Changes in the Product Portfolio of Defence Contractors: Global Experience and Opportunities for Russia

The paper reviews the global experience in changing the defence contractors’ product portfolios and identifies the conditions for intensifying diversification in Russian defence industry and promising ways to overcome the obstacles to defence contractors’ restructuring. The information basis of the research included the works by Russian and foreign defence industry scientists and practitioners and the data from the Stockholm Peace Research Institute. The article analyses the pattern of the public funding allocated to the nuclear weapons complex and applied defence research. It later examines the global experience in conversion and diversification of military production. The authors propose possible directions for solving the problems faced by defence contractors on their way to diversified and efficient production with regard to the current operational environment in Russia and the requirements to boost the companies’ innovative processes. The paper then describes the aims, advantages and disadvantages of conversion forms. The results of the research lay the ground for the methodological framework for developing recommendations to assess and improve the efficiency of innovative processes at defence contractors.

JEL classification: O 31, M 11

Keywords: defence contractors; State Armaments Programme; conversion and diversification of production; product portfolio; civilian products; innovative process.

Introduction

The upcoming changes in routine industrial relations pose a problem, a solution to which is on the agenda of almost every defence contractor. At the same time there are risks stemming from the pressure to diversify military production against a background of cutbacks in funding when the efficiency of civil manufacturing and competitive production projects based on military research cannot be estimated with certainty.

The objective of this study is to describe possible directions for solving the problems of efficient diversification with regard to global experience and current Russian environment. While attaining the objective the following tasks were carried out:
• the conceptual and categorical framework of conversion processes was examined;
• aims, advantages and disadvantages of conversion forms were identified;
national policy directions regarding the development of defence contractors and financing of military expenditures were studied and retrospectively analysed;

- global experience in the efficient processes of changing the product portfolio at defence contractors was reviewed;

- the conditions for conducting diversification of defence contractors were determined, and the directions for resolving the problems of active changes in the defence industry, most adapted to the Russian environment, were formulated.

Changing the product portfolio structure of defence contractors in the context of cutbacks in the State Defence Order (SDO) is a pressing problem. The experience of military powers shows that preparation for the processes of restructuring and diversification should begin 3–5 years before the SDO volume decreases which corresponds to the government's plans for the development of innovative processes in the Russian defence industry. Efficient processes of introducing civil products manufactured by defence contractors into the free market depend on many factors – from state support measures to the willingness of the firms themselves to fill a niche in highly competitive markets for industrial products and consumer goods.

Theoretical aspects of conversion and diversification of production at defence contractors

Global practice of changing the product portfolio at defence contractors includes transformations based on the conversion process. Conversion at defence contractors implies either modernization of their production lines intended for manufacturing military goods or conservation of production capacities, generally as a response to external factors (cessation of hostilities, arms programme reduction, and unfavourable economic situation in the country). From this point of view, it can be stated that any change in the product portfolio of an industrial plant is associated with the process of conversion. Characteristics of conversion can be supplemented by such phenomena as partial or complete reorientation of research institutes, design bureaus integrated in research and production firms (corporations), performing the whole complex of works on the development and production of military, civilian or dual-use products.

The process of conversion at defence contractors can take the forms of restructuring, diversification or assimilation.

A visible outcome of restructuring a military-industrial complex is a decrease in the overall production of military goods as a result of conscious actions to reduce military production in whole or in part, or to conserve facilities manufacturing military goods [5].

The phenomenon of industrial restructuring is generally considered in the context of organisational changes in a company that essentially transform the procedure of in-process and technological relations. However, for a defence contractor that is, for example, part of a large corporation, the process of industrial restructuring affects not only the organisation of its core activity and operating structure of the company itself, but also the functional structure of the higher levels of a management system [8. P. 73].

