

THE IMPACT OF TECHNOLOGY ON MILITARY STRATEGY

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Technology and military strategy

Since ancient times, starting from the primitive human socialization period, there have been disputes and fights between individuals, related initially to supremacy within the tribe, and later to the desire to monopolize better hunting or fishing grounds and pastures. In the beginning, the fights were based on physical force and the fighters' ability to use simple weapons. With the advance of civilization and development of the level of knowledge and productive capacities of the human tribes, the "weapons" as physical force and the abilities have been developed, supplemented by the use of some "extensions" (arrows, slingshots, spears, etc.) which allowed to neutralize fighters without direct contact.

From this point of view, no matter the reasons which have lead to wars (local, regional, global) throughout history, the strategies used have been conditioned by the destructive capacity of the weapons used against the living force and infrastructures of any type belonging to the enemy. As a result, the consequences of using ever improving war technique have increased with regard to human losses and destruction of infrastructure elements.

From the point of view of the military strategy, defined as planning action and waging the war, it is obvious that the main component elements such as: setting the objectives, preparing and drafting forces, maneuvering are conditioned by the amplitude and efficiency of the foreseen combat actions and by the technical level of the combat means utilized.

It is also obvious that as long as these means are superior to the enemy's, as performance on the battle field, this is a prerequisite for the success of the application of the strategic plans. In this context, the skilled use of the fighting

technique is very important in order to optimize its effects in actions developed on the tactical field. The combatants' good professional training is an essential condition for optimizing the use of the forces and decreasing the human losses and infrastructure damage. This training has evolved historically because, for instance, the training of an archer in the medieval times needed much fewer resources than that of a pilot of a supersonic aircraft, or the one of the information or communication systems' operators. This example shows the connection between technology and the concrete training actions of the personnel, within the strategic planning. The development of human knowledge, science and technique has led to the development of military technologies which became increasingly sophisticated and their result became increasingly complex on the battlefield. In this way, throughout history, wars have become increasingly violent, and the economic and human losses have increased accordingly; moreover, the operation theaters have extended to the global level.

In support of the above statement, we can notice by comparing the statistical data regarding the last two World Wars (see Table 1), a substantial increase of both commitments and human losses. The comparison was made between the two great powers: USA and Russia. The table shows the US advantage of not waging a war on its own territory.

Losses	Total no. of combatants	Dead in action	Dead in service	Wounded
First World War (1917-1918)	4,734,991 <i>1,200,000</i>	53,402 <i>1,700,000</i>	63,114 <i>2,500,000</i>	204,002 <i>4,950,000*</i>
Second World War (1940-1945)	16,112,566	291,557 <i>6,115,000</i>	113,842	671,846 <i>4,012,000</i>
Korea War (1950-1953)	5,720,000	33,741	2,833	103,284
Vietnam War (1964-1975)	8,744,000	47,424	12,785	153,303
Gulf War (1990-1991)	2,225,000	147	382	467

*) The losses suffered by Russia, and the former Soviet Union, respectively, were italicized

Romania suffered major losses, too: over 350,000 dead during the First World War and over 830,000 dead and missing in action during the Second World War.

The real reasons for starting these wars were mainly economic in nature.

Although the First World War was labeled by analysts as a family business, due to the fact the main belligerents were the blood-related monarchies (from Russia, Germany, Austro-Hungary), the real reasons were mainly economic. Austro-Hungary wanted to impose its supremacy in Balkans; Germany wanted greater power and international influence based mainly on the development of the navy, a field in which it competed with England. France wanted revenge against Germany. Russia was concerned about the decrease of its prestige and influence after the 1905 Russian-Japanese war and the civil turmoil of the Russian society which culminated with the Bolshevik revolution in 1917.

