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Public-private partnership in the scientific and technological sphere of defense industry: Russian and foreign experience

The article is devoted to the problems and prospects of cooperation between state and business as key areas in the strategy of technological modernization and maintaining the competitiveness of the economy. It analyzes the international experience of public-private partnership in the scientific and technological content of the military economy. The analysis held in the course of research has proved that the PPP in the defensive industrial complex of the Russian Federation is the best and often the only possible perspective of the further innovative development of the industry.

Public-private partnership, defensive industrial complex, innovative activity, duel-purpose technologies, State defensive order, Government program of arms.

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One of the national priorities in the country's development for the next few years is the increase of the national industrial production competitiveness on the basis of the technological modernization of enterprises. The successful solution of this problem will contribute to the output of national industrial products competitive on the inner as well as international markets.

Several problems can be pointed out that mainly handicap the achievement of industrial production competitiveness, specifically: the technological backwardness of some of the defense-industry complex branches, the slow introduction of new advanced technologies and highly automated precision equipment, the lack of appropriate personnel training. All this impedes the efficient and full-fledged mass production of the new generation of armaments, military and special equipment (AMSE).

Low production and technological segmentation along with the obsolete equipment (the share of modern production lines do not exceed 6 – 8% of total production volume) leads to the stagnation of major industry technologies and defense enterprises competitive capacity reduction [13].

Today the timing of creation and implementation of the new equipment and industrial base lags far behind actual needs. In addition, there is a problem of coordination between a large number of federal target programs (FTP) ensuring the effective development of defense industry enterprises.

It is necessary to point out an extremely low level of modern informational technologies utilization for supporting high-tech production at all stages of its life cycle (IPI-technologies) at the defense industry enterprises that try to cut down expenses on licensed software procurement, which is totally unacceptable as it may cause malfunction at the crucial moment.

The study and practice of IPI-technologies implementation abroad shows that their full application allows to solve the problem of cardinal improvement of quality and competitiveness of science-intensive technologies output at the expense of the reduction: for 20-30% the development and production costs; for 15-20% production defects and troubleshooting removal costs, for 20-25% operation costs, for 60-70% timing of the latest vehicle models market launch.

Given the importance and urgency of IPI-technologies development at the industrial enterprises, the IPI-technologies elaboration and industrial testing aimed at their large-scale replication at the industrial enterprises are stipulated by the Federal target program "National Technological Base".

It is worth mentioning that at present it is planned to invest a considerable amount of budget funding in the defense-industrial complex aimed at technical upgrading of the organizations participating in the State Armament Program (SAP) and the State Defense Order (SDO).

Under the Federal target program "Development of the military-industrial complex for 2007-2011 and for the period up to 2015" more than 500 billion rubles are to be allocated for technical modernization of defense organizations, including more than 300 billion rubles from the budget. Annually the domestic industrial organizations spend about 1 billion dollars on the technical upgrading from their own funds with the tendency towards the significant annual growth of these expenditures (projected to 2015, annual spending will reach $ 10 billion) [6, p. 20].

Besides, the Federal Target Program "Development of the Russian Federation military-industrial complex for the period up to 2020" is to be implemented soon and it should become the main instrument for solving problems of modernization of Russia's defense-industrial complex. For 10 years about 3 trillion rubles are to be invested in the Russian defense sphere including 440 billion rubles during the next three years [13].

However, the lack of funding for ongoing activities in the field of technological modernization remains a major problem.

International practice shows that the competitiveness of enterprises is ensured by updating the main production facilities every 5 years. At present the enterprises procure expensive technological equipment without strict economic evaluation of various options for technical modernization. Experience proves that disregard for modern methods of economic assessment of alternative options for technical upgrading can reduce the production efficiency after the acquisition of modern technological equipment, which is unacceptable in the market economy.

At present, the defense enterprises usually solve the modernization issues on their own, individually, depending on the possibilities of trying to receive budget funding, fulfilling orders according to the State Defense Order and analyzing the existing demand in its market segment of civil products. At the same time dozens and hundreds of organizations should by themselves draft the applications for the implementation of innovation and investment projects aimed at high-tech goods development

and production in the interests of a definite organization and submit these applications to the federal executive bodies. Considerable difficulties with the preparation of applications, uncertainty of the criteria for their selection, the lack of comprehensive evaluation concerning the choice of the technological modernization project do not give any guarantees that the enterprises' production capacities increase would be most possibly connected with production modernization activities and lead to obtaining a significant economic effect from these activities.

