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This article explores new innovation policy measures aimed at ongoing transformation of the space industry in Russia. The current implementation of a wide range of state programs and presidential decrees helps to maintain the leading position of Russia in the space industry and expanding international cooperation. The main objective of the paper is to present the principal directions of space policy development in Russia, including its priorities and the tasks to be solved in the short and mid-terms. In this paper we explore the main details of the space policy in Russia, the priorities of its development mentioned in the legal documents focusing on the innovative development of the space industry and possibilities for the public-private partnership and institutional reforms in this area.

Key words: space policy, innovation, government program, technology platform, innovative cluster, institutional reforms, public-private partnership.

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1. Introduction

Russia, as one of the leading countries in space industry, conducted intensive research on the development and use of outer space over the last decades. Strong traditions, scientific schools, engineering and design teams emerged in the field of space research. Now Russia possesses a unique experience and advanced technologies for placing spacecraft into orbit and the implementation of long-term manned spaceflights.

Over 20 years ago the law "On space activity" [1] aimed to initiate the long-term development of a normative legal base that regulated the activity of industrial enterprises and scientific institutions. Economic transformations changed the state's priorities and it resulted in an insufficient supply of space services that became an obstacle to the development of such areas as communications, telecommunications, navigation, remote sensing and others.

In the last decade the space industry has attracted much attention from research teams. One of the key trends of Russia's economic development is the active application of the results of forecast research in the formulation of strategies at different levels including the corporate, industry, and national levels. It helps to create the hierarchy of strategic goals as a system of concrete measures maintained and controlled by the government. New instruments for the realization of space policies are created given the initiatives of large companies included in comprehensive sector strategies, which in turn form a national system of state policies and priorities of the space industry development facilitating the public-private partnership.

This article explores new innovation policy measures aimed at ongoing transformation of the space industry in Russia. The current implementation of a wide range of state programs and presidential decrees helps to maintain the leading position of Russia in the space industry and expanding international cooperation. The main objective of the paper is to present the principal directions of space policy development in Russia, including its priorities and the tasks to be solved in the short- and mid-terms. In this paper we explore the main details of the space policy in Russia, the priorities of its development mentioned in the legal documents focusing on the innovative development of the space industry and possibilities for institutional reforms and the public-private partnership in this area.

The paper is organized as follows. Section 2 covers the key priorities of state policies in the area of space activity on the basis of the approved legal documents. Section 3 discusses the instruments for the realization of space policies with the focus on innovation. Section 4 shows the possibility for public-private partnership in the area of space industry development. Section 5 presents the main approaches to the institutional reforms in the space industry. Section 6 summarizes the results and draws conclusions.

2. Strategic projections and the development planning of space activity

The framework of the strategic planning in the space industry consists of the following elements. (i) The new instruments of space policy including the development and realization of wide-scale projects in the interest of fundamental science, the accelerated development of progressive space technologies, the creation of the scientific and industrial-technological potential for future projects and also for the use of the results of space activity in the interest of other sectors of the economy. (ii) The development of public-private partnerships in space services with the use of the results of space activity, the consistent development of opportunities in the creation of, on a commercial basis, space assets for communications, navigation, television and radio broadcasting and remote sensing, and in

the future, launch vehicles and the implementation of piloted flights in outer space and safety provisions and long-term sustained development of space activities, compliance measures to protect the environment, including near-Earth and deep space.

These foundations established the main objectives of state policy in the area of space activity [18]. They primarily concern the protection of state interests in space activity, including the guaranteed access of Russia to space from its own territory, promoting the economic development of Russia by forming and supporting the necessary in-orbit groups of space assets, launch vehicles, and ground infrastructure, ensuring the provision of the required volume and proper quality of services in the interests of the socioeconomic sphere, and maintaining the leading position of Russia in the implementation of piloted flights.

The strategic planning requires the development and expansion of the international cooperation, the formation of sustained international ties in the interests of joint scientific research and development of outer space, the promotion of Russia as a leading player in the world market for space goods and services given international standards and perspectives, and the development of a domestic market for such goods and services.

