

# RESEARCHING THE MAIN FACTORS INFLUENCING THE STRATEGY FORMATION OF RESTRUCTURING THE ROCKET-AND-SPACE INDUSTRY ENTERPRISES UNDER THE CORPORATISATION CONDITIONS

Gennadii BELYAKOV,  
Reshetnev Siberian State University of Science and Technology, Krasnoyarsk, Russian Federation,  
e-mail: gpbelyakov@mail.ru

Marina DMITRIEVA,  
Reshetnev Siberian State University of Science and Technology, Siberian Federal University,  
Krasnoyarsk, Russian Federation, e-mail: dmiml@mail.ru

Galina KARACHEVA,  
Reshetnev Siberian State University of Science and Technology, Krasnoyarsk, Russian Federation,  
e-mail: yhalinka@yandex.ru

Marina SAVELYEVA,  
Reshetnev Siberian State University of Science and Technology, Krasnoyarsk, Russian Federation,  
e-mail: mvsavelyeva10@yandex.ru

## Abstract

The article determines and systematises the main factors influencing the formation of restructuring strategy at the rocket-and-space industry enterprises under the corporatisation conditions on the grounds of development tendencies of the industry.

**Keywords:** factors, influencing the formation of restructuring strategy, rocket-and-space industry, restructuring, strategy of restructuring.

## Introduction

Space activities correspond to rather promising scope of activity contributing much to the defensive potential in different countries, due to that, several sustainable global tendencies are revealed (Bauer V.P. et al. 2012):

- the range of countries are consistently expanding; they perform research and application programs using space research facilities. Only Russia, the USA, France, China, Japan, and India possess the developed space infrastructure, providing independent solutions to the complicated problems of exploration and practical application of space. Great Britain and Germany display an active attitude to the issues of space military application;
- the developing countries mainly solve economic problems in space activities for the purpose of their progress. They launch applied space research facilities provided by the countries with high level of space exploration potential;
- the requirements to advance efficiency of investments to space exploration and facilities development. In the early stages of exploration and application of space environment, the space programmes in all countries are funded by the public budget, while developing the public budget funding decreases;
- the commercial space activities and private investment shares are increasing in the total funding;

- the competition among countries greatly shifts from the commercial competition level to the level of national innovational systems in the space activity scope; the systems include not only the manufacture, but the education system, fundamental and applied scientific activity;
- the integration into global economic relations is the main factor stimulating the intensity of innovative processes in space activity;
- the increasing complexity of space products and science technological and environmental issues connected with their manufacture steadily boost the requirements to the quality of space technologies;
- the large-scale space concerns develop a net of smaller businesses around them to achieve more financial sustainability and efficiency; the smaller businesses master and promote both high-technological production to the market and new technologies developed by them.

The rocket-and-space industry is considered the most science-intensive industry of Russian military-industrial complex. The variety and complexity of technological processes, the unique character of the designed rocket-and-space technologies require greater volume of experimental and research projects. The scientific-and-technological advance causes constant mastering and applying the newest technologies. The steadily increasing requirements to the rocket-and-space technologies initialize numerous innovations, fundamental and applied scientific research and development.

### **Reforming the rocket-and-space industry**

Since the mid 1990-s of the previous century, the governmental policy of reforming rocket-and-space industry has greatly influenced this industry. The reforming has resulted in integrating the individual enterprises and establishing large-scale design-oriented production structures specialized in developing and manufacturing rocket-and-space technologies of increased reliability at the industry. Reforming rocket-and-space industry has also lead to creating holding companies by means of uniting flagship companies with the main component industries to manufacture the rocket-and-space technologies. Further, the holding companies have united with scientific research and design agencies. Completing industry reforms has resulted in establishing United Rocket and Space Corporation together with Federal Space Agency of the state-owned corporation. The state-owned corporation in the field of space activity has incorporated managerial and economical functions that allow solving complicated and diversified tasks facing the space industry in the field of developing the current rocket-and-space technologies (Belyakov G.P., Karacheva G.A., 2015).