Besides, this modernization scheme does not exclude duplication during scientific research and capital investments of the organizations belonging to the same branch. For example, in 2004, according to the nomenclature of the Russian Federation Ministry of Defense 300 research and development (R&D) works requiring interdepartmental coordination were carried out with the total cost of 3.3 billion rubles. And according to the nomenclature of the rest of the governmental customers – 270 works with the total cost of 2.6 billion rubles. According to expert estimates, the number of duplicate works equaled 20%, and in the field of combat equipment, electronic tools for different purposes - about 30% [2]. Ultimately, this causes inefficient use of budget funds, and despite the sufficiently large amount of funding for technological and technical modernization of production at the expense of federal budget, own and borrowed funds the goals concerning one definite enterprise within one branch are not achieved not to mention an economy as a whole.

The results of scientific and technological activities form the basis of innovation potential for increasing the competitiveness of commercial products and serve as a kind of raw material for innovations - the economic effect of the sales of commercial products, the competitiveness of which is ensured by the introduction of something new.

At the modern stage of development of AMSE in our country these innovations are born in the process of creating the scientific and technological groundwork for advanced weaponry, mainly within the framework of the Program of basic military technologies development which is part of the State armament program.

Scientific-technical results, created in the interests of the defense industrial complex, in most cases have a potential for dual (both military and civil purposes) usage. The foreign experience proves that their transfer to the civilian sector of the economy can significantly improve the efficiency of the Federal budget expenditure, aimed at the creation of advanced defense technologies. Efficiency is increased by the additional revenue from taxes on civil products sales, as well as by the increase of the defense production profitability while producing the goods technologically similar to civil ones.

In the strategic aspect, it should be noted that the crucial directions of defense industrial complex scientific-technological base development usually coincide with the crucial directions of scientific-technical progress in general, therefore, the technological advances gained for the benefit of defense production, are also important for the civil products competitiveness increase and development of socially significant sectors of the economy.

Experts from the Ministry of Defense and the Ministry of Economic Development of Russia estimated that new knowledge and technologies obtained in the framework of the State Armaments Program (SAP) and having the prospects of dual use and, accordingly, the promotion on the internal, as well as on the external markets, make up about 55% according to the Program of basic military technologies, and in other areas of the SAP – about 30%. At the same time, this potential remains practically unrealized [4, p. 356].

In general, the defense industrial complex, along with the tasks of the target, i.e. defense purposes, carries out R&D and production activity in the interests of the various non-defense economic sectors and types of activity. At the same time it should be noted that non-core production and the activity aimed at the use of defense industry achievements in non-defense areas are not organized on the governmental level and only the restrictions on the dissemination of results obtained in the interests of defense and security and/or created by attracting the Federal budget funds are regulated by law. The solution of the key problem of transition to innovative development which is to be found in the extensive involvement of the objects of intellectual property in economic turnover is yet not enough worked out methodically and is not properly regulated by law.

Along with general breaks of the innovation process, connected with the lack of legally established procedure regulating the transfer of fundamental science promising achievements to the practical sphere, the following systematic selection of scientific research suitable for the engineering creation of new technical solutions, which ensure the obtaining of competitive advantages of innovation products, the defense industrial complex has other specific obstacles [8].

Firstly, the guidelines of defense industry organizations development often could not be determined by the innovation activity priorities, as their direct activity is aimed at the creation of military-purpose goods (MPG) and this market is not open and it is chiefly regulated by the state. Indeed, the purpose of innovation activity is to gain commercial effect from the competitive advantages on the free market due to the innovations that give the products the new features attractive for consumers. Competitiveness as a factor of innovation activity stimulation has not become a crucial one in the conditions of the program-target planning of the State defense order tasks that are oriented towards the definite potential executors that include only those having the appropriate licenses granting the right to carry out defense-related activities.

Secondly, neither does the placement of defense orders on a competitive basis have any significant impact on the striving of the enterprises towards the innovation-based development model, as the competitive selection is held mainly according to the criteria of MPG supplies benefits and the efficiency of the projects aimed at the perspective military-technical problems solution is not taken into consideration.

Thirdly, the institutional transformation of the defense industrial complex by the formation of vertically integrated systems and governmental corporations contributes to the concentration of resources, provides more opportunities for the creation of competitive advantages on the international market and at the same time strengthens the cooperative relations on the basis of corporate interests which simultaneously leads to a limitation in the choice of partners, conservation of technological ties and technological base.