The process of restructuring at a macro-level is generally implemented at a time of significant political or economic transformations in a country. Last time the process of restructuring was initiated in the Russian defence industry under the federal target programme “Development of the defence-industrial complex in 2007–2010 and up to 2015” (2007) and was further detailed in Methodological recommendations on the creation of integrated structures in the defence-industrial complex. By 2013, as a result of mergers and acquisitions, 54 deeply integrated structures were established in Russia to increase the efficiency of defence contractors [5]. Global experience of applying restructuring to the largest defence contractors is unquestionable. According to the Stockholm Peace Research Institute, all 100 of the world’s largest arms-producing and military services companies are represented by deeply integrated structures with mergers and acquisitions being a common tool for restructuring.

Diversification of military production involves re-orienting the company’s production capacities towards manufacturing civilian products. The main principle of the national policy in
defence industry is to use existing production capacities and research facilities with minimum finance to raise extra. Thus, diversification of defence contractors is required to be as efficient as possible. The most efficient deeply diversified companies in the contemporary global market include Northrop Grumman, General Dynamics, United Technologies Corporations, in Russia – JSC “Almaz-Antey”, OJSC United Shipbuilding Corporation, OJSC United Instrument Manufacturing Corporation [15. P. 51].

Experience of countries with developed military industry shows that diversification process should be aimed at a conglomerate rather than one single defence contractor with narrow industrial specialization to eliminate such shortcomings as lack of experience in the civilian market and to take advantage of putting military research efforts to civilian use.

Assimilation of military production involves mastering the production of goods having “civilian” application by defence contractors and branches of defence industry. The methods of assimilation may include full or partial assimilation of military goods to “civilian” occupations, as well as assimilation of production capacities of plants producing military goods in “civilian” manufacturing technologies (mastering the dual-use technologies) [5].

Assimilation of military products into “civilian” occupations was actively used at Soviet plants in the form of areas allocated in civilian production for the constant manufacturing of military goods in small quantities which provided conditions for maintaining a personnel qualification and an ability to quickly readjust production lines in the event of hostilities.

The second method of assimilation, the conversion of defence contractors’ production facilities to peaceful applications, should form the basis for increasing the share of civilian products in the revenue of such companies in the nearest future.

The practice of industrial assimilation has a century-old history, both in Russia and abroad. Examples of assimilated industries can be found in military literature since the beginning of the XX century. Despite the fact that the initial goal of industrial assimilation was to protect a country’s national security, starting from the 1930s, the USSR, Great Britain, and then China and other military powers have been striving for a more efficient use of defence contractors’ capacities and mastering the production of civilian products. The most efficient companies with assimilated production in their structure operate in electronics and IT segments, including the examples of Lockheed Martin, BAE Systems, JSC “RTI Systems”, JSC “Concern Radio-Electronic Technologies” [15. P. 51].

When choosing a particular form of conversion, the firms proceed from the aims of initiating the changes in production. For instance, when foreign highly-efficient defence contractors convert their production, they mainly want to create new capacities using military technologies or dual-use technologies, thus making the restructuring of military production lines both technically and economically impractical.

Russian and foreign experience of using specific forms of conversion allows distinguishing the aims, advantages and disadvantages of each particular form (Table 1).

| Form of conversion | Aim | Advantages | Disadvantages |
|-------------------|-----|------------|---------------|
| Restructuring     | Reduction in military production during the periods of cutbacks in the SDO. Improvement of defence contractors’ performance | Use of restructuring tools at all levels of the economic system. Ability to use the mechanisms of a public-private partnership. Ability to put military research efforts to civilian use | Duplication of elements in the structure when segmenting the business. Increased costs due to changes in the structure |
It is important to note that the choice of a particular form of conversion and its progress is largely influenced by the national security tasks for a specific period of time with respect to, among other things, the developing international situation. The experience of the world’s largest defence contractors demonstrates that the most efficient companies rely on the forms of conversion implying reorganisation of integrated structures as a whole rather than individual plants [12. P. 576].

The best conversion outcomes should obviously be expected when the tasks stated in a federal target programme are consistent with development aims of defence contractors. However, in any circumstances, the production process efficiency depends on the companies’ ability to solve the arising problems by using a systems approach.

