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Prospects for Developing the Technical Supply System of the Leading NATO Member Countries' Armed Forces

Abstract: The experience of the use of troops (forces) in wars and armed conflicts of the late twentieth and early twenty-first centuries has shown that the advantage in armed struggle will belong to armies that are sufficiently trained, armed and comprehensively provided. The most significant role in solving the problems of comprehensive support of troops (forces) is played by technical support – one of the main types of logistics of troops (forces). According to leading Western military experts, strategy and tactics are the basis for planning and conducting operations and combat operations, and the relevant components of the technical support system ensure their implementation, ie the scope and timing of operational plans depend on the ability of the technical support system to meet needs. troops (forces) in serviceable samples of armaments and military equipment, necessary stocks of military-technical property and other material and technical means. The study subject is the system of material and technical support of the leading NATO member countries' armed forces. The study object is the technical support of the leading NATO member countries' armed forces. The study's purpose is to determine the trends and prospects for further developing the technical support of the leading NATO member countries' armed forces. To achieve the purpose and solve the tasks, the authors used such scientific methods as primary methods for the purpose of gathering information and studying sources; secondary methods for the purpose of processing and analyzing the received data – quantitative and qualitative data analysis, their systematization; logical-analytical such as methods of deduction and induction. The authors used works and scientific sources of leading scientists, such as Vladyslav Yemanov, Oleksandr Sysoev, Oleksiy Kolomiets, Oleg Mysyura, Serhiy Kovalishyn, Oleksiy Pavlovsky, Serhiy Shevchenko. The authors

conclude that (1) trends and prospects for the development of air attack means of the armed forces of the leading countries of the world, their capabilities for defeating air defence forces and means must be thoroughly studied and considered during the organization and implementation of TS in all branches of management of the Air Force of the Armed Forces of Ukraine; (2) the main characteristics of the modern TS of the armies (forces) of the leading countries of the world, the directions of their development are a kind of foundation, based on which it is necessary to improve the TS of the Armed Forces of the Armed Forces of Ukraine; (3) as part of further research in this direction, it is advisable to analyze the possibilities and prospects of developing the WME system maintenance according to the technical state in the world-leading countries.

Keywords: technical support system, armament, military equipment, maintenance, repair.

Abbreviations:

AMS is automated management system,

HPW is high-precision weapons,

MTM is material and technical means,

MTP is military-technical property,

MTS is material and technical support,

TS is technical support,

WME is weapons and military equipment.

Introduction

The analysis of the experience of the use of troops (forces) of the leading NATO member countries' armed forces in local wars and armed conflicts of the late 20th and early 21st centuries showed ([Ashirmetov, 2023](#); [Kolomiitsev et al., 2023](#); [Kovalishin & Halturin, 2014](#); [Pavlovskyi & Sysoiev, 2010](#); [Pro skhvalennia..., 2017](#); [Safonov et al., 2023](#); [Shevchenko & Bezdielnyi, 2021](#)) that the advantage in armed struggle will belong to armies that are sufficiently trained, armed and comprehensively equipped. The most important role in solving the tasks of comprehensive support of troops (forces) is played by TS—one of the main types of MTS of troops (forces). According to the leading Western military experts, strategy and tactics are the basis of planning and conducting operations and hostilities, and the corresponding components of the TS system ensure their implementation, i.e., the scope and timing of the implementation of the developed operational plans depend on the ability of the TS system to meet the needs of the troops promptly (forces) in serviceable samples of WME, necessary stocks of MTP and other MTM ([Ashirmetov, 2023](#); [Sysoiev, 2004](#); [Yemanov, 2023](#)).

The subject of study is the system of material and technical support of the leading NATO member countries' armed forces.

The object of study is the technical support of the leading NATO member countries' armed forces.

The study's purpose is to determine the trends and prospects for further developing the technical support of the leading NATO member countries' armed forces.