Fourthly, the use of non-innovative mechanisms of creating advantages for the enterprises that are based, in particular, on the monopolistic position of corporations, in the short run, will reduce the potential effect from the innovation-based activity, the result of which is connected with numerous risks and additional expenses and can bear fruit only in the relatively distant future.

Fifthly, the Federal budget defense expenditures could be properly planned only for the period of 1 up to 3 years due to the financial, economic and military-technical uncertainty in the permanent crisis conditions of the last two decades. In these circumstances the defense industrial complex enterprises had no real opportunity for strategic planning of their development when innovation-based activity could be considered as a significant factor of economic policy.

Thus, economic, organizational and managerial conditions of the enterprises producing defense products objectively do not create the necessary incentives for the development of innovative activity in the defense industrial complex. On the contrary, the defense enterprises' commercial success in the non-core products market can cause a change in the priorities of their target activities and lead to the breaking of the relations with the defense sector that fails to ensure comparable economic results.

Consequently, it is clear that organizing the innovation-based activity in the defense industrial complex requires governmental incentive and regulation of balance of participants' defense and commercial interests.

Legally binding state regulations and procedures dealing with the distribution of rights and responsibilities between the subjects of innovation activities as well as ensuring the conformity between the technological development priorities, stipulated by defense tasks and commercial priorities dictated by market conditions are the important factors of formation and functioning of the defense industrial complex innovation system.

Efficiency of the use of budgetary funds allocated for technological development and provision of military industrial complex technological security can be greatly increased by the organization of systematic transfer of advanced scientific and technological military or special purpose achievements to the civilian sector of the economy. As foreign experience proves, additional effect can be seen due to the increase in the competitiveness of civil production by mastering advanced technologies created in the interests of technologically similar defense goods production and also due to defense and civil products net cost decrease along with the expansion of the production using dual-purpose technologies.

Attraction of extra-budgetary funds for the interests of the defense industrial complex development can be organized on the basis of correspondence of scientific-technological development guidelines, crucially important, on the one hand, for increasing the interested investor's commercial product competitiveness, and on the other hand, for ensuring the necessary technical level of defense products.

The public-private partnership (PPP) having the goal to create stable relations between science and market and provide for the commercialization of research and development results is the main form of public (defense) and private (commercial) interests combination when organizing the innovation-based activity in the defense industrial complex.

In our opinion, *public-private partnership in the scientific and technological content of military economy* can be defined as a system of long-term relations between the state (its constituting entities representing the state) and subjects of the private sector of the economy aimed at implementing scientific-technological projects in military-industrial complex on the basis of resources consolidation and income or material benefits, costs and risks distribution.

The PPP establishment implies that the state, which invites private investors to participate in socially significant projects implementation, is the initiator of the cooperation. It is the long-term governmental goals and tasks, problems and obstacles arising from the state's social commitments and increasing military and economic demands that should form the basis for the partnership initiatives of the state.

The PPP alliance efficiency is ensured not so much by the direct pooling of resources as by full use of the each participant's unique capabilities and a joint reduction of risks. When forming an alliance with the business, the state, as a rule, not only gains an advantage concerning budget expenses but also gets a more flexible and efficient project management system. As for the business, it receives a number of guarantees and preferences [7, p. 145].

The PPP models and structure vary but at the same time there are certain features allowing to differentiate the partnership into an independent economic category. It is a formalized cooperation of state and private structures, created for the achievement of specific goals and based on the appropriate agreements of the parties.

The main goals of the state in the scientific and technological sphere of the defense industrial complex include:

- increase of state property management effectiveness in the field of science and innovations;
- organization of systematic selection of the fundamental science research results in the sphere of priority development directions and critical technologies of the Russian Federation and their conversion into applied results, suitable for engineering implementation in the advanced technical solutions in technological processes and constructive objects;
- the increase of the usage efficiency of the Federal budget funds, allocated to state customers – Federal executive bodies for the purpose of MIC technological base development, as well as through the expansion of their dual-purpose application in the civil sector of the economy;
- raising of additional extra-budgetary funds aimed at the MIC technological development in the spheres crucial for creation of the new generation of AMSE as well as non-defense products, competitive on the domestic and foreign markets;
- expansion of dual technologies usage by unifying the military and civilian products technological base for increasing the profitability of defense products output, which is limited by state customers' financial capacities,
- encouraging small and average businesses to the innovation-based activity,