Global experience in restructuring and diversifying production at defence contractors

The process of changing a defence contractor’s product portfolio towards civilian production may be initiated by both internal and external reasons. Nonetheless, at least the economic rationale for it must remain obvious. The world’s largest market-oriented defence contractors almost always keep a constant eye on opportunities to reap substantial benefits from manufacturing civilian products, pursuing and developing new markets. In this regard, the goals set by the Russian government for the development of civilian production at defence contractors indicate that the task of increasing the efficiency of accumulated production capacity is at least relevant.

Diversification of production has been the most actively implemented in the past and the present by the contractors located in the USA, Western Europe, China, Japan, South Korea, and some other countries. A study of experience in conversion and diversification, for example, in China, reveals some positive factors that characterise the military production organisation in this country (Table 2).

The combination of these factors favoured the development of civilian production at Chinese defence contractors and resulted in even higher-than-expected share of civilian goods in their revenue. For example, in the beginning of the 21st century it was 80%, thus exceeding the target level by 30% [4].

| Form of conversion | Aim                                                                 | Advantages                                                                 | Disadvantages                                                                 |
|-------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Diversification   | Keeping production capacities and the employment rate during the periods of cutbacks in the SDO [14]. Improvement of defence contractors’ performance | Elimination of low production performance risks by changing the contractor’s product portfolio | High level of expenditures. Need to take industry specificity and production peculiarities into account [8. P. 72]. Lack of experience of liaison with the civilian market |
| Assimilation      | in “civilian” production | Ensuring national security                                                  | Rapid adaptation of workers to military production                          | Extra costs to maintain expertise. Lower peace-time production efficiency |
| in “military” production | Ensuring efficiency of military production. Keeping production capacities and the employment rate | Use of the same processes to produce both military and civilian products. Improvement of performance standards for civilian products by applying military technologies | Changes in production limited by the type of technologies and kind of product |

Table 1 (concluded)
### Table 2
Factors favouring the development of civilian production at defence contractors in China in the 20th century

| Factor                                                                 | Description                                                                                                                                                                                                 |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Availability of production facilities suitable for manufacturing civilian products | Deep militarisation of China in the 60–70s implied self-sufficiency of its army. Apart from their basic functions, Chinese defence contractors were engaged in construction, agriculture, and production of consumer goods. |
| Civilian production stimulated through the national policy             | Plans for conversion to civilian production involved the development of a gradual restructuring strategy. Civilian production was facilitated by a change in the structure of the PRC defence industry – in the late 1990s, declassified military ministries established trade and industrial corporations. |
| Territorial restructuring                                              | Many plants were relocated closer to transport hubs and large cities, or handed over to local authorities free of charge in order to organize civilian production.                                                   |
| The manufacturing of cheap consumer goods of relatively low quality for export | The first exported civilian products were priced low and ensured significant revenues for further conversion of military industry to civilian production.                                                                 |
| Organisation of labour and "Chinese mentality"                        | Predominance of financial motivation, diligence and strict compliance with instructions.                                                                                                                   |
| Favourable external economic conditions                                | Cooperation with defence corporations of NATO and Japan, purchase of military equipment in the 1980s. Use of Russia's and the former Soviet Union countries' military technologies, emergence of the Russian market in the 1990s. |
| Use of foreign research and development                               | Signing contracts with the world's leading manufacturers for the production of parts and components.                                                                                                          |

*Note.* Compiled on the basis of [8. P. 72; 19; 21].

The US defence contractors proved to be successful in diversifying their production. According to the Stockholm International Peace Research Institute (SIPRI), in 2015 civilian production in their revenue amounted to a world-beating rate of 41.8%. Currently 48 of 100 largest arms-producing and military services companies reside in the US. The main features of the American defence contractors are as follows: significant amount of public funding, use of open innovations, and active diversification of defence contractors’ product portfolios [14].

The increase in the income of the US defence contractors is based on selling not only products, but their life cycles as well [6; 8. P. 72].

The EU arms market is dominated by Germany, France and the United Kingdom. Large defence-industrial complexes operate in Italy, Spain, and Sweden.