According to the state programme of Russian Federation “The Space Activity of Russia”, the development of rocket-and-space industry moves along the direction of implementing absolutely new manufacturing technologies, complete utilization in developing, testing, and manufacturing rocket-and-space technology. The industry enterprises implement basic and critical technologies; they allow building scientific technological reserve to design and implement new technologies and reserve industry technological availability to manufacture competitive rocket-and-space technology.

One of the priorities in the governmental policy of Russia in the space activity is to perfect a management system of the rocket-and-space industry. Consequently, the industry reformation goal is to solve the problems of restructuring enterprises to improve efficiency of their activity. Earlier the arranged events in restructuring the rocket-and-space industry supposed the industry structure transformation directed to integrating technological and manufacturing industry components into a single engineering and technological complex to realize efficient scientific-technical policy, creating domestic competitive rocket-and-space technology, promoting Russian technologies to the potential markets attracting the necessary resources. Since that time, the integrated structures have had to meet the issues to determine strategic principles, to delineate responsibilities between the head and subsidiary companies, to build an efficient organizational structure, to integrate business processes and managerial changes.

Currently the main problems in restraining the rocket-and-space industry modernization have not been solved. Large project-based manufacturing structures of the industry need to reveal and analyse factors influencing both the enterprise modernization and the restructuring process reconsideration. It is necessary to change the organizational economic model of functioning and especially to form the restructuring strategy for enterprises entering the corporate structure of the rocket-and-space industry. The authors of this research have been studying the materials in restructuring Russian enterprises; they have concluded that solving this problem has not been paid attention yet. Some research materials do not consider factors influencing the restructurisation or study the factors having an impact on its efficiency. Also in their research, the authors highlight that the factors are determined randomly, as a rule. In the majority of research, there are not any proofs of factor impact on restructuring enterprises or the research focuses on factors influencing the enterprise restructuring in general without considering their activity specificity.

### **Factors influencing restructuring enterprises of the rocket-and-field industry under corporatization**

To increase efficiency of corporate structures of the rocket-and-space activity and to realize measures for further restructuring based on changing business model of functioning enterprises, the authors of the research studied and systematized the main factors (fig. 1) influencing restructuring enterprises of the rocket-and-space industry integrated into a corporate structure. Such enterprises face the restructuring issues at both external and internal levels.

The authors propose the following factors influencing restructuring the rocket-and-space enterprises as external:

- the government support to industry reforming. The Strategy of Russian rocket-and-space industry development, Federal Space Program, state programmes in the sphere of space activity and weapon, several federal special purpose programmes envisage development of economically sustainable, competitive, and diversified industry, achievement of technological leadership and necessary presence of our country in space exploration. The programmes determine tasks to design rocket-and-space technology, to launch and support essential constituents of space apparatuses of scientific and social-economic purposes, to preserve competitive advantages at the world market of launch services of Russian launch vehicles, to provide international cooperation in the sphere of space exploration. These tasks require new approaches to restructuring rocket-and-space enterprises; the approaches are directed to technical re-equipment and industry modernization, development and implementation of industrial critical technologies of the world level, increase scopes of the government support to the space activity.

- high degree of the state participation in the existing organizational forms of the enterprises belonging to the industry. More than 75% of Russian rocket-and-space enterprises are controlled by the state by the current time. Companies without state participation are less than 10% of the general amount of enterprises. Other companies are controlled by the state with the special controlling interest, though the state participation tends to decrease in new integrated structures;

- information sensitivity of research and development results in the space exploration sphere. The technologies developed in the rocket-and-space industry are under legal protection and they are not distributed among the developers and manufacturers of the rocket-and-space technology. The industry possesses an enormous potential in the commercialization of intellectual property items obtained due to the space activities. Nevertheless, the deficiency of awareness of commercial potential of the intellectual property accumulated at the enterprises prevents the industry from obtaining a substantial profit out of the results of scientific-technical activity. In the previous research «Developing a strategy to restructure enterprises of the rocket and space industry» (Belyakov G., Dmitrieva M., Karacheva G., Savelyeva M., 2018), the authors highlight that the rocket-and-space enterprises – participants of the corporate structure should be active in research and development globally to become leaders at the world space market. The rocket-and-space enterprises should be full-fledged players at the world «product trade».