The major effects of the First World War were both economic and social-political, i.e., Germany was forced to sign in 1919, in humiliating conditions, the Treaty of Versailles, to accept the responsibility for starting the war and to pay large amounts of money in order to compensate for the costs of the war. From the social perspective, the socialist ideas began to spread widely, and they were materialized in the emergence of the first state with this economic system, the Soviet Union. Technology strongly developed after the war, especially the automobile manufacturing, aircraft, radio communication equipment, and also the management of the industrial activities.

Unfortunately, none of the major powers, except the USA, was satisfied by the results of the war, and especially with the Treaty of Versailles provisions (in particular, the responsibility clause for starting the war and the new territorial arrangements). The extreme forms of nationalism, militarism, and totalitarianism got strength, aggravated by the economic depression and instability in Germany, Italy, and Japan; the expansionist politics based on a powerful development of the military power intensified, especially in Germany, facilitated by the placatory politics of France and England.

The effects of the Second World War were felt at the global level because the majority of the world's countries were directly or indirectly involved in the military action.

The fight for the national independence of the non-European countries had been tremendously stimulated by war. The weaknesses of France and England, two major imperialist powers, had constituted opportunities for national freedom movements, so that the European empires started to collapse within approximately 3 decades after the war.

During the war, the military technology progressed tremendously: the English invented the radar and the sonar; the progress in electronics and computers lay at the base of the later development which changed the world fundamentally. The achievement during the war of the atomic bomb by the European and American scientists not only changed the strategies, nature, and potential of the future wars, but also heralded the beginning of the nuclear era.

The Russian suffered enormously during the war: Western Russia was devastated. During the process of defeating Germany, the Russians developed a wide array of powerful weapons and an army which occupied a big part of the Central and Eastern European countries. The natural resources and raw materials, as well as its demographic potential allowed Russia to become a super-power alongside the USA.

The US economy was stimulated vigorously by WWII, considerably more than it had been by the First World War. The economic depression from 1929-1933 was surpassed definitively and a new industrial complex was built in all the states spared of the infrastructure damage caused by the war; the US economy prevailed worldwide. After four years of military reconstruction, the USA also became a global military leader. The US position as a world military leader became more obvious than ever after the Second World War.

The objectives of military strategy must be strictly related to the armies' capabilities to fulfill them: the level of equipment with highly performing armament and military technology, the level of training of the armed forces, the capacity to organize and conduct military campaigns. From this point of view it is possible to make a comparison, for instance, between the military actions carried out at the beginning of the Mediaeval Ages, based on close quarter battle between fighters armed with swords, spears, bows, wearing armor and helmets, and the military campaigns of modern times in which are engaged complex military means tailored for total war, where there is strong support for information, communication, optimization of the activities by using information technologies, and in which the space technology is involved.

At the same time, there is a strong concern to limit the exposure of the fighters on the battlefield or to create adequate means of protection for situations in which their presence is necessary.

The impact of technologies on military strategies may be illustrated very well by the evolution of the military actions of the major powers, based exclusively on the use of their capabilities and advantages.

The USA, one of the major world powers has constantly correlated its military doctrine to the technical capacity to accomplish the targeted objectives. In this way, the James Monroe doctrine (1823), which states the American

commitment to not intervene in disputes between the European powers and between the US and its colonies, motivated the isolationist tendencies when the US did not want (i.e., did not have the necessary means) to intervene in other areas of the world.

As a consequence of the economic development of the USA, the Woodrow Wilson doctrine, founded during the First World War, promoted the idea that the USA had the right and obligation to intervene on the European continent and elsewhere in order to defend freedom and promote democracy.

The further development of the economy and military technologies of the USA is reflected in the evolution of the doctrinary principles:

- The Truman doctrine - was based on the idea of stopping the expansion of communism, and was supported and motivated by the nuclear hegemony of the USA;

- The Eisenhower doctrine (1957) – the USA will effectively use military force (i.e., massive retaliation) against any aggression or imminence of an aggression against it or its allied states, with the subsidiary idea to counteract the Russian influence in the Middle East.