Development of civilian production at the EU defence contractors has the following features [18]:

- high share of exported military goods. The State Defence Order accounts for about 28% of all manufactured products;
- arms production concentrated in the hands of large concerns;
- each concern’s manufacturing facilities located in dozens of countries;
- 44% average share of civilian products in the sales volume.

General trends in the world’s largest defence contractors’ activities include:

- significantly diversified operations of arms-producing corporations;

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1. Analytical portal for the traders UTMagazine.ru. Available at: https://utmagazine.ru. (in Russ.)
2. Stockholm International Peace Research Institute. Available at: https://www.sipri.org.
• a large share of civilian sales in the revenue of corporations manufacturing aerospace products and engaged in the IT business with shipbuilding corporations tending to produce fewer civilian goods;
• production facilities located internationally to enjoy the benefits of the host countries [20];
• allocation of significant public funds for defence research;
• competitive production resulted from the application of a customer-centric approach.

A study of global experience in the development of civilian production at defence contractors proves to be relevant for the Russian defence-industrial complex to identify and assess its capabilities. The most significant aspects of foreign experience most applicable to Russian conditions include the following:

1. Commercial and industrial corporations established by the owners.
2. R&D base expanded through the open innovation model.
3. Growth of military exports stimulated by the government.
4. Production of certain types of goods located in foreign countries.
5. Sale of a product life cycle to actively promote its commercialization.

Main national policy directions for Russia’s defence industry development

Defence contractors’ activities are directly related to the fundamental principles of the national policy for the defence-industrial complex development. Comparatively high level of defence spending in the previous years ensured building up technological reserves in various military industries, modernizing production facilities, and creating efficient integrated military structures. In view of the existing conditions, the main directions of the national policy for the coming years are to: promote integration processes within defence industry; use the mechanisms of a public-private partnership in defence industry [11; 17]; diversify military production to ensure the development of technological reserves and efficient performance in times of cutbacks in the SDO; create high-end manufacturing facilities for civilian and dual-use products at defence contractors and increase the share of civilian goods in their revenue.

The previously adopted army and naval rearmament programmes are expected to be completed in the next two years. Yet the successful implementation of the State Armaments Programme (GPV–2020) can be observed today through, among other things, the large-scale technical modernization of defence contractors and the build-up of their production potential which lay the foundation for the growth of the entire Russian industrial complex [1]. At the same time, it is obvious that in order to strengthen market positions and ensure utilization of created production capacities, a number of large domestic defence contractors need to diversify their production focusing on the markets for high-tech civilian goods [7].

These tasks are quite in line with the decisions taken by the country’s policy-makers and the Government of the Russian Federation. In the message to the Federal Assembly on December 6, 2016, the President of the Russian Federation Vladimir Putin formulated the following guidelines for setting and achieving strategic goals for the development of defence contractors: the share of civilian products in the revenue structure should reach at least 17% by 2020, 30% by 2025, and up to 50% by 2030.

A further incentive to diversify the defence industry and to boost manufacturing of civilian and dual-use products is cutting public funding of defence contractors [10]. It is worthwhile to mention that despite the funding allocation being initially related to the Prague Treaty on the Reduction of Offensive Arms in Europe, the current volume is well below the permissible level. According to the Ministry of Defence of the Russian Federation, GPV–2020 was preliminary estimated at 36 trillion rubles, while the actual costs of the programme so far amounted to 23 trillion rubles.

Next, consider another aspect. While the content of GPV–2020 was determined by the “research and technological groundwork” of the end of the last century [2], the GPV-2018-2027
procurement plan allows for funding the modernization of production facilities but only on condition that the manufacturing of civilian goods increases. The total budget under the programme is approved at 19 trillion rubles which is also less than that of the previous one.

The national defence funding under GPV 2011–2020 falls into the following pattern. “Ground forces” accounted for the largest share of the “National defence” item in 2015 and amounted to 78.31%. The nuclear forces funding decreased by 26.53% from 2012 to 2016 and reached 1.08% of the total national defence expenditures in 2016 (Fig. 1). The budget for applied defence research fell by 33.29% and comprised 6.11% of “National defence” in 2016.

