

The formation of unified scientific and technological space in the Union State of Russia and Belarus within the union programs

The article reveals the content of work conducted through the cooperation of scientists and specialists of both countries to build scientific and technological potential, priority areas of work of mutual interest.

Union State of Russia and Belarus, scientific and technical cooperation, the priorities for cooperation, space research, nanotechnology.



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Scientific and technical cooperation within the Union State is one of the most important ways of economic integration, which is aimed primarily at the coordination of the unified solution of the most important socio-economic issues of mutual interest.

Currently in order to enhance allied collaboration between scientists and experts of Russia and Belarus, the Academy of Sciences together with its long-time Russian partners have identified priority directions – capacity building, first of all in the field of space research, computer science and technology development in several directions, including nanomaterials and nanotechnology, biotechnology and etc.

A perfect example of this is purposeful cooperation of the parties presided by governmental customers of NAS of Belarus and the Federal Space agency of the Russian Federation on the development and use of long range space vehicles and technologies for national economies.

Thus, the successful completion of the first project “Cosmos-BR” (1999 – 2004 years) in

which implementation were involved 10 Belarusian and 16 Russian organizations, an experimental sample of space information reception center and a new antenna system appeared, technology for decoding of space images and an experienced navigational and communicational terminal and other significant know-how developed.

All this was the basis for further partners cooperation within the program “Cosmos-SG” (2004 – 2007).

It involved more than 50 companies, academic and training institutions from both sides. Information and image processing technologies, design of facilities for testing spacecraft and simulation of different situations were priority at this stage of cooperation. All sorts of devices were made for Baikonur. Also the navigation system using satellite signals developed.

Today, within the current program “Cosmos-NT” (2008 – 2011) are developing a pilot sample of the unified microsatellite platform and the experimental model of a microsatellite of a new generation on the basis of long

range technologies that provide its enhanced term of active existence for at least 10 years. In the future, if you create a multifunctional space system of the Union state on the basis of microsatellites can be provided the phased deployment of an orbital constellation and the possibility distribution of global ground infrastructure technologies, carrying out reception, processing and dissemination of information from space. It is planned to establish the first Russian-Belarusian group – Belarusian and Russian spacecraft, “Canopus”, which will together deliver the information and for Russian and Belarusian consumers.

This system building will expand the scope of its services to the mass consumer of space profile: Earth’s natural resources studying, environmental monitoring, warning of emergencies, forest fires.

The result of collective fundamental and exploratory researches is that the cause of restraint of further development of rocket and space technology is the lack of possibilities to reduce the mass and dimensions of products, minimization of which is only possible by creating new lightweight materials and coatings with specified characteristics.

In this regard, a new collective project “Nanotechnologies-SG” has developed, which was launched in the fourth quarter of 2009 and its aim is to form components of unified scientific, technological and information environment in the use of nanomaterials and nanocovers by spacecraft building.

The design and operation system of space technology is a complex socio-technical system. Cases of its failure can lead to incorrect data results by space researches even to the accident and man-made disasters, severe economic, environmental and social consequences. Therefore logically it was necessary to develop another program of the Union state – “Developing a unified system of standardization and certification within the collective space projects of Russia and Belarus” (“Standardization-SG”). Its implementation will eliminate the technical and organizational difficulties arising from the

ineffective use of normative documents on standardization and certification of space technology by each party. The results of macro-economic analysis show that the economic benefits of standardization make about 1% of state GDP.

The next stage of space cooperation in the near future will be connected with creation of experimental sites of the complex monitoring focused on the solution of applied thematic problems in interests of the Russian and Belarus consumers of the information using the information from space technologies in a combination to air and ground technologies (systems) – “Monitoring of the SG”.

This cooperation of Roscosmos and NAS of Belarus suggests a number of projects for the future.

Use by the leading countries of the world supercomputing capacity to solve the special challenges of science, education, economy, and a significant backlog of our states helped to determine the following significant priority for our countries.