Accordingly, the benefits of each participant interested in the partnership are as follows:

– for the public sector - improvement of quality and reduction of the state order's cost, improvement of its basic directions selection system, finding the new ways of scientific-research sector results implementation; increase of the effectiveness of the state support of research and development carried out by the business through the reduction of risks it may have while investing into the innovation-based activity; the best practical application of obtained public sector research and development results by increasing their profitability potential; filling the gaps in the infrastructure of knowledge transfer, its development [5, p.260];

– for the private sector – the availability of information about the results of intellectual activity, created in the (MIC) defense industry under the state contracts and suitable for commercialization; the possibility of the acquisition of rights to use the results obtained at the expense of the Federal budget and having high commercial potential; the availability of services providing contractual relationship registration between the main participants of innovation process (state customers, developers, investors) by the "one stop" principle; the possibility of partial compensation of risks connected with the adaptation of defense oriented products to competitive market conditions; the availability of credits, granted on favourable terms, including those granted against the pledge of future products; the availability of consulting, marketing and other services [1, p. 70].

The world practice witnesses many ways of joint participation of state and business in innovative activities.

The USA have gained remarkable experience concerning the PPP formation. In this country the scientific and technological development perspectives are constantly in the focus of attention of the state's ruling circles, which finds its expression in the development and regular updating of goals, tasks, guidelines and

scope of the scientific and technological activities, in promoting the use of scientific and technological potential for strengthening national security, developing economy, strengthening of positions in the world market, as well as in the carrying out scientific and technological activities to meet the internal demands of the country while promoting the implementation of foreign economic interests.

The USA are the ardent followers of the "technological war" concept striving to gain technological superiority over any potential enemy, get hold of the other states' latest scientific achievements in the defense sphere and become a leader in every scientific and technological field [4, p.159].

The policy of priority innovation financing carried out by the USA expresses itself in the form of a broad partnership between the Federal government, corporate and academic sectors in the spheres of science and technology development and technological infrastructure formation. This policy is aimed at the promotion of perspective but high-risk technologies, elimination of the dissociation between military and civil industrial bases in order to expand access to a broad range of technologies ensuring national security.

This policy, stimulating the "dual-use technologies" development and implementation, being a part of the US technological security state program, contributes to the convergence of civil and military industry, eliminating the institutional and technological barriers between them. The United States consider that it is necessary not only to finance R & D in the military sphere, but also to encourage the demand for its results on the part of the corporate sector. It is necessary to get big financial-industrial groups working on global civil markets interested in their own investing into the technologies originally developed by the defense industry for military purposes, but having the potential of commercial use.

The majority of the US R&D carried out at the expense of the Federal budget, is under the authority of the Defense Department. Their share in the total Federal R&D financing approaches the figure of about 60%. Given the inflation rates, the Federal budget expenditures on defense research and development for the recent years also show the outrunning growth in comparison with the research and development in civil sector [3, p. 9].

The Defense Advanced Research Projects Agency (DARPA) is the main institution in the system of the US Department of Defense, responsible for the financing of scientific-research and experimental-design works carried out by the technologically oriented companies for the needs of the defense industry. Strategically, the goal of this establishment is "to maintain the US technological superiority in defense sphere, prevent the emerging of unexpected technological threats to national security by providing financial support of the revolutionary and highly profitable R&D, which reduces the gap between fundamental discoveries and their military application".

DARPA fulfills its mission through a worldwide search for the most "promising" scientific ideas and the subsequent sponsorship of research projects that form a kind of a "bridge" between the basic research and their usage for military purposes. DARPA is the only establishment of the Defense Department, not bound by specific operational goals: its purpose is to provide the US Department of Defense with technological solutions.

The Agency is unique due to the fact that it implements only the projects, ensuring the revolutionary accomplishments in the defense sphere, but, as a rule, highly risky ones.

The majority of technological innovations that shaped the appearance of the modern US armed forces were developed and implemented with the direct support of DARPA. These include: low observable technology "Stealth", radar system with a phased antenna array;

uncooled night vision devices and the IR all-round surveillance system; unmanned land-based, air-based and submarine-based military equipment, over-the-horizon radar target detection technology, etc.

Although the Agency focuses primarily on the military sphere, a significant part of its projects deals with the development of dual purpose technologies. Internet, GPS navigation system, semiconductors and integral circuits - all these areas, widely used at present in the civil sector, are based on the research, carried out with the direct participation of the DARPA.