The reduction of spending on “Nuclear weapons complex” and “Applied defence research” in “National defence” resulted from the need to modernize production facilities at a large number of defence contractors.

It could be argued earlier that the trend towards a decrease in public funding in these areas would continue alongside relatively low allocations for performing military tasks proper. But after Russia’s broadening its role in the Syrian conflict, structural changes in national defence funding are going to become more noticeable. A considerable volume of military expenditures is likely to remain unchanged. According to the Stockholm Peace Research Institute, in 2016 Russia ranked second by military spending, behind the USA and ahead of China [3].

Notably, the USA, along with China in some other aspects, is the most successful country in converting military production.

Conditions for production diversification at Russian defence contractors

A successful model for diversification of military production in any given country cannot be transferred to the Russian defence industry in an unchanged form. It is important to take into account the historical context, legislative requirements, dynamically changing foreign policy, and many other aspects. Nevertheless, it is fair to say that the efficient diversification of defence contractors will depend on how well the existing organisation of defence industry determined by the following features matches the nature of the tasks set.

1. Defence contractors are part of state corporations, such as Roscosmos, Rosatom, Rostec, or joint-stock companies with state-owned shares (for example, United Aircraft Corporation and United Shipbuilding Corporation).

2. State corporations include holding companies and organisations under direct control that perform a number of functions including the distribution of product portfolio among individual businesses.

Fig. 1. Funds allocated to “Nuclear weapons complex” and “Applied defence research”, % of the “National Defence” item of Russia’s budget in 2012–2016

1 Analytical portal for the traders UTMagazine.ru. Available at: https://utmagazine.ru. (in Russ.)
3. Defence contractors enjoy advantages of geographical dispersion: location depends on availability of labour, material and financial resources, as well as safety factor.

4. Defence contractors lack customer-focused strategic approach to marketing civilian goods [16].

5. Production of military goods at most defence contractors prevails over that of civilian ones.

6. Cost management is conducted with consideration of pricing for products being supplied under the SDO.

Obviously, the adoption of the state armaments programme for 2018–2027 and the corresponding plans to intensify the production of civilian products at defence contractors should raise the organisation of innovative processes raised to a new level. However, it is already possible to predict the likely challenges and obstacles to production diversification at defence contractors. It is critical to underscore that these challenges and obstacles serve as reasonable grounds for some experts to expect the forthcoming reforms to be unproductive.

Basing on the conditions prevailing in the Russian defence industry, foreign experience of bringing efficient changes to defence contractors’ product portfolios by converting military production, and national policy towards defence industry development, the following problems with changing defence contractors’ product portfolios, and their possible solutions, can be outlined.

**Prevalence of the state order in military production** caused, among other things, by lack of balance in the degree of a contractor’s liability for a failure to supply the goods under a state defence order and a civilian contract. Increased liability of defence contractors for not achieving the goals set for product diversification is proposed as a main means to stimulate product portfolio diversification. A list of key performance indicators for civilian production at defence contractors should act as the main solution to the problem.

**An immature market for civilian and dual-use goods** as one of the obstacles to initiating efficient innovative processes. So far state corporations have been purchasing a significant share of high-tech civilian products from foreign suppliers. According to the President, state corporations’ initial purchase orders for civilian products manufactured by defence contractors should become a tool to ensure the sale of civilian goods at early stages.

**Low production efficiency at defence contractors.** According to the Stockholm International Peace Research Institute, the workforce productivity at the largest defence contractors in Russia is four times as low as that of their foreign counterparts. Such a low production performance is explained by the irrational use of resources and imperfect management systems employed by the contractors. Production efficiency is planned to be improved through the use of state property by private companies under concession agreements. The main obstacle to using this mechanism of a public-private partnership is flawed rules and regulations with regard to the application of concession agreements concerning items of movable and immovable property of defence contractors.