It emphasizes the US intention to control the area of strategic oil resources. This objective is clearly expressed in the Carter doctrine (1980).

- The Kennedy doctrine has as central elements the mutually ensured destruction (balance of terror) and flexible response instead of massive retaliation. At the same time, the objective was to stop, including by force, the spread of the Soviet influence in Latin America;

- The Reagan doctrine proclaimed the unconditional support against communism anywhere in the world and launched the Strategic Defense Initiative program, also known as the Star Wars.

As regards the latter doctrine, we may stress that its operational support relies on cutting edge technological and scientific elements and on operational structures of extreme complexity meant to provide high quality and reliability. These include advanced surveillance systems of the areas of interest, including outer space, monitoring the trajectories, and destroying the dangerous objects before they hit important targets on US territory. To back up this process, very briefly described, they use technical means including global positioning systems; safe communication systems; hard and soft platforms designed to store, manage, evaluate, and utilize information regarding the potential forces and armament systems.

The realization of such a program involves the consumption of important financial, material, and human resources, which is not available for all states.

Even the states with lower economic power are able to, and have to, take part in the improvement of military technology, to correlate their strategic objectives to the latter and to the tasks regarding their contribution to the global or regional security, within the military alliances.

Special attention is given to the technology transfer from civil and military applications, in order to decrease the cost of the equipment.

There are possibilities of development for the small states which must constitute objectives of technical infrastructure of strategy and national military doctrine:

- The development and implementation of air surveillance systems for the national territory and of the fleet-management information systems ;

- The increase of the firing power and accuracy, of the firing distance and effect on the target, during day and night and under any weather conditions, of the classic armament; Computerization of the command units through implementation of C4I2 systems from battalions to the large fighting units, the realization of flow and information management within and between military forces.

- The development of the means which ensure fast maneuverability and deployment of military forces and their equipment within the national territory or on the theatres of operation.

- The development of the capabilities meant to provide logistic support for the technical equipment;

- The achievement of short- and very short-range weapon systems which would ensure air defense at low altitude of the air force and navy units, troop concentrations, and assets of major military and economic importance.

Specific strategies

The emergence and perpetuation of conflicts which involves locally two nations, generated by economic, religious, territorial claim issues, or issues of any other nature, are not indifferent to the technology progress.

Local armed conflicts, with their specific strategies, can break out between nations belonging to the same military alliance (i.e., Turkey versus Greece in Cyprus) or between the promoters of the “democracy” imposed by force to less developed nations, for economic reasons, or for gaining influence in certain areas.

It is worth emphasizing that in this particular case, a major component of victory is given by the soldiers’ morale; they cannot be defeated by forces superior in point of training and military technology. There are many examples in this regard: Afghanistan could not be “democratized” either by the English, or by the Russians, and now the Americans are still having problems in this part of the world.

Although the American war machine is unprecedented, regarding its equipment and combat capability, it has not achieved notable success either in Vietnam, Korea, Sudan, or Somalia, and the prospects of a successful end of its military actions in Iraq and Afghanistan are still uncertain.

The classic means are used to a certain extent in these “local conflicts”: armored vehicles, field artillery in fixed position and self-propelled artillery, fighters and bombers, short and medium range surface-to-surface missiles, equipment developed in order to decrease the vulnerability of the crew and to increase the destruction capacity.

Their modern versions benefit from electronic components which increase, to the highest levels, the orientation possibilities in the tactical field (through coupling to GPS military systems and the possibility to use very accurate digital maps); the capacity to identify and classify enemy targets by using sensors in the visible spectrum, radar, infrared, or night vision equipment; the effect on armament targeting by means of electronic targeting systems which increase the accuracy of firing and significantly reduces response time. The increase of ammunition destruction capacity by using high power explosives, binary explosives, shaped charges or tactical nuclear weapons adds up to those mentioned above.