Based on the study's purpose, the following tasks were solved:

- conduct an analysis of trends and prospects for the further development of the technical support of the leading NATO member countries' armed forces;

- derive analytical dependencies to determine ways of development of technical support of the leading NATO member countries' armed forces;
- establish the influence of technical support components on indicators of the system of material and technical support of the leading NATO member countries' armed forces.

To achieve the purpose and solve the tasks, the authors used such scientific methods as primary methods for the purpose of gathering information and studying sources; secondary methods for the purpose of processing and analyzing the received data—quantitative and qualitative data analysis, their systematization; logical-analytical such as methods of deduction and induction.

The authors used works and scientific sources of leading scientists, such as Vladyslav Yemanov, Oleksandr Sysoev, Oleksiy Kolomiytsev, Oleg Mysyura, Serhiy Kovalishyn, Oleksiy Pavlovsky, Serhii Shevchenko.

Materials and Methods

The current stage of the development of military science in the world requires taking into account the latest trends in the development of WME, which have manifested themselves in local wars and armed conflicts of our time, just like an analysis of the functioning of the TS of the armies (forces) of the world-leading countries, ensuring the conduct of these operations (combats). Therefore, the issue of determining the trends and prospects for the further development of the systems of TS, armed forces WME of the leading NATO member countries based on the results of the analysis of their support in local wars and armed conflicts of the late 20th and early 21st centuries remains relevant (*STANAG 1406*; *STANAG 2182*; *STANAG 2406*; *STANAG 7166*).

Results

Trends in the WME Development of the Leading NATO Member Countries

The fundamental difference of modern military conflicts is the leap-like renewal of various types of WME and methods of their use. Thus, there were nine previously unknown weapon types in the Korean War (1950–1953), already 25 such types in Vietnam (1964–1975), about 30 ones in the conflicts in the Middle East (1967, 1973, 1982, 1986), 50 ones in the Persian Gulf war (1990), and more than 100 samples and weapons systems during the hostilities in the Balkans in 1999 that had not been used anywhere before. Military and political leadership of the leading NATO member countries, in particular the USA, among the latest technologies, pays special attention to aerospace and missile technologies, as evidenced by the analysis of the experience of military actions of the last decades in which the US armed forces took part.

The main trends in developing the world-leading countries armed forces WME are based on:

- expanding the scope of scientific knowledge and achievements realized in samples, complexes and systems of WME;
- increasing their manoeuvrability and the degree of automation through the use of artificial intelligence and robotics;
- increasing the ability of WME samples to act autonomously in different environmental conditions and on a real-time scale;

- simplifying the operation of air defence systems and reducing, on this basis, the number of crews and the amount of military work;
- creating special means for peacekeeping activities to neutralize armed conflicts, including the creation of non-lethal weapons;
- increasing the role and importance of guided weapons, first of all, high-precision weapons in WME systems;
- shortening the time of transfer of samples, complexes and systems of WME to combat readiness;
- increasing the security, survivability and reliability of the functioning of samples, complexes and systems of WME;
- implementation of the modular principle of construction, new forms of standardization and unification of samples, complexes and systems of WME;
- increasing the importance of modernization of existing samples, complexes and systems of WME in the general system of creation of WME.

The technical base for implementing the WME development trends consists of the latest technologies, based the latest achievements in microelectronics, informatics, optoelectronics, robotics, etc.

According to their specialists, implementing the specified trends in the leading NATO member countries' WME development can lead to significant changes in the forms and methods of conducting combat operations by troops (forces) and their comprehensive support.

Analysis of the Existing System of Leading NATO Member Countries' Armed Forces Technical Support

Technical support is organized and performed to maintain the combat readiness of the troops (forces) by:

- providing them with WME and other MTS;
- maintaining them in working condition and readiness for combat use;
- restoring WMEs when they fail.

According to the assessment of military experts, the combat readiness of troops (forces), the combat capability of units, WME, is directly dependent on the degree of TS management system readiness, just like the quantitative and qualitative composition of the forces and means of the TS.

Technical support, as a type of MTS of troops (forces), includes:

- maintenance of WME;
- repair of WME;
- introduction of constructive changes to WME;
- collection, evacuation and restoration of damaged WME;
- preservation and storage of WME.