As the future government customers the National Academy of Sciences of Belarus and the Federal Agency for Sciences and Innovations of the Russian Federation supported a suggestion from the initiative groups of the United Institute of Informatics Problems of NAS of Belarus and Program Systems Institute RAS on the revival of the computer industry in the allied countries, industrial production of a number of software-compatible models of supercomputers with a wide spectrum of performance.

As a result, the first stage of collaboration between scientists of the States Parties from the Union State made a significant contribution to the concept development of creation and development of industrial production “SCIF” supercomputers.

Five “SCIF” family supercomputer, which entered the world ranking of five hundred most powerful machines in the world were created in 2004.

The next stage in the development of the collective project “SCIF” since 2007 is being

implemented the Federal program “SCIF-GRID” (The development and use of software and hardware GRID-technology and high advanced (supercomputer) computer “SCIF” family systems).

Today, referring to the implementation of the Belarusian part of the program up to 2009, it could be argued that for the first time in the world for the middleware UNICORE were developed suites of software and software documentation system for monitoring and testing sites; analysis systems, resource statistics and accounting; resource broker; batch processing system for the OS Windows platform; services and file sharing UNICORE distribution facilities. This made it possible for the Republic of Belarus to increase organization participation in European grid-projects.

As part of the supercomputer technology development for the first time in the Commonwealth of Independent States was created hybrid architecture supercomputer of MC “SCIF-OIPI”, a prototype of a hybrid architecture at the computer node cluster configuration using special processing elements like GPU (Graphics Processing Unit). Supercomputer “SCIF-OIPI” resources are included into the grid-infrastructure.

Given the fact that at the present stage the necessary condition for the world information economy functioning is the availability of global information computing infrastructure based on a set of technologies in which the dominant position are occupied by high-performance computing resources (supercomputers), telecommunication technology and software for efficient use of infrastructure, Russian and Belarusian Scientists and specialists are planning to devote the next phase of cooperation to this issue.

It is assumed to create and conduct operational tests of basic high-performance computing space of the Union State and the technology for its effective use within the future collective project “SCIF-Union” – “Development of technologies for the creation and effective use of information and high-performance computing space (cyber-infrastructure) of the Union State”.

In the near future the Belarusian and Russian developers plan to start working on forming a new program – “ORBISS”, which is aimed at development and implementation of effective mechanisms for introduction of high performance computing technologies into the industry.

The program realizes the creation of specialized software and hardware infrastructure, software-based with open code, focused on the solution of applied problems in the domestic industry, as well as on the solution of the most relevant for the largest domestic companies’ practical problems, based on this infrastructure. Such infrastructure creating will make possible the implementation of key strategic development objectives of the states-parties from the Union State.

The “ORBISS” program is aimed at creating conditions for accelerated development of high-tech machinery on the basis of the most efficient domestic information technologies and high-performance hardware solutions to create a branch innovative scientific and technological base to solve current practical problems of designing and conducting various tests of engineering products.

Within the future program “SCIF-Nedra” scientists and experts are planning to develop a set of information and computing technologies on the advanced supercomputing “SCIF” family platforms focused on the solution of the complex intensive geological and geophysical problems, providing increased efficiency of exploration and use of the resource potential of hydrocarbon in Belarus and Russia. This will significantly reduce the dependence of domestic oil and gas service on the foreign presence, increase the competitive advantages of domestic oil and gas service companies and as a result strengthen the energy security of the Union State.

In addition, as a result of this collective project we will receive stable multiplicative effect of high-tech development in related industries, which will help to solve some tasks of energy efficiency and conservation in Belarus.

National Academy of Sciences of Belarus, the Ministry of Health of the Republic of

Belarus and the Ministry of Health and Social Affairs of the Russian Federation supported a number of collective projects of a technological nature. One of them is a project to create drugs of a new generation based on human proteins derived from milk of transgenic animals. Primary transgenic animals from human lactoferrin gene were created within the first joint program “BelRosTransgen” (2003 – 2007). The scientists got a number of important and innovative research results related to the creation of genetically engineered structures that provide an economically significant production of biologically active drug human proteins in milk of transgenic animals, and also developed the technology of agricultural transgenic animals.