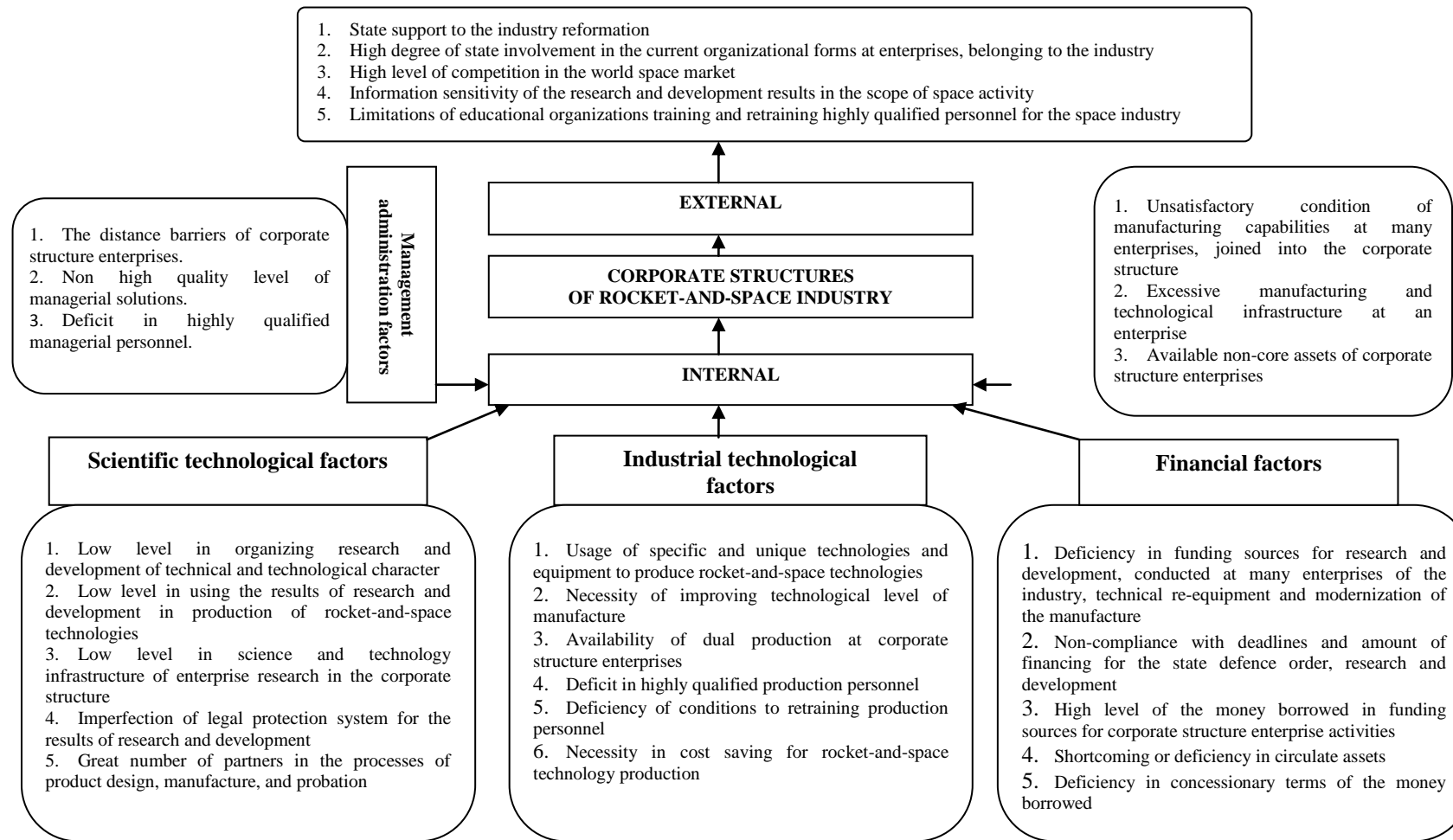


Fig. 1. Structure and interrelation of factors, influencing the restructure of rocket-and-space industry enterprises under the corporatization condition

First of all, changes in organizing R&D are connected with the transition from “the closed” model performing research and development of innovative products to the model based on the active cooperation with the external sources of innovative ideas. Therefore, Russian rocket-and-space industry needs to solve a problem to commercialise research and development results and their further transfer to other fields of economy.