Maintenance of WME in the NATO member countries' armed forces is performed based on standards developed in each country. The version of the maintenance system adopted by the US Army is given in Appendix ([Table 1](#)).

In connection with the adoption of modern types of WME, the US armed forces are

transitioning to WME maintenance system in a state that, according to military experts, will make it possible to reduce the costs of its implementation by up to 30% (*Kolomiitsev et al., 2023; Kovalishin & Halturin, 2014; Pavlovskiy & Sysoiev, 2010; Pro skhvalennia..., 2017*).

In NATO, next to the national management bodies of TS, joint bodies have been created, which are responsible for developing the general policy and requirements for the TS system, the organization and performing of repair and restoration works of WME.

The core management bodies of the MTS system, which organize and carry out TS activities, include the NATO Advisory Council on Armaments, the Infrastructure Committee, the Committee on Rear Management Pipelines of the International Joint Staff of the Military Committee. The main body that directly deals with the issue of the maintenance of troops (forces) is the NATO agency for the supply of spare parts, maintenance and repair. In addition, NATO has created bodies that organize the maintenance and repair of specific types of WME.

When planning and implementing the TS, the management bodies adhere to the following principles:

- national responsibility for the TS of units, military units (subunits), transferred to NATO;
- centralized TS;
- minimum duration of repair of WME.

It is believed that the criterion for evaluating the effectiveness of the TS is the ability of the military administration bodies (departments, services), military units and units to perform the WME restoration directly in the troops in a short period.

Now there is a process of some reduction of the total volume of MTP stocks, stored in the warehouses of the Ministry of Defense, with the simultaneous optimization of its possible use. According to the American press, the process of reorganization of strategic stocks began in the 1990s. They ceased to be attached to some commands in the zones, but became general. It ensures the implementation of a new US strategy, providing for the possibility of the country's participation in two regional military conflicts, simultaneously conducted in any region of the globe.

Materiel in the NATO member countries' armed forces is divided into five classes (*Kolomiitsev, 2023 et al.; Kovalishin & Halturin, 2014; Pavlovskiy & Sysoiev, 2010; Pro skhvalennia..., 2017*):

- class I—personal hygiene food and items, consumed in approximately the same of quantities in any conditions of the environment and terrain. They are allocated based on data on the number of personnel.
- class II—standard weapons, military equipment, engineering and medical property, spare parts and tools necessary for maintenance and repair.
- class III—fuel and lubricants of all kinds, liquid gases, coolants and coal.
- class IV—items of supply that do not belong to the standard (table) set of weapons, military equipment and equipment, construction and fortification materials, special machines and additionally allocated items of supply of class II.
- class V—ammunition of all kinds, explosives, detonators, poisonous substances.

A single system of MTS codification has been introduced to simplify and unify the accounting, storage and requisitioning of supplies in the NATO armed forces. According to it,

each item is assigned a 13-digit number and a short description, which facilitate the selection of identical and interchangeable MTS.

The created reserves of MTS are divided into basic ones, needed in the initial period of the war—for about 30 days, and long-term ones, needed in the subsequent period. The created reserves of MTS are graded as follows. In the rear areas of the division, before the start of the operation, reserves are created for 10–12 days of hostilities, during the operation, the reserves are maintained in the division at the level of 3 days. In total, it is expected to have supplies for 7–10 days of combat operations in the operation course in the rear area of the army corps and warehouses.

It is worth emphasizing that one of the most significant TS tasks is to restore the maximum possible amount of WME in the shortest possible time. According to the estimates of NATO specialists, WME losses, including armored ones, during the Arab-Israeli war exceeded the indicators of the Second World War by an average of four times.