The priorities identified on the national level in the area of space activity are listed here in the order of their importance [18].

The main priority is guaranteed access of Russia to space from its own territory and activity associated with the development and use of space technology, goods and services in the interest of the socioeconomic sphere of the Russian Federation, and also the development of the space and rocket industry and the fulfillment of international obligations. Second, there is the activity related to the creation of space assets in the interest of science. Finally, the third priority is activity related to piloted flights, including the creation of a technological reserve for the implementation of this in the framework of international cooperation in piloted flights to planets and other bodies of the solar system.

In addition, the national space policy includes measures for the industry development of the rocket-space complex that meet national interests. These measures include the creation of a new generation of space complexes and systems to enable them to be competitive in the world market and the completion of the development of the GLONASS system; the development of satellite groups, including the creation of groups of communications satellites, ensuring the growth of the use of all forms of communications – fixed, mobile and personal; the creation of a group of meteorological satellites that are capable of delivering information in real time; the expansion of the Russian presence in the world space market, and finally, the modernization of ground space infrastructure and technological equipment.

The presidential decree "On the approval of the priority directions of science and technology development in the Russian Federation and the list of critical technologies of the Russian Federation" [10] provides the legal basis for the technological development of all sectors of the Russian economy. Among the mentioned priorities were nanosystems, information and telecommunication systems, life sciences, transportation and space systems, environmental management, energy efficiency, energy conservation and nuclear energy.

These areas of science and technology are, to a greater or lesser extent, related to space activities, i.e. each direction has themed groups, including interdisciplinary research using the development of other areas or fields of knowledge, which are conducive to the emergence of new knowledge. Obviously, space systems contribute to the development of all the other disciplines, and at the same time, new knowledge and technology are developed in these areas because of the opportunities that open up as a result of the use of outer space.

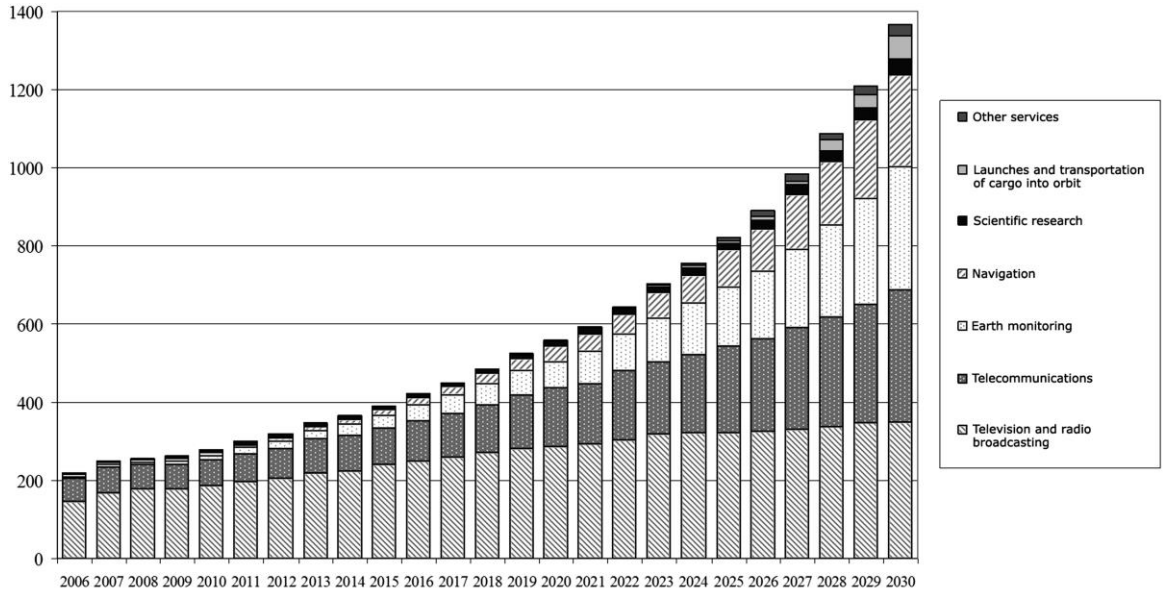
A list of critical technologies approved by the President [10] was grouped into thematic areas, considered to be the most promising, for example:

- a new generation of space and traffic engineering;
- information technology, management, navigation systems;
- electronic components and energy-efficient lighting devices;
- nanodevices and microsystems engineering;
- structural nanomaterials and functional nanomaterials.