This is the first aspect related to the strategy and the tactics of the use of the means specified above, in the tactical field, which is also decisive for the fighting units’ safety. Before starting the fight, the fighting units receive exact information regarding the enemy, gathered by direct observation made by specialized satellites or by UAV, TAV research means, or specially equipped helicopters.

The cutting-edge military technologies, using electronic simulation, provide better organization and planning of the military actions, the estimation of the necessary means and preliminary estimates of losses.

The recent military conflicts highlighted new concepts regarding the training and execution of the combat actions, dynamic and mobile, using professional fighters and cutting edge military technology.

In military actions, space becomes more and more integrated, including land, air, naval, outer space components, completely digitized due to the extension of the capacity to use information and to command the troops.

The development of the military technology required the subsequent development of military logistics and a change of the concept in order to include the appropriate support of all tactical field factors’ necessities. Logistics is, essentially, the planning process for military forces for the military operation purposes. It includes: design, development, acquisition, storage, transport, supply,

distribution, and evacuation of personnel facilities; installation; and maintenance services.

Global logistics permanently imposes a quality level which requires from logistics to undergo a permanent renewing process, in accordance with new technological acquisitions, regarding both the equipment, and training and support. From this perspective, the logistics foundation is very important for the tailoring of the military forces, starting from the fact that any operative sub-unit becomes functional through adequate logistic support, designed in the depth of echelons of tactical, operative, and strategic levels.

The Romanian experience in this field provides uncalled for examples when armament, equipment, and military technology have been procured without getting the appropriate solutions meant to ensure the ammunition, spare parts, maintenance materials, equipment and tools for operating them and training the personnel, maintenance operations have been ignored, all this having a negative effect on their availability on the battlefield. The logistic systems of technologically advanced armies widely use IT which ensures the timely food supply at the necessary locations (which can be sometimes be within considerable geographical distance) for troops, fuel, ammunition, spare parts, etc.

Information technology has fundamentally changed the classic procedure for logistic support for troops, so that they became fast, flexible, efficient, and controllable.

In modern armies, the organization and procurement models of the operative units, based on new, innovative technologies, have allowed for the decrease of losses, especially human. In Table 1, even though the US commitment increased in the Second World War as compared to the First World War, the loss of human lives did not increase in the same pace.

The realization of the strategic systems at the global level

The realization of strategic systems at global level like “the Star Wars” type, the global coverage with positioning systems, or global communications require huge funds which are prohibitive even for developed countries.

This is one more aspect that has changed the strategic concepts in the way in which the investments in these technologies can be made by attracting the support of more nations interested in security strategies.

Their contribution can be only financial, or they can participate (the developed countries) to solving some of the sections of the strategic programs. At European level, there are examples in the field of military aircraft, multi-role helicopters, wide range rockets, global positioning systems, and armored vehicles, specialized information systems for command, control, and management.

At the same time, each nation should pursue its own interests and be concerned about participating as much as possible into research, development, and production of military technology even when it belongs to a political-military organization.

Taking into consideration the high costs of military equipment – not only for procurement, but also for training, operating, maintenance, replacement – it is an advantage that the tasks related to the contribution for security within the alliance be also supported by military equipment produced in-country.

The participation of small and middle-sized states to provide the alliance with armament, ammunition, and military technology is meant, by its nature, to alleviate the effort to equip own troops at the alliance's standards and to avoid the import of unemployed. They also commit themselves to invest in research and development of new military technology with a positive impact on the technological level at the national scale, because it is well-known that military technologies are the driving engine of progress.

After the Second World War, especially after 1965, the domestic production of armament and technology necessary for the Romanian army was also caused by the fact that the Soviet Union had drastically limited the export of military technology to Romania, also substantially decreasing the spare parts supply necessary to operate the technology that had been already imported.