When organizing the repair of WME in combat conditions, the US troops (forces) repair bodies' specialists adhere to the following principles:

- for the restoration of damaged equipment located near the front edge, the time of repair work should not exceed 20 minutes;
- equipment, which requires about one hour to restore (including towing time), must be evacuated to the nearest shelter 2–4 km away from the line of contact of the troops;
- repair works lasting up to 12 hours are expected to be performed in the rear areas of battalions, 12–36 hours—in the rear brigade areas, 36–120 hours—in the rear areas of divisions and corps;
- equipment that requires a longer time to restore must be evacuated further to the rear or dismantled for spare parts;
- in the event of a threat of capture by the enemy, weapons and military equipment are subject to destruction.

Regulatory and repair and restoration works in NATO countries armed forces are organized and performed in a single repair system, including military (current), field (medium) and basic (capital) repairs. The main types of repair of WME of the leading NATO member countries' armed forces are listed in the Appendix (*Table 2*).

Military (current) repairs are performed by the forces of combat services (crews), just like the personnel of repair units (battalions and companies). It includes operations to replace nodes, aggregates and eliminate malfunctions, the labor intensity of which does not exceed six man-hours per equipment unit.

Field (average) repair, performed by the forces of repair division bodies, army corps, is divided into direct and general. Direct average repair is performed in the interests of a specified unit, military unit (subdivision) and involves the work performance, the degree of labour intensity of which does not exceed 24–36 man-hours per unit of equipment. General average repair is performed in the interests of the entire WME supply system. It assumes the implementation of works on the restoration of the WME with a labour intensity of 72–96 man-hours per equipment unit.

Basic (capital) repairs are carried out by civilian contractor companies from the USA, just like NATO member countries if there are relevant agreements.

Trends and Prospects for Developing the Technical Support System of the Leading NATO Member Countries' Armed Forces

The appearance of new modern types of WME has always necessitated the development of new forms and methods of using troops (forces) in operations (combat operations) and new approaches to their comprehensive support, too. This concerns (1) the structure of the TS system itself and (2) the organization of the restoration of WME, taking into account its possible losses during operations (combat operations), thirdly, the norms of WME reserves and their echeloning both in peacetime and in a specific period, fourthly, of direct management of the TS of troops (forces) in operations (combats).

Discussion

Because the task of ensuring the combat readiness of troops (forces) has turned into one of the most significant problems of increasing their effectiveness in combat use, it is worth assuming that developing the TS system will be performed in this direction. In addition, the development of WME, operational art and tactics of combat operations causes changes in the structural construction and functioning of the TS system.

The analysis of the experience of organization and implementation of TS activities of troops (forces) in operations (combat actions) based on the experience of local wars and armed conflicts confirms this conclusion and determines the main trends and directions of development of TS systems of the armed forces of the leading NATO member countries, listed below.

- (1) Automation of technical support management. First, this concerns creating an AMS, which should cover all management processes, related to TS. To date, in the armed forces of the leading NATO member countries, the TS management system is fully automated in the brigade-division-corps link. In particular, befitting automated material accounting centres have been created in the tactical management chain (brigade). Thus, in the operation "Desert Storm", the troops TS planning was already performed with the help of a system that made it possible to perform all calculations for determining the need for material resources, their distribution and supply to the troops. Space communication systems were already used in Operation "Iraqi Freedom" under the control of TS.
- (2) The ability of the TS system to perform repair and restoration works of WME systems in modern conditions of armed conflict. It is due to the use of new types of weapons, in particular, HPW, which led to a change in the structure of combat damage of WME in the direction of an increase in severe damage and irreversible losses. Thus, the irreversible MAW losses reached 50% in Afghanistan, the losses of the Taliban's anti-aircraft guns reached 50-80% in the anti-terrorist operation "Unshakable Freedom", the vast majority of the damaged anti-aircraft guns were severely damaged in the operation "Iraqi Freedom". Therefore, it is likely that developing the TS system will be performed in the direction of increasing the capacities for military (medium) and basic (capital) repairs, i.e., strengthening the tactical and strategic link repair systems.
- (3) Early preparation of the TS system of troops (forces) in operations (combat operations). Thus, to ensure the combat operations of the armed forces troops in the Persian Gulf zone, 30 daily MTS supplies were created two years before the operation. Six months before the

operation, these supplies were doubled and before the start of the operation satisfied 60 daily needs of the troops. The technical support of the troops (forces) in the operations “Unshakable Freedom” and “Iraqi Freedom” was performed by a system that was deployed in advance and functioned in peacetime.