- insufficiency of educational establishments training and retraining highly qualified personnel for the rocket-and-space industry. Development and manufacture of the advanced rocket-and-space technology require training relevant personnel. Currently Russian rocket-and-space industry experiences a severe shortage in highly professional specialists; though, it does not mean deficit of employees at the rocket-and-space enterprises, the enterprises need trained employees for the aerospace industry. It results in the necessity of creating an advanced system of university graduate and post-graduate levels, retraining and personnel development. In addition, the personnel in-plant training should be provided by the infrastructure of the rocket-and-space enterprise. This allows increasing the efficiency to complete a state plan on training specialists and adjust graduates’ qualification to current demand.

- high level of competition at the world space market. The main global space activity of Russian Federation concentrates in the sector of manufacturing the rocket-and-space technology that equals to a little more than 10%.

The goals and restructuring tasks are formulated under the influence of the external environment, as well as the environment determines the restructuring conditions. However the internal factors have greater impact on restructuring the rocket-and-space enterprises. The continuous process of reforming the enterprises allows solving a part of problems. The simple integration of enterprises does not eliminate problems. The integration requires an efficient organisational structure for a corporation in general and its enterprises in particular; it requires integration of business-processes within a manufacture of rocket-and-space technology, efficiency increase in using property and the capital of corporate structures. The authors propose to divide internal factors in figure 1 into five main groups: organizational-managerial; scientific-technical; manufacture-technological; financial; property factors.

The organizational-managerial factors include those influencing restructuring the management system of the rocket-and-space enterprise corporate structure:

- distance barriers of corporate structure enterprises. The rocket-and-space enterprises are located in six federal regions of Russia, the majority of them is concentrated in the Central federal region. The scientific-research and design agencies are mainly placed in Moscow region. They develop intercontinental ballistic missiles (in Moscow and Reutov), rocket engines (in Khimki and Korolev), cruising missiles (in Khimki)

The manufacture is located all over Russia. The cruising missiles are manufacture in Votkins (Udmurtia), ballistic missilery for submarines are produced in Zlatoust and Krasnoyarsk. Boost vehicles to launch aerospace vehicles are manufactured in Moscow, Samara and Omsk. The space vehicles are also produced there and in Sankt-Petersburg, Istra, Khimki, Korolev, Zheleznogorsk. Sibirsky Federal Okrug is really significant for the rocket-and-space industry; it houses more than 20% of the joint industrial production volume. The distance barriers of enterprises at corporate industrial structure complicate restructuring, therefore, it is necessary to analyse and reconsider the ways to optimize business-processes and conditions for the efficient enterprise cooperation.

- low level of managerial decision quality. Non-complex, non-systematic, and monetary approaches at the rocket-and-space enterprises of new top managers destruct the worn out infrastructure of the manufacture in the industry, when top managers rotate, if new administration has always worked for the industries with short-cycle production, or for financial organizations before, and they are not aware of internal production algorithms in a science-intensive industry.

- deficiency in highly qualified management. When approaches to managing corporate structures is formed and changed, the skillful specialists are retired due to their age. Employing new trained managerial personnel is complex and connected with the absence of system to train top-managers in defense and rocket-and-space industries.

The organizational restructuring of research and development at the rocket-and-space enterprises is determined by the scientific-technical factors; the authors highlight the following:

- low level of organizing research and development of technical and technological character according to poorly developed financial base for the main enterprises of innovative manufacture type, first. Up to 70% of all activities especially in the production sphere, research and development are performed on order of the governmental agencies, closely connected with the defense industry. The resources are often limited by the government contract and federal special-purpose programme; that results in time delaying or temporary halt of advance research and development, their cost increase.