As a result of foresight studies and expert assessment, breakthrough technologies were identified to respond to the global, national and industrial challenges in the long term.

The last five years an intensive integration of forecasting research to long-term strategies for scientific, technological and socio-economic development occurs to meet future needs, and analyze opportunities and existing capacities. The results of national forecasts derived from interdisciplinary research with respect to global demand of space services are integrated into sector strategies as follows (Fig. 1).

Figure 1. Forecast of the global market dynamics for the space industry and its main segments until 2030



Source: Higher School of Economics (2012).

In the Long-term Forecast for Scientific and Technological development of Russia until 2030 [14], "windows of opportunity" that will allow the Russian space industry to achieve high results in the exploration of space and Earth exploration from Earth's orbit are outlined. These features are defined as goals to be achieved over the next 15-20 years:

1. Leadership in:
   - the international market for launching payloads into orbit
   - the field of liquid rocket engines
   - the development of launch vehicles of increased weight
2. Unique technological groundwork for development and production of reusable space vehicles and engines
3. Participation in international projects ("Sea Launch", etc.)
4. Development of a national satellite navigation system GLONASS
5. Technology transfer of new materials in the construction of space technology related industries.

The strategy sets out a number of key challenges for space activities:

- satisfying of the country's growing needs of the socioeconomic sphere, science, defense and security with the use of domestic space vehicles;
- maintaining a leading position in the most important areas in the basic space research (astrophysics, study of solar-terrestrial relations, etc.);
- achieving a leading position in Lunar research;
- participating in international projects, including missions to other planets;
- maintaining the leading position in space launch vehicles;
- maintaining an independent system of space launches;
- developing world-class operational and technical specifications of national space vehicles;
- establishing an effective high-tech aerospace industry;
- maintaining Russia's place in the global space market.

3. Instruments for the realization of space policies

As shown above, Russia has formed a legal and regulatory framework to ensure the qualitative changes in the management and organization of science, technology and innovation in the space industry.

There are three major sets of instruments aimed to the realization of space policy priorities: the development of program-oriented management at the state level, the introduction of new mechanisms of innovation management in companies with state participation, and the public-private partnership in form of technology platforms and industrial clusters [22].

3.1 The system of government and federal target programs

Russia began a new stage in the development of state level tools and programs in by introducing a new management tool into practice in 2010 — government programs [16].

The regulatory and methodological framework for the development of Russia's government programs, as it is currently established, includes:

- List of state programs of the Russia [15];
- Order of the development, implementation and evaluation of the effectiveness of government programs [19];
- Methodological guidelines for the development and implementation of government programs [16].

The above mentioned documents form the principles of government programs, and they focus on long-term objectives, the adequacy of authorities and responsibility for the achievement of outcomes in accordance with the requirements of project management.

They (the documents) establish measurable the quantity and quality outcomes characterizing consumer satisfaction and ensuring immediate results. The provision of public services, the regularity of performance evaluations are covered as well.

According to the above mentioned framework documents, a government program is a document which defines the goals, objectives, results, guidelines and tools of public policy aimed at achieving the goals and priorities established by the "Concept of Russian socioeconomic development for the period up to 2020" [13], and ensures the timely implementation of large-scale nationwide or international measures.

An approved list of government programs of Russia [15] consists of 41 government programs. It includes program related to space activities: "Space activity of Russia in

2013-2020" [5]. It defines three goals: economic, contributing to the dynamic development of the economic, political, those that enhance national security and strengthen Russia's position in the world community and social, the sustainable increase of the welfare of Russian citizens.