**The quality of non-military goods that fails to meet the current requirements, and insufficient guarantees of their operational reliability despite a relatively high price** as a serious obstacle to diversifying defence contractors’ production and developing civilian markets. Under approved GPV 2018–2027 a significant part should be assigned to the fulfillment of life-cycle contracts by defence contractors to ensure the quality of high-tech products and their after-sales service [13]. Currently, the after-sales service is provided by the Rosatom State Corporation under international contracts for the construction of nuclear power plants. However, such contracts are still not a common practice for Russian defence contractors due to imperfect legislation. Legislative gaps include lack of flexibility in the long-term outcomes of a contract, complex calculation of the contract value, long-term risks and difficulty in their management [9].

**A cutback in funding for carrying out R&D and defence procurement caused by a decrease in the SDO** is one of substantial obstacles to reaching the targeted rate of increase in the share of
civilian products. Special investment contracts (SICs) should become one of the fund-raising instruments. Signing an SIC will provide major advantages to the private party: stability of tax conditions; tax privileges; ability to attain a special status of a sole supplier for federal needs under certain conditions, etc. It will also serve as a guarantee for the state that the assets of defence contractors are used efficiently.

Interrelation of the problems with legislative and systemic obstacles arising at defence contractors and the potential solutions to them are presented in the flow chart (Fig. 2).

![Flow chart of causes of and solutions to defence contractors' diversification problems](image)

Fig. 2. Flow chart of causes of and solutions to defence contractors' diversification problems

Diversification problems at defence contractors should be addressed consistently with the consideration of both internal processes and external conditions developing in the Russian economy in general and in the defence-industrial complex in particular.

**Conclusion**

The main national policy directions for Russia’s defence industry development and the State Armaments Programme for 2018–2027 pose a number of challenges for defence contractors that will require new approaches to solving the problem of diversification.

The study of conceptual framework of production conversion processes revealed the aims of applying various forms of conversion, their advantages and disadvantages. The analysis of foreign experience in changing defence contractors’ product portfolios led to the following conclusions: the most efficient diversification processes at different times were based on establishment of commercial and industrial corporations by the owners, sale of the innovations’ life cycle, and putting military research efforts to civilian use through the models of open innovation.

The directions of the Russian national policy for the defence industry and the existing conditions impose certain restrictions on the range of ways to resolve the forthcoming issues for defence contractors. Possible solutions to the problems may involve adoption of concession agreements, special investment contracts and hybrid contracts for product life cycles as well as introduction of an efficient management system for defence contractors.

The authors’ contribution to the study of the problem includes formulation of the aims, advantages and disadvantages of the defence industry conversion forms; identification of the key issues of the upcoming processes of changing the defence contractors’ product portfolios and proposition of the most efficient ways to solve them in the Russian conditions; the building
of a flow chart showing interrelation of defence contractors’ diversification problems, their causes and potential solutions.

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Изменения продуктовой структуры предприятий ОПК: мировой опыт и возможности для России

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Статья посвящена исследованию мирового опыта процессов изменения продуктового портфеля военных предприятий, выявлению условий активизации диверсификации для российской военной промышленности, а также перспективных направлений преодоления барьеров реструктуризации предприятий оборонно-промышленного комплекса. Информационной базой исследования послужили труды отечественных и зарубежных ученых и специалистов в области военной промышленности, данные Стокгольмского института исследования проблем мира. В статье проанализирована динамика бюджетного финансирования ядерно-оружейного комплекса и прикладных научных исследований в области обороны, представлен мировой опыт конверсии и диверсификации военных производств. С учетом современных условий функционирования оборонных предприятий РФ и требований активизации инновационных процессов сформулированы возможные направления решения проблем диверсификации производства предприятий ОПК с усилением обеспечения их эффективности; описаны цели, преимущества и недостатки
форм конверсии. Результаты исследования могут быть использованы в качестве методической основы разработки рекомендаций по оценке и повышению эффективности инновационных процессов на предприятиях оборонно-промышленного комплекса.

Ключевые слова: предприятия ОПК; Государственная программа вооружений; конверсия и диверсификация производства; продуктовый портфель; гражданская продукция; инновационный процесс.

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