- low level of applying results of research and development at manufacture of rocket-and-space technology;

- low level of science-technical base of research at enterprises in the corporate structure;

- imperfection of legal protection system for research and development results;

- big amount of co-contractors in design, manufacture and probation of products. More than 550 enterprises of allied industries participate in creating weapon missiles and rocket-and-space technology. Production-technological factors influence restructuring manufacture process of rocket-and-space products, products of double and commercial designation. The authors underline the following manufacture factors:

- using specific and unique technologies and equipment to manufacture rocket-and-space technology, characterized by the complexity of manufacturing products (low-volume output, and sometimes individual product output);

- necessity to increase of technological production level;

- availability of double production at corporate structure enterprise. The majority Russian rocket-and-space machine building plants are of “subsistent production” character with total cycle. Reorganising double production of the corporate structure at rocket-and-space industry, namely, organizing the manufacture of rocket-and-space technology on a single process flow will result in preventing from doubling repeated manufacture types, improving cost to complete government defense contract by unifying research and development, sustainable labour division, removal of excess capacities out of defense production and removal of unemployed property out of turnover.

- shortage of highly skilled production personnel, determined by long-term drain of qualified specialists, difficulties in employing new employees, who are also characterized by lower basic education level and professional training;

- absence of conditions to retraining production personnel. Retrogression of training system for highly qualified personnel, including researchers; training system was originated in 90-s. Due to the activity of those enterprises and organizations of the rocket-and-space industry, the system is gradually becoming stable. The enterprises give grants to performers of government defence contract.

- necessity to reduce savings for the rocket-and-space technology production.

Financial factors influence restructuring business capital in the corporate structure in the rocket-and-space industry. These factors determine restructuring enterprises as a result of insufficiency of funding sources to research and development performed at many rocket-and-space enterprises,

technical upgrading and manufacture modernization. Also restructuring is influenced by non-compliance with deadlines and amount of financing of the government defense contract, research and development; high rate of loan capital at the funding sources of the corporate structure activity; absence or limitation of circulate assets and concessionary terms of loan-based funding.

The subjective moments cover: weakness and conservatism of enterprise financial subdivisions, unified expenditure accounting principle; absence of marketing approach in management systems (therefore, these systems at the rocket-and-space enterprise, in the defense industry, in particular, are still “linear”, without closed-loop feedback), non-economic thinking of the majority of top managers of previous generations.

In the research, the authors propose property factors influencing enterprise asset restructuring in the corporate structure of the rocket-and-space industry. They are:

- unsatisfactory state of manufacturing capabilities at many enterprises integrated into the corporate structure caused by physical worn out equipment and its obsolescence. Due to funding deficiency, we could follow fast moral and physical aging of production equipment needing modernization and upgrading, deteriorating technological and age structure of production assets, and, first of all, car fleet.

- excessive production and technological infrastructure of an enterprise under the conditions of long-lasting unutilised capacities, at ever-increasing tariffs of natural monopolies, raw material cost, materials and purchased complementary articles result in significant increasing production cost, product cost, non-competitive prices and require additional funding to support an underemployed part of manufacture facilities.

- availability of enterprise non-core assets at the corporate structure. Corporate structures endeavour to control raw material suppliers and arrange their own distributive mechanisms. The degree of non-core assets and removal of these assets out of the corporation are determined by every company independently or by a decision of higher-level authority. The rule adoption and requirements for socially conscious behavior limit removal of non-core assets out of the corporation. In May, 2017 the decree of Government of Russian Federation on 10.05.2017 № 894-p introduces a new reduction of Methodical recommendations on detecting and disposal of non-core assets. The recommendations determine an order of detecting non-core assets; methods of disposition, principles and an order to organize and sell non-core assets. Requirements also regulate document formats and mechanism of divesting non-core assets.