According to the state program "Space activity of Russia in 2013-2020", the major program-targeted instruments for its implementation are included in its composition "The Russian federal space program for 2006-2015" [6], the federal target programs "Maintenance, development and use of GLONASS 2012-2020" [7], and "Development of Russian space centers in 2006-2015" [8].

In accordance with the law "On Space Activities" [1], it is determined that the Russian federal space program is a long-term planning document, which is formed on the basis of the state order for the creation, production and use of space technology for scientific and socioeconomic objectives.

The system of program and target documents governing space activities in Russia contains, in addition to government programs, a tool such as the federal target programs. Among them:

- Development of Russian spaceports for 2006-2015 [7];
- Maintenance, development and use of GLONASS for 2012-2020 [8].

The federal program "Development of Russian spaceports for 2006-2015" [7] aims at the development of ground infrastructure space activities, in particular the modernization of launch pads and technical complexes of three spaceports: Plesetsk (Russia) and Baikonur (Kazakhstan), as well as the start of operations of the first and second stage of Vostochny cosmodrome (Russia).

The second federal target program "Maintenance, development and use of GLONASS for 2012-2020" [8] aims at ensuring the maintenance, development and creation of conditions for large-scale use of the GLONASS system. The GLONASS system is designed to provide a permanent navigational service to domestic and foreign consumers whose demands on the characteristics of the navigational field are constantly increasing, so digital navigation maps may eventually cease to be relevant. In addition, there is the need to ensure the competitiveness of the GLONASS system in conditions of continuous improvements of the GPS, GALILEO and the deployment of COMPAS systems [21]. The federal target program provides for the development of all structural elements of the GLONASS system in the long term, including maintaining the space segment by making the following spacecraft: 13 units of "Glonass-M" and 22 units of "Glonass-K." In addition, there are plans to complete flight tests of a new spacecraft "Glonass-K" with new navigation signals, functions, and improved performance. To obtain the source data for map updates, beginning in 2015, it is planned to develop cartographic space system, including the development of spacecraft performing opto-electronic surveying.

The program is marked by the need to maintain the space infrastructure of GLONASS — the ground control systems and high-precision ephemeris time correction, differential correction and monitoring tools to ensure the fundamental elements of the system and so on. It is assumed that ground control will undergo further modernization, the network of measuring stations in the country and abroad will be expanded up to 40 stations. This will improve the accuracy of the system. Increasing the accuracy of navigation details for consumers to the level of decimeters and centimeters will be achieved through the modernization of complementary complexes of the system, particularly the system of high-precision ephemeris and time correction, differential correction and monitoring, and the employment of consumer centers.

And finally, the program formulated the need to ensure the required level of reliability and quality due to a qualitatively new level of scientific and technical support in de-

veloping, manufacturing and testing all elements of the GLONASS system. In particular, a permanent customer service office staffed by highly skilled professionals will be set up that has funds for all stages of the life cycle of the system and will provide skilled monitoring, compliance with regulatory requirements, complete ground tests and tests of finished products. The range of controlled development and geography of scientific and technical support will be significantly expanded and more than 20 leading companies throughout the Russian Federation will be involved in this.

The federal target programs describe the innovation chain from the fundamental and exploratory stage of research to the production of new technologies and allow for a focus on large-scale, important investments for the state and scientific projects.

Objective-oriented approaches require harmonization mechanisms and planning documents, embedded in a single chain of the development, adoption and enforcement of decisions. They are aimed at achieving the goals of space activities and the socioeconomic development of Russia. With this approach, it will be possible to make a variety of tools work to achieve goals and objectives, as well as provide for the objectives of fiscal policy.

Currently the challenge faced by the government is to create a single mechanism of program planning and budgeting, for which it is necessary to improve the financial control, based on the long-term goals, and the sources of funding.

3.2 Programs for the innovation development of government controlled companies

The innovation development program of joint-stock companies with state participation, public corporations and the federal state unitary enterprises is one of the new tools of innovation management in the real economy.