As a consequence of the massive investments in the defense industry, which has been gradually created, until the late '70s and the early '80s, a powerful infrastructure for research, development and production, consisting of approximately 35 big factories (such as the Cugir Mechanical Plant with over 18,000 employees, the Ploeni Mechanical Plant with 16,500, "6 Martie" Zarnesti with about 15,000, the Army Industrial Group with over 8,000 employees, the National Center of Aeronautic Industry with over 36,000 employees) with a total of over 140,000 employees was set up.

The scientific research in the field, supported by approximately 8,000 researchers, technological engineers, and designers, was consequently subordinated to the operational requirements of the military industry, its task being to elaborate new categories of military technology with the highest possible degree of domestic integration. Based on this, by the end of the '80s a large part of the imports for completion and important categories of military technologies was eliminated.

The national defense industry of that time afforded the supply of almost the entire class of products: infantry armament and ammunition 7.62 mm caliber, 5.45 mm, 12.7 mm, field and anti-aerial artillery 14.5 mm caliber, 76 mm, 100 mm, 120 mm and the ammunition necessary for the Romanian tanks, armored vehicles with caterpillar treads and on wheels (the tank with 100 mm cannon, the tank with 120

mm cannon, infantry combat vehicle, the combat vehicle of mountain troops, armored amphibious vehicles 4x4 and 8x8), military helicopters and for logistics missions (PUMA 330H and IAR 316B, under French license), combat and auxiliary ship, modern and with displacements up to 5,000 tonnes, equipped with equipment for submarine discovery and attack, radar and infrared spectrum sensors for terrestrial, aerial, and naval targets discovery, complex communication equipment (cryptographic equipment), military engineering technology (clearing minefields, means of transportation and pull over obstacles) specialized storage, construction equipment, etc.

All above mentioned achievements has permitted the army equipment, so that in the second part of '80s over 85% of the necessary equipment was produced in-country and some was made available for export. They would still import equipment for fighter aircraft, navigation equipment for aircraft, automatic naval cannons with firing units, air defense radar stations, and part of the underwater weapons necessary for the Navy.

The Romanian army was equipped with military technology of Soviet inspiration which, except the aerospace and nuclear technology, had important flaws in comparison with the similar Western technology, caused by the "philosophy" of its design and execution. At that time, the Western technologies embodied high performance and subtle elements of microelectronics, sensors and microprocessors, optronic devices a.s.o., while the technology available for the states under Soviet influence was rudimentary by comparison, with a lot of electro-mechanic components and, initially, with vacuum tubes electronics. The above mentioned shortcomings materialized in products with the same level of performance, but oversized and heavy, with high consumption and operation resources, complicated and difficult operation instructions (especially because of the lack of use of the process optimizing technologies based on IT) and low degree of protection of the operators.

The production technologies used were also big consumers of raw materials, materials and energy, and usually the issue of specific consumption per product was superficially approached.

With regard to the export of military technology before 1989, Romania had a specific market selling especially artillery products and related ammunition, infantry armament and ammunition, communication means, military clothes (uniforms and boots). The military export's contribution in the '80s represented approximately 25% of Romania's external debt (approximately 21 billion USD) which was completely paid off by March 1989.

Further to the reorganization of the army and the other forces that ensure the national security, and the significant decrease of exports to the traditional

markets, after 1989, the demand for military technology and equipment, armament and ammunition gradually decreased every year. This led to a major rebound of this sector of national industry.

As a consequence, the production capacities have been resized in relation with the demands of the national defense system and of foreign partners. In order to eliminate parallelism and the over-production, the production facilities were regrouped, the military ones being separated from the civil ones – where possible – and some of them were modernized by investments.

The defense industry is still a field of strategic interest for Romania. Maintaining a powerful sector of defense industry, organized on the market economy principles, may meet simultaneously the domestic necessities of technologies, special equipment, armament and ammunition. The specialized manufacturers can participate in the achievement of a significant part of the interoperability objectives agreed with NATO, and can also produce for export. The integration in NATO and EU structures and the adherence to the European Agency for Armament does not impose the elimination of the defense industry, but on the contrary, its material and financial support.