In the process of optimization of business-processes at the level of corporate structure, to divest non-core assets, the authors propose to apply one of the developing directions of restructuring an internal-corporate outsourcing. The authors have already studied the given direction in their research «Developing a strategy to restructure enterprises of the rocket and space industry». Delegating functions to outsourcing means to restructure types of activities of the rocket-and-space enterprises, however, it leads to changing the corporation structure, personnel, reforming assets and production policy. As a tool to a restructuring strategy, the planned outsourcing can completely change the results of enterprise activity at corporate structure; therefore, it is an efficient mechanism to restructure the corporation. According to the research, the majority of European companies are engaged in outsourcing. In Russian practice, its mechanisms come into operation. Domestic enterprises are reluctant to delegate a part of operations or non-core assets to outsourcing, apprehending disagreeable risks to lose business control and protect commercial secrets.

## **Conclusions**

Research of the above factors influencing restructuring the rocket-and-space enterprises under the conditions of corporatization allows the enterprises integrated into the corporate structure to overcome inconsistencies of available possibilities to new requirements and tendencies in developing

global market of space technology. The science-based management of the determined factors secure the results:

- forming a competent management system of rocket-and-space enterprises;
- efficiently distributing the government defense order inside the corporate structures providing minimum cost on development and full-scale production of rocket-and-space technology;
- deadline management for developing manufactured products and launching them into production.

This can be achieved due to using the best technologies and technological solutions inside the integrated structures by following a unified technical policy including unification of the developed systems and elements, maximum usage of scientific technological reserves, a manoeuvre with enterprise capacities.

- organization-property securing of the main core of cooperation for the developers and manufacturers of the rocket-and-space technology;
- cost improvement for realizing the government defense contract by engineering and technological unification, competent labour division, removal excessive capacities out of defense production sphere and non-used property out of turnover;
- organizational-technological unity and continuity of the cycle “scientific research – research and development – developing mainstream technologies – manufacture – commercialization – exploitation” for both defense and commercial products;
- workload optimization of manufacturing facilities;
- mechanisms to use consolidated funds to finance the development of space systems of new generation for military and commercial designation, exploration and applied research and developments, modernization of the existing systems, new outlets.

In prospect, the rocket-and-space industry will generate powerful financial flows, able to influence index increase for Russian industry in general, and the industries of the countries assisting the development of Russian space activity in cooperation with Russian Federation.

## **References**

1. Bauer V.P. Condition and mechanisms of rocket-and-space industry in Russia. / V.P. Bauer, Dzh. V. Kovkov, A.M. Moskovskij, V.K. Senchagov – M.: Institute of Economics Russian Academy of Sciences, 2012. 53p.
2. Belyakov G.P., Karacheva G.A. Restructuring of enterprises of rocket and space industry in terms of establishing a corporate structure // Vestnik SibSAU. 2015. Vol. 16. № 4. P. 992-996
3. The State Program of the Russian Federation “Space Activity of Russia for 2013-2020” Approved by the Decree of the Government of the Russian Federation dated April 15, 2014 No. 306
4. The main provisions of the state policy of the Russian Federation in the field of space activities for the period up to 2030 and further perspective, approved by the President of the Russian Federation, April 19, 2013 Order No.-906.
5. Decree of the President of the Russian Federation, 02.12.2013, No. 874 “On the control system of the rocket and space industry”.



6. The Federal Space Program of Russia for 2016 - 2025, approved by the Government of the Russian Federation, March 23, 2016 No. 230.

7. Belyakov G., Dmitrieva M., Karacheva G., Savelyeva M., Developing a Strategy to Restructure Enterprises of the Rocket–And–Space Industry // Proceedings The 32nd IBIMA conference 1571-1578.

8. Fiyaksel E.A., Ermakova E.A. Organising R&D system in Russian corporations. // Innovative Economics. 2012. №8 (166). P.30-35.

9. Ivanov A.V., Kuznetsov O.V. Improvement of professional training for the military- industrial complex // Higher Education in Russia.2015. № 8-9. P.32-38.