While dealing with dual purpose technologies the Agency pays special attention to commercialization of R&D results. When private corporations are not yet investing in technologies valuable for the Defense Department, DARPA takes the leading role in the technological base development.

At this moment the Agency directs its investments for the needs of national security and does not intend to create the groundwork for the industrial base of the private sector. As soon as the development of technology is shifted from the Defense Department to the private sector, DARPA should define the transition strategy from the position of a technological leader to the "niche player".

The technology of integral circuits can serve as an example of such a transition. In early 1970-s the US Defense Department was the main consumer of integrated circuits. The demand on the part of the armed forces reached 17% of the market of semiconductors.

By the mid-1990s, the private demand for semiconductors has increased significantly, as a result, the Defense Department controlled about 1% of this market, its influence on the development of these technologies decreased sharply, and DARPA has changed its leading role for the role of a niche player. At present, the Electronic Technology Office at DARPA is dissolved [11, p. 32].

Since 1986 DARPA is specially engaged in the stimulation of "innovations", developed by small research groups. A lot of research programs are narrow in their scope and are carried out by one or two scientists assisted by several laboratorians or technicians. Nevertheless, the US Defense Department does not neglect such groups, signs contracts with them and provides them with equipment and data. Especially often it is practiced at those research stages, when a wide search is required and carrying out the works on a competitive basis is most efficient.

The main criteria taken into account when holding competitive tenders include: the goal of the research; the novelty of the design; analysis of approaches existing in this field; the presence of revolutionary innovations in a project; evidence of the possibility of achieving the project's goal; the formulation of the intermediate and final results; defining the consumers of the project outcome; the cost and terms of implementation of the project.

Universities, government laboratories, federal R&D centers and non-profit organizations play the most important role in conducting research and development. At the same time, DARPA annually allocates a substantial part of its funds for industrial enterprises.

It is necessary to mention the American practice of creating Centers of Excellence. Centers of excellence are established at the universities, they have extensive scientific research programs and essentially serve as the centers for creating new science-intensive firms. As a rule, they function under a mandatory share participation of private companies, state budgets, etc. Such centers are established all over the country. The Defense Department and representatives of industry also take part in their activity. This contributes to the transfer of knowledge, flexibility, and mobility in R&D sphere. The companies gain knowledge concerning the latest achievements in the scientific and technological sphere, which allows them to remain at the cutting edge.

Of paramount importance is the sharing of experience and strengthening of the work coordination. These centers help to reduce duplication of the work. Professional training of scientists and engineers is also being improved [10, p. 20].

Unlike the United States, the United Kingdom in accordance with the Defense Science and Innovation Strategy does not aspire to global leadership in all scientific and technological fields, yet it ranks second in the world concerning the expenditures on the military science. According to the concept of the "Towers of excellence", Britain plans to achieve leading positions only in critical areas, which include guided weapons, optical-voltage sensors, synthetic environment creation, radar systems, underwater sensors and the software for human-machine interface. The rest of the scientific-technological areas are a sphere of international cooperation and commercial purchase within the country [4, p.159].

The UK has an agency similar to DARPA, which is called the Defense Science and Technology Laboratory (DSTL). The laboratory was established in July 2001. According to the governmental initiative the Defense Evaluation and Research Agency (DERA) was transformed into two establishments: the Defense Science and Technology Laboratory (DSTL) and the company QinetiQ. DSTL is the executive agency of the UK Ministry of Defense (MoD), it works out recommendations in the sphere of defense science, technology and security. The company QinetiQ provides technological products and services in the defense sphere for the state and commercial customers.

In the last ten years the British government established two main forms of organizational structures: the Towers of Excellence (TOE) and Defense Technology Centers (DTCs) for the purpose of constructive cooperation between the Ministry of Defense, industrial and academic circles. The Towers of Excellence seek to increase technological superiority of Britain's AMSE and improve the "vertical" base of equipment suppliers in key priority areas at the levels of a system or a main subsystem. DTCs are world-class centers, carrying out R&D, focusing on innovations that will contribute to the improvement of the UK future defense capability through the development and use of technologies [14, p. 289].

Great Britain is the European leader in the use of PPP mechanisms. In 1992 the Private finance initiative (PFI) was founded for the purpose of developing more efficient public services of high quality. Long-term British experience of PFI has shown the effectiveness of this form of cooperation with the private sector in comparison with the direct participation in the projects funding. Higher discipline of PPP projects, the requirements of a customer to draw up the budget for the long-term period of a project life cycle stimulate the higher quality of project preparation, business planning and execution of the specifications by the private sector participants.

