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MILITARY ENGINEERING

“Military engineering art is a branch of military art embracing theory and practice of military engineering preparation of the state's territory for war, organizational development and armament of the engineer troops and their employment in combat and operations, engineer support of combat action. Military engineering art includes a number of branches relating to fortification, obstacles and demolitions”.

Military engineering is, in essence, civil engineering undertaken in a military environment. The duties of military engineers also include mapping and surveying, which became increasingly important as indirect fire weapons were deployed. The constraints of time, finance, labour and materials, which affect all civil engineering projects, weigh especially heavily on military engineers in time of war, with the added complication that engineering activities may be hampered by enemy action, sometimes in conditions of actual combat.

Military engineers are required not only to construct their own works, but also to destroy those of the enemy. The engineer's role in the provision of protection against intruders maybe said to have begun with the construction of simple huts and walls. These gradually developed into great positional defenses of earth and stone around cities and on the frontiers of states, requiring the use of skilled engineers both to design those of their own side and to attack those of the enemy. With the advent of gunpowder, the mathematical and scientific knowledge needed by engineers for fortification and siegecraft became increasingly important and most modern military academies trace their descent from schools for engineers and artillery established during the 18th century. In sieges, the engineer's duty was not merely to act as a technical expert, but also to conduct troops forward to the point of attack when a fortress was stormed.

In the British army, a standard cry was ‘follow the sapper’, the term for those who, under engineer officers, dug the saps or shelter trenches used in the attack on fortresses. If the demolition of an obstacle required the use of explosives, the engineers placed the charges and ignited the fuses. Among many heroic episodes of the Indian Mutiny campaign was that of the Powder Bag party, including fourteen sepoys of the Bengal Sappers and Miners under engineer officers, who blew in the heavily defended Kashmir Gate at the British storming of Delhi.

Field fortifications, generally made of local materials and intended to serve a temporary need, can be constructed and, in the case of enemy works, demolished by ordinary sappers and pioneers, who are required to possess only basic field engineering skills.

The simplest form of road in field engineering consists of two parallel ditches with the excavated spoil heaped between them to produce a cambered way. An alternative type, widely used in wooded swampy areas, is the corduroy road, made by felling trees to clear a path, splitting the trunks, and laying them transversely to form a corrugated roadway. More permanent roads, built by military engineers for strategic purposes, generally assumed a wider economic role, allowing wheeled traffic to move easily where previously only less efficient pack animals could go. Examples include the straight highways of the Roman empire, the military roads built by F.M. Wade and his redcoats in the Scottish Highlands after the Jacobite rebellion of 1715, and the Grand Trunk Road, 1 500 miles (2 414 km) long, in British India. In many cases, such roads continued as public highways for hundreds of years after they had served their original military purposes. Away from the combat area, military engineers assumed the role of architects, designing barracks and camps complete with buildings for every kind of function, including housing for officers and men, kitchens and dining halls, offices, stores, workshops, stables and wagon lines, guardrooms, hospitals, schools, churches, etc., together with roads and exercise grounds.

During the 19th century, as European and American governments extended their dominions into areas of previously untamed wilderness, it was frequently the case that the only engineers available for the construction of public works were those belonging to the military. Such employment was readily sought by engineer officers, who not only had the personal satisfaction of opening up new terrain, but were also able to practise their profession in conditions similar to those of actual campaign. In the USA, the Corps of Engineers assumed and retained responsibility for the construction and maintenance of navigations and waterways in parts of the country long under civilized occupation. The draining of morasses, a skill in which all military engineers were trained in order to counter enemy inundations, was especially valuable in such areas.

Bridge-building, especially over rivers and across watercourses which armies have to pass, has been a vital element of military engineering from the earliest times. Bridges made of boats collected together and moored side by side, with a decking of timber planks, were used from the classical period. Xerxes crossed the Hellespont (Dardanelles) by this method in 480 B.C. Pontoon bridges are constructed on the same principle, with the pontoons (light boats designed to be transported overland) acting as floating piers, on which the planking carried as an integral part of their bridging train is laid. In the absence of pontoons, rafts, barrels, or inflated skins could be used for flotation. 'Flying bridges' used in the campaigns of Alexander "the Great" and still familiar to military engineers in the early 20th century, were made by anchoring boats (usually covered by decking) to a point in mid-river. They were moved from one bank to another by angling the bows into the current. Shallow rivers and dry gullies could be bridged by lines of wagons, and with the advent of motorized transport a similar role was assumed by tracked vehicles. A standard technique for crossing ditches, moats, etc., was to build a causeway using brushwood, earth or rocks. The application to warfare of modern industrial and scientific developments added new fields of science and technology to military engineering. In operational areas, military engineers built and ran railways. Telegraph, radio, chemical and biological weapons, and aviation were all originally allotted by armies to their engineers, before the formation of specialist corps.