Taking into account the strategic importance of pharmacology industry and created genetically engineered drugs it is regular that we a suggestion to develop the second scientific-technical program – “BelRosTransgen-2” (2009 – 2013).

From 2009 to 2013 it is planned to perform substantial work on the 4 basic areas:

1. Development of technologies for high medicines and food products derived from milk of transgenic animals containing human lactoferrin;
2. Scientific developments and researches on optimization and verification of gene structures that provide implantation of human lactoferrin genes into animal-producers;
3. Experimental work on the production and reproduction of animals;
4. Organization of pilot production of medicines and food products containing human lactoferrin.

Future collective projects to develop new methods and technologies of restorative therapy of pathological changes of tissues and organs using stem cells (“Stem cells”), and to develop and introduce next-generation technology for the production of radionuclides and radiopharmaceuticals for diagnosis and therapy of oncological diseases (“Nuclide”) are socially important for Belarus and Russia.

The first project developing is due to the necessity of solving problems to provide adequate treatment for patients needing transplants of vital organs and with this purpose to the possibility of unification of the scientific potential of Belarus and Russia. According to estimates of experts in the world by 2010 the number of potential patients needing replacement and regenerative therapy with stem cells will be about 2.5 million people. The introduction of methods and technologies to produce, cultivation and transplantation of stem cells will make possible to solve this problem and improve the quality of these patients life.

During three years it is planned to develop the technological protocols. Clinical trials of cellular therapies will take another three years. In the near future in Belarus and Russia it will be possible to treat skin lesions, diabetes and cardiovascular diseases.

The second project – “Nuclide” – is aimed at the development accelerating and introducing new generation technologies of radionuclides and radiopharmaceuticals for diagnosis and therapy of cancer.

In the future these technologies development and implementation will allow to reduce the foreign exchange costs twice as more and better and to provide the population of Belarus and Russia with advanced isotopic methods of examination and treatment.

With the above mentioned projects, by the organizations of the National Academy of Sciences of Belarus with the Russian partners were developed and are in the process of domestic agreement of proposals for the development of new most relevant projects.

Together with colleagues from Saint-Petersburg the scientists within the project “Pramen” set a task to design and create promising technologies in the field of inorganic semiconductors: technologies of quantum-well heterostructures growth, microwave transistors manufacturing, high-power pulsed and continuous lasers in the green, near- and mid-IR spectral regions.

The project “Koval” is aimed at the development and implementation of high-tech laser

technologies of materials processing, also for use in critical conditions (high temperature and pressure, aggressive chemical and radiation-intensive environments, etc.) in Belarus and Russia.

Current global trends in the development of plasma physics and plasma technology reflects a new project – “Plazmateh”, which is aimed at development and creation of plasmodynamic systems and plasma technologies, which are competitive on foreign markets.

By future state customers – the National Academy of Sciences of Belarus and the State Corporation “ROSATOM” were supported two new and for both states important software development.

Some collective proposals are considered in the development of mechanical engineering. So scientists from Belarus and Russia are planning to improve the competitiveness of manufactured automotive products to the world level

within the future program “Autoelectronics” on the basis of new organizational and technological solutions.

The current long-term cooperation of the National Academy of Sciences and the Federal Space Agency and in recent years developing business relationship with the Federal Agency for Science and Innovations of the Russian Federation, the Ministry of Health and Social Development of the Russian Federation, Ministry of Industry and Trade of the Russian Federation, the state corporation “ROSATOM” contribute more and more the effective implementation of collective projects on the one hand and on the other hand, the development of the immediate and long-term perspectives in the integration business. This, in turn, has beneficial effects on the expansion and strengthening of bilateral relations between our subordinate organizations.