- (4) An increase in MTS number and weight, consumed by one serviceman in modern conditions of conducting operations (combat operations). If earlier this norm in the initial period was 70-100 kg (of which up to 70% belongs to the MTS of the TS system nomenclature), then already in the war in the Persian Gulf, it exceeded 110 kg and, according to Western experts, has a steady tendency to increase. Thus, according to the results of the analysis of military specialists on TS issues, the division’s daily need for material resources was (will be):

- up to 100 tons in the First World War;
- 700–800 tons during the Second World War;
- more than 1,000 tons in the Vietnam War;
- 2,000–2,100 tons in the war in the Middle East;
- 2,700–2,800 tons in modern local wars and armed conflicts.

This factor makes it necessary to determine expedient options for the echeloning of MTS in various branches of managing the TS of the troops (forces).

- (5) Increasing readiness degree of military units (subunits) and TS institutions in operations (combat actions). For example, in the war in Chechnya, at the end of the operation, some military units of the TS armed forces of the Russian Federation had a readiness level corresponding to combat military units.
- (6) Development of the weapons system and military equipment. Changes in views on methods and methods of repairing the latest weapons systems are provided for in this direction. It is quite likely that the entire complex (systems) of weapons will be immediately repaired (restored) when its elements fail. At the same time, the means of repair will develop in the direction of the development of diagnostic systems and the aggregate method of repair.

Conclusion

The conducted analysis of the functioning of the existing system of TS of the leading NATO member countries armed forces and its capabilities to support the troops (forces) of WME, MTP and other MTS in operations (combat actions) makes it possible to draw the following conclusions:

- (1) Trends and prospects for the development of air attack means of the armed forces of the leading countries of the world, their capabilities for defeating air defence forces and means must be thoroughly studied and considered during the organization and implementation of TS in all branches of management of the Air Force of the Armed Forces of Ukraine.
- (2) The main characteristics of the modern TS of the armies (forces) of the leading countries of the world, the directions of their development are a kind of foundation, based on which it is necessary to improve the TS of the Armed Forces of the Armed Forces of Ukraine.
- (3) As part of further research in this direction, it is advisable to analyze the possibilities and prospects of developing the WME system maintenance according to the technical state in the world-leading countries.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Appendix

Table 1. The existing system of maintenance of WME of the US Armed Forces

Type of maintenance	Periodicity		Duration	
	Tanks, IFV, etc (1 group)	Cars, etc (group 2)	Group 1	Group 2
Overview 1	Before each exit		30 min	15 min
Overview 2	At short stops		15 min	3 min
Plan type "A"	Every day after running the machine		1,2 hours	20 min
Plan type "B"	Weekly	In two weeks	4-6 hours	1 hours
Plan type "C"	Monthly or after 400 km mileage	Monthly or after 1,600 km of mileage	up to 24 hours	16-17 hours
Plan type "D"	Quarterly or after 1200 km mileage	Quarterly or after 9,600 km of mileage	1-2 days	1-2 days
Seasonal	When switching to the summer (winter) period of operation		3-5 days	3-5 days

Table 2. Types of the leading NATO member countries' armed forces WME repair

Repair	Echelon of repair	Content, duration of repair	The place of repair, who performs it
Military	First	Current repair	company, driver, crew
	Second	Current repair (2-6 man-hours per sample)	company, brigade, special rem. groups
Field	Third	Repair of WME with replacement or repair of nodes, aggregates (24-36 man-hours per sample)	brigade, division, repair company
	Fourth	Repair of WME with replacement or repair of nodes, aggregates (up to 96 man-hours sample)	division, army corps, repair battalion
Base	Fifth	Overhaul of WME. Restoration of operational resource by 70%	field army, stationary repair enterprise