This tool emerged at the initiative of the Russian government [17] within the framework of the development of measures for the realization of the "Strategy of innovative development of Russia 2020" [12]. The Ministry of Economic Development provided methodical materials for creating innovation development programs of joint-stock companies with state participation, public corporations and the federal state unitary enterprises. According to these data, the programs are compiled in the medium term (5-7 years) in accordance with the priorities of the state scientific-technical and innovation policy. They aim to develop new technologies, innovative products and services that meet world standards, as well as innovative development of key industries of Russia. In the methodical recommendations, planned levels of indicators for innovative development for all levels of management, including senior management, were approved as key performance indicators (KPI).

These programs are also integrated into business strategy and are designed to promote the modernization and technological development of companies through significant improvements in key performance indicators of production processes.

Of particular importance in the creation of innovation development programs is the formation of corporate structures and mechanisms conducive to the creation of a coherent system of innovation management, including documents that describe the main directions of technological development, technology roadmaps, concepts and technology policy in the field of information, programs to improve system and product design, and energy efficiency programs.

In developing such programs, considerable attention was paid to the formation of intellectual property systems and administrative structures responsible for technological and innovative development of the company, such as the establishment of a board of directors that is responsible for issues of innovative development, scientific and technical coun-

cil with assistance from external independent experts, the introduction of the post of Director, who would be responsible for the development of innovation.

In addition, an important tool is "knowledge management", which has confirmed the need for a significant expansion of the companies implementing the results of research and development carried out in the domestic sector of knowledge generation and higher education, as well as the use of advanced technologies, products and services developed by small and medium-sized innovative enterprises. It is also used for the examination of received proposals for the application of new technological solutions, and those extending the practice of cooperative interaction with the scientific, technical and promotional organizations and innovation infrastructure, including through an innovation cluster.

The establishment of an innovation management system implied the most open corporate technology policy for the market and the company's owners, including the state. This openness is expressed primarily in informing stakeholders about future scientific and technological needs of companies, which are, of course, subject to the requirements of commercial confidentiality and the need to protect intellectual property.

The development of companies' innovation development programs has followed trends in global scientific, technical and socioeconomic development. To this end, companies were ordered to participate in the preparation, implementation and use of the results of long-term scientific and technological forecasts, organized by the federal executive authorities and the National Academy of Sciences, as well as create technology roadmaps for planning and organizing the development of specific technologies and products.

In addition, participation of companies in the formation and activity of innovation clusters (see below), including a list of those technological platforms, which involve the organization, principles and mechanisms of interaction with the different categories of participants of technology platforms, including with relevant universities and scientific organizations, was also ensured. Those instruments are also open for foreign participants.

The innovation development programs have become more effective instruments for regulating the activities of the leading organizations of the space and rocket complex, including [17]: S. P. Korolev Rocket and Space Public Corporation Energia; Information Satellite Systems named after Academician M.F. Reshetnev; Khrunichev State Research and Production Space Center; Russian Space Systems; NPO Energomash named after academician V. P. Glushko; State Rocket Centre named after academician V. P. Makeyev; Russian Satellite Communications Company.

The methodic materials to create a system for monitoring the implementation of programs of innovation development of joint-stock companies with state participation, public corporations and the federal state unitary enterprises were approved more than two years ago [11]. They contain provisions on the monitoring programs of federal executive bodies, particularly on the principles of its formation and organization, composition, structure and contents of companies reporting materials and arrangements for monitoring.

The purpose of monitoring is to promote the implementation of innovation development programs of companies in full and on time, as well as the analysis of the impact of programs on the formation of a competitive national innovation system.

The monitoring system provides for the evaluation of the impact of the program, the timely detection of problems and the prevention of emerging deviations from the plan recorded in the program. The key performance indicators from innovation development programs are used in the formulation of public policies aimed at improving the competitiveness of the national innovation system.

4. Legal foundations of public-private partnerships

In the last 20 years the legal rules and organizational and financial models of interaction between government and business have been developed, which have become one of the main mechanisms of expanding the resource base for economic development and the improvement of the management of state property. Public-private partnership was seen as a system of relations between society and business, and, at the same time, as investment, innovation centers and service projects were implemented jointly by government agencies and private companies and were usually located on public property.

