecia, Faktyczny term. zakonczenia, Droga przejazdu, Zakres odpowiedzialnosci, Komunikaty, Uwagi, and Załączniki. The interface also features a 'Pasek zakladek' (tab bar), 'Ikony narzędziowe' (tool icons), and a 'Projekt pozwolenia na przejazd' (permit project) section.

Source: *Instruction of operational use of ICT system of monitoring the position of troops SI CONVOY_DU-4.4.4.2.*
Ed. MND, Warsaw 2015.

Figure 6. An exemplary form of the main authorisation registry window

The user has a preview of the documents provided that the institution he represents is included in the list of companies responsible for a given project. From the moment the document is found in the “In implementation” tab, the user can print or export “Permission ...” to a PDF file format, so as to limit the possibility of modifying it.

In individual authorisation tabs, the user may obtain information on the permit number, the possible way of piloting the passage, the date of the planned start, the authorities preparing the document, issuing the permit and implementing the possible pilot and the type of journey, the ordering unit and the starting point. There is also the possibility of viewing each pass separately.

By using this function, the user receives detailed information about the journey: all journey times, travel routes and personal data of people working on a given document on behalf of individual institutions working on a given document along with the current stage of work on the document.

New solutions in the management of the army’s transport system

The possibilities offered by SI CONVOY and the conclusions drawn from the discussions conducted in the military environment with representatives of military units from different areas of the country and individuals of various character, allow conclusions to be drawn that can be the basis for improving transport processes in the Armed Forces of the Republic of Poland. Such a system would focus the needs of some and the transport capabilities of other military units. It would operate on the principle of transport exchanges, operating successfully on the civilian transport market. The only difference would be that military units would not pay for transport services.

Military units planning the transport would report it in the program, stating on which route the trip will take place and what transport possibilities of the vehicle remain unused. Other units with a transport need would make contact with the first unit and set the details. Even if the vehicle had to extend the route a little, savings would be made for the entire MND.

From the experience of the Bundeswehr, which introduced a new system of transport management in 2002 and expert opinions preceding the implementation of a new model of transport system management, it follows that military vehicles were used too often and too often required repair. The introduced changes have allowed more than half of wheeled vehicles used in the army for about 15 years to be withdrawn².

Nobody leads such research in Poland, but from conversations conducted in the environment of, say, company commanders, logistic battalions and my own experience in the mechanised brigade, I can say that almost half of military vehicles’

² T. Jałowiec, Zarządzanie pojazdami w Bundeswehrze. Ed. „Przegląd Logistyczny” nr 1/2008, Warsaw 2008.

journeys are carried out without any cargo, while in the vast majority of cases, the transport possibilities of the vehicle are not fully utilised.

Considerations deepened by the knowledge that such solutions are applicable on the civil market, allow us to ask whether it is reasonable to create a transport exchange programme in the Polish Armed Forces. It seems that such a system would be a natural step towards new applications in the manner of using the SI CONVOY system. To this end, mechanisms such as the development of vehicle displacement monitoring for all vehicles in the MND should be implemented and the dissemination of knowledge raising awareness of the need to improve the efficiency of the military transport system.

Conclusions

The Armed Forces of the Republic of Poland needed a modern IT system based on a fixed and mobile ICT system, supporting the process of issuing permits for road crossing and monitoring the movement of troops in real time. The conducted research shows that the SI CONVOY introduced in 2011 fulfills the imposed requirements, both in terms of the displacement itself and the monitoring of military transport by wheeled transport. Electronic transmission of information on the movement of military cargo on the roads with the supply resources makes the transport proceed in a harmonised and efficient manner. As a consequence, for the military transport authorities and army movement, the implementation of a useful tool supporting the management of the transport system, in particular in the field of planning and monitoring of journeys during the relocation of logistics resources, has become less burdensome and more effective.

The many years of functioning of the licensing system in the Polish Armed Forces clearly demonstrated that the implementation of tasks by a transport system without a tool, such as the CONVOY system, would be ineffective. The use of the system allowed increasing requirements resulting to be met from:

- an abrupt increase in the number of trips requiring a permit;
- expectations of the organisers of the journey to shorten the time needed to issue the permit;
- the possibility of securing the granting of permits for the passage of vehicles of foreign states residing in our country or moving through its territory;
- improving the efficiency of transport authorities in the field of issuing permits;
- the possibility of monitoring the movement of troops during crisis and war.

To sum up, the basic advantages of SI CONVOY include:

- shortening the time needed to prepare road toll permits;
- an intuitive way to develop a journey;
- shortening the time needed to reach agreement on individual authorisation projects;
- the ability to monitor the location of troops in real time.

In addition to the undoubted advantages, SI CONVOY also requires action to improve the functionality (capabilities that the system does not have) in terms of:

- the ability to create complex (complex) journeys;
- the ability to define different travel speeds;
- the possibility of updating data on predefined subordinates of military units issuing convoys;
- an extended procedure for the full implementation of the SI CONVOY web portal;
- a small number of mobile terminals in relation to the needs.

Since its implementation, the system has been constantly modernised and adapted to contemporary operational and technological requirements reported by users. A wide range of functionalities, which includes SI CONVOY, means that despite the fact that it is extensive and not always intuitive to use, it guarantees reliable, full and up-to-date information on road transport permits and monitoring the movement of troops.

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