The program for the development and launch of military satellites "Skynet-5" for the British and NATO armed forces can serve as an example of the PFI concept implementation. The UK Ministry of Defense, the Postal Services Commission and private investors signed a preliminary £ 963 million agreement on the development of the satellite. The total value of the satellite's whole life cycle equals £ 2.5 billion. It is noteworthy that a consortium consisting of the 30 banks is the private investor of the project [9, p. 100].

At present, three Skynet-5 satellites have been placed into orbit and the fourth will be launched in 2013 that will ensure capacity increase of the MoD satellite communications network. The corresponding agreement was signed between the UK MoD and the main contractor for this project in 2010. Besides, it was decided to extend the Skynet-5 operating life for two more years – till 2022. The military has estimated that the economic benefit of

£ 3.6 billion or $ 5.4 billion can be obtained if about £ 400 million or $ 600 million would be invested into Skynet-5 and its operating life would be extended.

Another European PPP model is represented by the creation of a multi-purpose transport/refueling aircrafts "Future Strategic Tanker Aircraft" (FSTA) by the company AirTanker for the British Air Force. The FSTA project is aimed at the development of the UK refueling aircrafts fleet, including the creation of the newest operating base and the attendant infrastructure. The delivery of 14 new tanker aircrafts for the Royal Air Force is expected within the framework of the project covering the period of 27 years (2008-2035).

The total value of the equipping the British Air Force with tanker aircrafts and the provision of related services is estimated at £ 13 billion (£ 16.7 billion). If Britain takes part in military actions and its demand for these aircrafts increases the total project cost will increase respectively. It should be noted that the UK MoD spent approximately £ 47.5 million (which is 0.4% of the total project cost) for the holding of a tender prior to the conclusion of a contract.

In the course of negotiations ongoing since 2004 AirTanker on its part managed to attract about £ 2.2 billion (£ 3.2 billion) for investing in the development of the fleet, operational base and attendant infrastructure. The cost of the services provided to British Air Force will consist of a fixed part: for the fact of aircraft provision, and variable part - for every hour of aircraft operation [12, p. 66].

From the organizational point of view the aircrafts fleet is planned to be divided into three parts. One of them will be in continuous operation of the military. Another one is supposed to be in operation of the military on weekdays, and on weekends - used in commercial (transportational) purposes. The third part will be used for commercial purposes, and handed in at the disposal of the Air Force in case of emergency.

All 14 aircrafts will remain the property of AirTanker consortium. The British MoD will not buy but lease them, while ensuring the minimum demand on its part for the consortium services. If AirTanker is unable to provide the agreed services, the payments from the Ministry of Defense will be effected only for the actually provided services.

The projects described in the article are a bright example of successful partnership between the public and private sectors in the field of defense. The US and UK experience proves that along with such necessary components of the innovative development as the efficiency of the innovative activity legal base, systematic and intensive investments in R&D, development of entrepreneurship and production base improvement, of crucial importance is the formation of a dense cooperation network between all the subjects of the national innovation system (including the interaction between the military and civilian sectors of the economy) as well as between all the stages of the dynamically developing and significantly challenging innovation process. Public-private partnership is becoming a core of the emerging networks.

Taking into account the nature, scope and implementation timing of the scientific-technological projects, PPP in the RF military industrial complex seems to be the best and often the only possible prospect of the further development of the defense industry. Attraction of business allows to implement a lot of strategically important projects and programs, when the state budget is unable to allocate the funds for their financing. Besides, the innovation process being an integral part of scientific-technical activity, which is based in this case on military and double-purpose technologies is also evolving, which, in its turn, contributes to the establishment and improvement of the defense industry infrastructure and the achievement of parity with the United States concerning the main types of armaments and military equipment.

It seems that the development of the works on advanced armaments, military and special equipment on fundamentally new physical principles requires the creation of fundamentally new organizational schemes for such work. It might be appropriate to suggest the establishment of the Russian Agency for advanced defense research and development as the counterpart of DARPA.

In our opinion, the creation of this establishment will help in a relatively short time to narrow the scientific and technological gap between Russia and the leading foreign countries not only in the field of AMSE, but also in the technological development in general, and in future to resume the leading positions in the world.

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