At the same time, Russian space activities historically deepened and continue to deepen the contradiction, according to which the in-orbit and ground-based infrastructure, the infrastructure of scientific activities, engineering and human resources are the responsibility of the state, while the consumer market and the demand for products and services for civil space activities are rapidly developing at all levels — federal, regional and municipal, private sector and households. This contradiction prevents the reduction of the burden on the state budget for an expanding range, with an increased volume and quality, of space products and services. And it is obvious that the adoption of regulations that define the rules of interaction between government and business in the field of space activities is necessary.

In the Russia's legislation on public-private partnership is under development. The principal legal act is the federal law "On concession agreements" [2], which determines the order of application of the concession mechanisms in the implementation of public-private partnership.

Technology platforms

Technology platforms are communications platform aimed at increasing efforts to develop advanced commercial technologies, new products (services) to secure funding for research and development through the participation of all stakeholders (private business, science and government); the improvement of the legal framework in the field of science, technology and innovation development.

In order to accelerate the formation of strategic research programs and improve their quality, a mechanism will be developed that will support technology platforms in the form of grants and monitor the effectiveness of technology platforms, including the monitoring of compliance with the core principles of their activity, namely their openness to new entrants in the best interest of all concerned participants.

The platform's program states a long-term strategy for the scientific and applied research industries and their systematic correction, for the construction of an open information and communication platform, including one with the use of the Internet for communication and public access to information about projects, initiatives and funding mechanisms, be developed. In addition, platform participants should consider the achievement of synergy in the industry possible through the construction of an efficient public-private partnership in the interaction of government representatives, industry, scientific and expert organizations.

As part of the technology platform, the following elements are currently being implemented: predictive and analytical work, the choice of strategic research directions, development roadmaps to achieve strategic objectives, consulting and information support of federal executive authorities and public organizations; the harmonization of the efforts of stakeholders, including federal departments and agencies, authorities at the regional and municipal level, scientific and educational organizations, public corporations, businesses and organizations with all forms of property, infrastructure monopolies, which were taken in the framework of existing mechanisms for the implementation of the national science

and technology policy, industry policies and programs, corporate development programs, etc.

Business technology platform activities helps to form the system of the coordination of scientific research in the field of space activities in accordance with their use in other sectors of the economy; information provision and the intensification of the use of space technology and the results of space activity in various industries, as well as the provisions of a public-private partnership in the field of innovation related to the space industry and the creation of an innovative educational infrastructure for the benefit of educational institutions at various levels along the technology platform profile.

There are two platforms related to the space activities [23]: the National Space Technology Platform and the National Information Satellite System.

Within the framework of the platforms three priorities should have been developed.

This is primarily satellite building, including the technology of rocket and space technology of the new generation of energy-efficient engines and propulsion systems for vehicles, orbital space technology information services and technology, management, and navigation systems.

The direction of space systems and devices integrates technologies and creates new multifunctional materials, programmed and algorithmic provisions, devices based on micro- and nano-electromechanical systems, radiation-resistant electronic components of high reliability, high-performance stand-alone power systems, including those run on solar energy.

In the direction of space services, there are technologies of broadband access to multimedia services, monitoring and forecasting of the environment, prevention and elimination of pollution, prevention of emergency situations due to natural and man-made disasters, search and exploration of mineral deposits, monitoring and forecasting events in the atmosphere, hydrosphere, lithosphere and biosphere, and the creation of a geographic information system.

Thus, within the framework of technological platforms mechanisms of public-private partnership in the field of space activities were formed.

Industrial clusters

Industrial clusters include set of enterprises and organizations placed in a restricted area characterized by uniting the members of the cluster of scientific and industrial chain in one or more sectors (key economic activities). They provide mechanism for the coordination and cooperation of cluster members aimed at synergistic effect in terms of improving economic efficiency and effectiveness of each business or organization due to the high degree of concentration and cooperation

Currently, there has been the formation of innovation clusters in order to support the development of small and medium-sized businesses, education, innovation and technology policies; policies to attract investment and development sectors of the economy, export, transport and energy infrastructure.