Military engineering science is a special component of generality of military and fundamental sciences; an aggregate, determined by functions and contents of military engineering, of basic scientific knowledge; approved general and particular scientific and practical theories the stated objectives of which are to describe, explain and predict military engineering processes, as well as provide scientifically substantiated recommendations in matters of the state's military engineering development, organization and training activities of its functional entities, organization and implementation of engineering support of preparation for and conduct of military operations of the Armed Forces.

Military operations represent an organized process of armed struggle between sides. Description and interpretation of any military processes in military sciences are methodologically supposed to determine their essence, general and particular objectives and methods of achieving them, contents of combat missions, preparatory measures and organization of accomplishing them. "Tsel" (Russian term that can mean aim, goal, objective) is defined in the Ozhegov Russian Dictionary: "Tsel is the object aspired to, something you need to achieve, what is desirable to achieve."

"Under modern conditions, *engineer support* of combat and operation includes: engineer reconnaissance of the enemy, terrain and installations; engineer preparation of the terrain; search for and destruction (defusing) of enemy nuclear mines; destruction of detected reconnaissance and signal devices of the enemy; clearing and maintenance of lanes through artificial obstacles and rubble from collapsing buildings; clearing the terrain and installations from mines; preparation and maintenance of lines of march, supply and evacuation routes; building and maintenance of crossing facilities for the crossing of water obstacles; procuring and purification of water and establishing water supply points; engineer measures to conceal troops and installations; support the operation of helicopter subunits attached to units (combined units); enable the troops to negotiate areas of destruction, control floods and contain fires; taking measures against integrated reconnaissance and strike systems and other precision weapon systems of the enemy and neutralizing the aftermath of the employment by the enemy of weapons of mass destruction, destruction of nuclear power and chemical industry facilities." Engineer support of preparing and conducting military operations has as its aim to create the necessary conditions for putting the troops in full readiness for the performance of assigned missions and direct assistance in upgrading their survivability, mobility, dynamic quality of offence and stability of defense, as well as containing the enemy or obstructing its operations by inflicting upon it engineer-related damage and creating a tactical situation conducive to its effective and comprehensive defeat.

These objectives are achieved through staying always on top of the engineer situation; being fully equipped and having highly trained personnel and operation-ready assets of engineer munitions and equipment; maximal protection, concealment and prepared field locations of troops; the possibility to move forward and negotiate natural and artificial obstacles in appropriate sectors at an appropriate rate; the ability to oppose the enemy by effective engagement of its troops and installations using engineer munitions, skilful application of engineer knowledge, personnel and assets.

Military operations, the process of engineer support has two stages: preparation of engineer support and its implementation. Preparation of engineer support involves planning and a number of practical activities to get the troops in full readiness for the performance of EI missions. The planning of engineer support is the main theoretical component of EI preparation consisting in detailed development of a thoroughly substantiate.

It is easy to see from analysis of history of the development of engineer support organization that there occurred, in the 1970s, a distortion of the essence and contents of its questions by directly identifying them with the theory of organization of combined arms combats and operations. This distortion still persists in existing documents and is found in drafts of new guideline and training documents of the engineer troops. In particular, we can see there the “concept of engineer support”, “concept and procedure of performing engineer support missions”, and so on which are not defined logically enough. As for “planning”, a fundamental notion, it still remains part of a detailed elaboration of plans of engineering chiefs. Furthermore, included as belonging to EI organization for some reasons are engineer reconnaissance activities, whereas organization of engineer-technical support is described not as a basic part of EI organization, but as a separate area of engineer-technical activities.

Problems in military engineering organization of the territory of a state (coalition of states) are due primarily to changes that occurred in this country's state system in the early 1990s, along with changes in the lay of its borders, military-political situation, and military organizational development. All of that objectively calls for a revision in the system of measures, designed for military engineering organization of the national territory as a whole and its separate strategic and operational sectors. The focus in this sense should be on those of them, where a substantial change has occurred in the trace of the state borders and where combat operations are likely to be pursued amid an in-depth isolation of a TO.