Not all states can afford to proceed, within a reasonable period of time, to the information society and realization of operative structure and logistic infrastructures specific to the modern war, but some efforts in this direction must be made. Even if the training and instruction costs of the military personnel are bearable, the compatibility of the technical means, armament, and ammunition with those specific to NATO involves big and expensive efforts, and this should be made by political decision, during a longer period of time, based on a definite and well designed program.

The political decision makers must clearly define the system of probable risks and threats which Romania might face and, based on it, to set the national military structure, the character and nature of the military actions that should be developed in case of aggression, the configuration of the mobilization system and of preparation for defense of the economy and territory, the system for political-military decision and for the war waging actions.

The decisions adopted must be up to the requirements and challenges of the modern war, and gradually incorporate the compatibility and interoperability standards of allied armies within the Euro-Atlantic area.

Moreover, different approaches with regard to the organizational structure and specific procurement have emerged because of the asymmetric threats, organized crime development, cross-border criminality, and the increase of the gravity of the domestic threats to the national security.

The effect of technology as a moderator

There still are premises for the commencement of local conflicts in the future, strictly contained territorially, when the disputes cannot be diplomatically resolved. The escalation of these conflicts in time is, as a rule, limited by the international reactions that impose the belligerents to show partiality towards the diplomatic means instead of war.

The foreseen characteristic of the future local conflicts is demassification, i.e., the decrease of the critical mass engaged in the military action; the military forces are reduced, the armament is improved, quantity is compensated by quality, the maintenance costs are reduced. Smaller but powerful and easy to maneuver operative structures are set up. The transition from traditional to non-lethal weapons, the control of information, of material and energy-related (visible and invisible) media becomes more obvious.

The likelihood for a worldwide conflict to commence is low, based on the information related to the premises supporting such a conflict.

First of all, the development of technologies is not any more the privilege of one single power. The information flow, the easy access to the new technologies, human and financial investments in military research have all led to the emergence and development of new centers of power with large economic and demographic resources which increase the multi-polarity phenomenon: i.e., China, India, Japan, and Brazil. The expansion of the “atomic club” by countries like India, China, Pakistan, Israel, and the development in these countries of the means of transportation and space technologies balance significantly the potential of armed conflicts to break out at the global level.

The freedom of circulation allowed the creation of powerful communities of Chinese, Indians, Pakistani, or Africans in Western states (especially France) which represent a source of technological, financial, and information transfer to the country of origin, contributing thus to the latter’s development.

The public opinion is better and more concretely informed about the areas of tension and the possible beginning of conflicts due to the socialization networks with millions of members developed on the Internet, and it is harder to manipulate.

The civil society is better informed, and has an increasing role in standing against war; it can also force politicians and governments to choose different ways to resolve and de-escalate conflicts.

There are many examples in modern history when the military conflicts were ended consequent to the protests of the civil society and non-governmental organizations.

The development of military technologies, the increase of the destructive potential of the armament, the emergence of new types of threats paradoxically represent a reason to deter military aggressions.

According to the new risks and threats, and to the “strategic concept” adopted by NATO state and government leaders in Rome in 1991, the danger of a war in Europe has virtually disappeared, but there are still risks and uncertainty for the Alliance members and for other states in the Euro-Atlantic region.

These regard ethnic conflicts, violation of human rights, political instability, precarious economy, spread of nuclear, biological and chemical weapons and spread of the means to supply them.

Taking into consideration the destructive effect of the military technology at the global level, not only on humans and infrastructure, but also on the environment, the question is if and under what circumstances a new conflict of the amplitude of the last two world conflagrations may take place.

In our times, the war waged by classical means which targets at the destruction of enemy human force and infrastructure is less probable. The development of technologies, especially in the information field, has led to a different type of threats: against information systems for financial management, population census, banking systems, management of the energetic systems of transportation and of communication might have a more devastating economic effect than war itself, and can be launched from various locations, including the territory of the assailant.