On the federal level there are already mechanisms that provide flexible financing for cluster development. In accordance with the federal budget rules [20] related to the government support of small business, funds are allocated on a competitive basis by providing subsidies for the funding of the relevant regional program. This mechanism creates opportunities for the most flexible use of the financial support of state budget in order to implement a wide range of cluster projects.

Opportunities for development offered by cluster projects include building special economic zones of technical innovation, industrial production, tourism and recreation, developed in accordance with the federal Law "On special economic zones" [3], as well as

industrial parks, the creation of which is carried out in the framework of the state program "On the creation of technology parks in Russia in the sphere of high technologies" [9].

Additional prerequisites for the cluster development based on science “cities” is provided in the provision of financial support for the construction of an innovative, social and engineering infrastructure, funded from the federal budget in accordance with the federal law "On the status of the science city of the Russian Federation" [4].

In addition, effective mechanisms for the financing of cluster development projects are development institutions, including the Russian Federation Investment Fund, a state corporation "Bank for Development and Foreign Economic Affairs (Vnesheconombank)", JSC "Russian Venture Company", and the Foundation for Promotion of Small Enterprises in Scientific and Technical Sphere.

At the same time, only a relatively small part of the cluster development projects have reached the stage of practical implementation. On a number of priority areas of cluster policy work has not yet commenced. While there is a lack of necessary coordination of federal executive bodies, executive bodies of subjects of Russia and local authorities, must come together with industry in order to implement cluster policies. Also, mechanisms were not set up for methodical, information consulting and educational support of cluster development, as well as limited financial support for cluster projects from budget sources.

A need to improve the efficiency of the cluster development potential as one of the priority areas to enhance competitiveness and economic diversification has become obvious.

The formation and development of clusters is an effective mechanism to attract foreign direct investment and encourage foreign trade integration. The inclusion of local clusters in the global value chain can significantly raise the level of the national technological base, improving the speed and quality of economic growth by increasing the international competitiveness of enterprises in the cluster, through the acquisition and implementation of critical technologies and the latest equipment; obtaining access to the cluster enterprises in modern management techniques and expertise and access to opportunities in the highly competitive international markets.

Cluster development also allows the optimization of the provisions of domestic enterprises in the manufacturing value chain, helping to raise the degree of processing of extracted raw materials, import substitution and increased localization of assembly plants, as well as upgrading the non-price competitiveness of domestic goods and services.

State agencies and local governments are supporting the development of clusters mainly in the fact that they contribute to institutional development, including initiating and supporting the creation of a specialized organization, activities in strategic planning, effective communication and cooperation between the cluster members.

An important measure to promote the functioning of clusters is the development of mechanisms to support projects aimed at improving the competitiveness of enterprises and the efficiency of their interaction. The project support must be provided regardless of the affiliation of companies involved in their implementation in a particular cluster.

5. Institutional reforming as the tool of the space policy

The achievement of strategic targets requires reforming of space industry. The structural changes will be directed, first of all, on separation of functions in scientific and technical sphere and industrial production of space-rocket vehicles.

Principles of industry reforms are actively discussed now in governing bodies, among key issues are the following:

1. separation of the functions of customer, operator and auditor of goods and services purchased by Space Agency;

2. consolidation of Agency's central office functions: focus on strategy building, public policy and coordination;
3. increasing managerial autonomy of space sector organizations. Creating opportunities for resources and facilities redistribution by their own decision;
4. separation of technical, scientific and administrative functions in the management structure of the Space Agency;
5. creating the conditions for harmonious horizontal and vertical integration of space sector enterprises;
6. creating a flexible project structure reflecting the goals and objectives of space sector. Use of temporary working groups of enterprises and research centers aimed at solution of specific problems;
7. creation of institution (corporation) for technology commercialization;
8. creating an sectoral Institute of Development;
9. budgeting on the basis of results through system of contracts, grants and subsidies;
10. revision of human resources, payroll and social policies to attract qualified young professionals, preservation and development of the human resources in the industry.

The world and Russia's experience shows different ways of the industry management organization. Three models are of great interest.