As is evident from recent studies, additional planning for the following measures is needed on top of a set of tasks envisaged by the current guideline documents: development of engineering and technical solutions to remove consequences of enemy employment of mass destruction weapons, aftermath of devastating attacks against atomic and chemical industries, of technogenic and natural accidents and disasters; given a real threat of an aggression, timely preparation for demolition and construction of obstacles to protect crucial military and national economic facilities; timely development and preposition of required stocks of fortification structures, bridge structural components, bridge trains, engineering munitions, expendable materials, etc.

Current problems in the organization and rendering of engineer support for military operations have been caused by appropriate changes in conditions of their preparation and pursuance. Considering new tendencies in the military-political situation, most attention is concentrated on the study of organization of engineer support for combat operations by troops (forces) in local wars, armed conflicts and counter-terrorist operations, including actions by joint groupings of troops (forces) comprising military units of different power ministries and agencies (Defense Ministry, Ministry of Internal Affairs, Federal Security Service, and others), as well as in operations early in a large-scale war. Simultaneously a number of particular issues is under study as well, such as improvement of engineer support for reconnaissance and search operations, aero mobile operations, sealing-off operations, defense (including in dispersed battalion defense areas) in armed conflicts, protection of troops in permanent deployment garrisoning locations, command and control of the Engineer Troops with the use of advanced automated systems, etc.

Latest investigations into problems of engineer support for operations and combat actions mounted by the Joint Force confirm the necessity of creating a unified agency to control engineer and engineer-technical support. Moreover, agencies of this kind should be formed and trained in due time, because it is a very difficult and labour-consuming task. Coordination and control in the interests of engineer support have been exposed to a detailed study as well. Specifically, it has been recognized as expedient to have a unified information support system, including obstacle registration and reporting.

Many problems in engineer support for military operations could be removed during the effort to draw up new combat manuals and regulations, particularly where employment of the Engineer Troops in modern armed conflicts is concerned. The engineer support theory got enriched with new principles and tenets, which were developed by prof. V.K. Shamshurov and dr. L.G. Zhukovsky in their works. A number of research papers mapped out the main ways for solving problems connected with the requirements that engineer reconnaissance be conducted to the entire depth of an area engulfed by an armed conflict, that efficiency of the search for engineer mines be enhanced, and that the quality of protection of troops and facilities in the course of fortification organization of positions be improved.

Fortification had been the titular subject in military engineering art for 200 years. All outstanding military engineers and scientists in the 18th and 19th centuries, starting from general en chef A.P. Hannibal (the great-grandfather of the great Russian poet A.S. Pushkin), were fortification experts. Emperor Peter I, who knew the Dutch military engineer Coehorn in person, had his works translated into Russian, and supervised the construction of Kronstadt, the naval fortress off St. Petersburg, also “dabbled” in fortification. In some measure, this attitude to fortification reflected the

contemporary state of military engineering art in the West and Russia. Contributing to further development of fortification were many Russian military engineers and scientists: F.F. Laskovsky, A.Z. Telyakovsky, E.I. Totleben, K.I. Velichko, and, in the Soviet period, D.M. Karbyshev, S.A. Yakovlev, V.N. Vasilchenko, A.P. Platonov, and others.
Quite a rich experience of fortification organization of defensive positions was accumulated during the Great Patriotic War, but postwar changes in conditions of warfare urged its further improvement. The need emerged for trenches and launching positions for new WME types, hermetically sealable shelters and dugouts for protection against mass destruction weapons, covered stretches in trenches and communication trenches, etc.
As to the organizational and technical aspect, there were validated and imposed the sequence of and timeframes for organization of positions, make-up and range of fortified structures and constructions, procedure Under the modern conditions, it is urgently necessary to validate and develop new assets and methods of fortification organization of terrain for different variants of military operations, such as perimeter defense against the background of a system of dispersed battalion strong points and battalion defense areas in an armed conflict zone, or defense in depth with the use of a security area during efforts to repel a large-scale outside aggression. In a generalized form, the available experience of fortification organization, as well as latest approaches and requirements related to its effectuation, including in local wars, armed conflicts and counter-terrorist operations, are present in draft regulations on military engineering affairs prepared by the Military Engineering Academy.

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