1. Industrial management organization consists of the Agency, and horizontally and vertically integrated structure of the space industry. In world practice there is an experience of introduction of three kinds of the given model.

The first sub-model has been implemented in the USA. It is based on division of functions on development, realization and control of space industry policy. A basic function of space agency is management of realization state industry policy. The agency is divided into the constant and temporary divisions responsible for realization of concrete projects. The given approach provides differentiation of spheres of responsibility at political and technological levels, and promotes a greater transparency of making strategic and operative decisions and creates reliable motivational stimulus for executors.

The second sub-model is realized in India. One of the key elements of this structure is the special auxiliary institute for commercialization of industry production that provides connection of integrated structures with commodity markets. This is a highly specialized division which can provide an exact estimation of demand structure in the internal and external markets. It is also the intermediary between the integrated structures and interested parties, actively presenting interests of the industry enterprises.

According to the third sub-model, the enterprises are consolidated in vertically integrated structures including all production chain, and horizontally integrated structures including the highly specialized enterprises producing separate systems for final production. The given approach allows avoiding radical divergences with positions of the strategic documents defining a course of industry re-structuring, and to use of existing experience on integration of the space enterprises. Besides, the creation of horizontally integrated structures allows joining the large domestic players producing individual components and having sufficient potential for distribution of their production on the world market.

2. Industrial management organization consists of the Agency, two-three large corporations / vertically integrated structures — competing suppliers of end-use products.

The given model, according to experience of China, provides creation of two or three competing suppliers of final production. It allows keeping large scientific, research and production schools and provides the alternatives.

At the same time the limitation of rigid state control by suppliers of final production gives the greater freedom to producers of subsystems and components necessary for production of launch and space vehicles and a land infrastructure, simultaneously having laid down them in conditions of tight world competition. Besides, the competition between several producers provides necessary stimulus for more responsible choice of suppliers.

The realization of the given model, as in the first model, provides the separation of functions of political and technological divisions, and allocation of institute on commercialization of space production.

3. Industrial management organization consists of corporation included a number of research centres and strategic companies (holding companies), suppliers of finished products.

This given model assumes the transformation of the Agency to the corporation applying the program approach in the organization structure. According to this approach, the realization of each program or the project is given to the separate structural division. Thus non-core functions of existing Agency are transferred to supportive divisions of corporation.

According to experience of the USA, India, Germany such corporation governs the research centers, carrying out fundamental and applied researches, and also engaged in tests and operation of launch and space vehicles, and the enterprises producing the final product samples. These enterprises are working with the state orders as well as with market orders. The individual components and subsystems the enterprises are buying in the open market.

This model also assumes the creation of the development institute for support of the state and private space enterprises. This institute can be created in the form of the Corporation on support and development of industry units, accumulating own resources and assisting the industry integrated structures in attraction of resources from international state and private institutes of development.

Conclusion

This research was concerned with the basic directions of space policy development in Russia. It has clearly shown intensification of processes of industry re-structuring with application of innovative tools of strategic, program and project planning on short, medium and long terms.

Russia considers the development of national space industry in a context of the international cooperation, including the cooperation in the space exploration.

There is an understanding of necessity of complex changes in scientific, industrial and institutional spheres. However, not all problems have the single decision, in particular in the institutional sphere.

There are many debates concerning the management organization of space industry, in particular in a context of recent trend of movement of high tech industries to the network structures, open innovations and outsourcing schemes. The findings of our research show that the specification of the space enterprises requires the differentiated approach. Further study related to the institutional reforms is still required.

The vertically integrated structures might be the preferable organizational structure for the space enterprises possessing the unique specific equipment which produce narrowly specialized final product.

However, there is also other group of the enterprises. They do not receive benefits from the vertical integration, as it limits their market freedom. For such enterprises it is reasonable to develop products and technologies which can be applied in many industries

with the minimum updating, to use possibilities of adaptation of existing technologies to the new markets, and to participate in network structures.

The third way allows combining the production of unique and serial samples on the basis of resource base development and product diversification.

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