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Innovation priorities of Ukraine: the aerospace sector

Annotation

The article deals with the issues of Ukraine's international cooperation in the aerospace sector under the conditions of innovation-driven development. It reveals the necessity of integrating intellectual resources as well as research and production potential of different nations, in order to solve global problems, in particular pertaining to the development of air transport.

Keywords

innovation, strategic priorities, aerospace sector, international cooperation, scientific and technological cooperation

1 Introduction

The contemporary innovation development has turned into a powerful factor of economic growth and sustainable international competitiveness of different nations. Therefore, national governments pay specific attention to this issue and focus financial, intellectual, and research resources on scientific and technological development.

2 Formulation of the problem

The advent of global competition has changed the set of the factors supporting economic growth and competitiveness in world markets, and innovation development has turned into a most important factor. These issues are of special significance to Ukraine, because only an innovation development model may lead to a transition onto a new technological level, provide sustainable development, and create new jobs in new research-intensive sectors, which are to facilitate rise in employment and welfare.

3 Survey of recent research

The problems of innovation development of a national economy have attracted the attention of many Ukrainian and foreign researchers. Considerable contribution in the elaboration of these issues was made by well-known foreign scholars – J. Schumpeter, Ch. Freeman, G. Mensch, R. Nelson, P. Romer, R. Florida, and others. Among Ukrainian scholars, we are to refer to L. Antonyuk, V. Heyets, L. Fedulova, A. Poruchnik, V. Semonozhenko, I. Yegorov, and others. Most of them postulate that innovative development of an economy largely depends on the level of state

policy. These considerations render relevance to further investigation of the instruments of innovation development of an economy and research of its strategic trends.

4 Main results of the research

The contemporary global development is greatly influenced by the formation of information society, which determines significant qualitative changes in the world economy and sets up a new level of interaction among nations, economic systems, and peoples. The emergence of new technologies, the development of information networks and Internet boost economic growth across various countries, bringing about higher employment and welfare, lower poverty, and resulting in general human progress, with the creation of a powerful development potential for the 21st century.

The unfolding of the contemporary process of globalisation fosters technical advance due to competition and economic stimuli inherent in the global markets as well as the integration of the world's financial and scientific resources. Therefore, the present-day technological progress acquires quicker pace and is more fundamental by its character. It is just the technological transformations we are currently witnessing, being closely interwoven with globalisation, that are factors shaping the new paradigm of social and economic development of the world.

Under the new conditions of development, all countries regard as top priority the mobilization of new sources underpinning economic growth and utilization of opportunities originating from innovations. The process of innovations, which makes use of intellect, experience, knowledge and social values, enables many countries to secure

high performance in the global competition based on these advantages. Francis Gurry, WIPO Director General, indicated in his presentation of the Global Innovation Index 2016 that investing in innovation is critical to raising long-term economic growth. "In this current economic climate, uncovering new sources of growth and leveraging the opportunities raised by global innovation are priorities for all stakeholders" [1]. In this process, each country is to determine its specific policy mix that could enable mobilizing the innovation and creative potential of its economy.

The international experience testifies that the most advanced economies are simultaneously leaders of the global innovation process. Thus, in 2016 the top ten countries in the innovation rating included Switzerland, Sweden, United Kingdom, the United States of America, Finland, Singapore, Ireland, Denmark, the Netherlands, and Germany [1].

The innovation policies of advanced countries, such as United Kingdom, Germany, Italy, Canada and Japan, have been gradually reoriented from the goal of the formation of an innovation-driven economy towards the shaping up of a new innovative society.

The innovation development issues are crucial for every country in the world, and Ukraine is not an exception, as there is a high need in determining and further developing those branches of economy which intensively utilise innovations to boost economic growth and support global competitiveness.

For Ukraine, as well as for other countries that have performed market-oriented reforms, production of innovations and creation of closed production cycles are becoming nonviable because of the high cost of research and technological equipment, the permanent growth of the amount of vitally needed technologies, and the reduction of amortization terms for high-tech products. This situation requires identification of innovative development priorities, which would concentrate the use of scientific, intellectual and financial resources.

Ukraine has identified the following strategic priorities of innovative activities for the period of 2011-2021:

- 1) Development of new technologies for energy transportation, introduction of energy efficient and resource saving technologies, and the elopement of new energy sources.
- 2) Development of new technologies of high-tech of the transportation system, space rocket sector, aircraft and sea vessel construction, military equipment and ammunition production.
- 3) Development of new technologies for production of materials, their processing

and composition, and the creation of the sector of nanomaterials and nanotechnologies.

- 4) Technological renovation and the development of the agro-industrial complex.
- 5) Introduction of new technologies and equipment for high quality medical care and treatment, and pharmaceutical production.
- 6) Proliferation of technologies for environment-safe production and protection of the environment.
- 7) Development of modern information and communication technologies, and robotics [2].

Ukraine ushered in the third millennium as an advanced aerospace nation. The space rocket industry was declared Ukraine's state priority and an important factor of innovative economic development. The exploration and utilization of the airspace proved to be a prerequisite for the development of a scientific and technological potential, the provision of long-term state interests in the areas of security, required improvement of the living standards, and the country's participation in the search of solutions to global challenges confronting the humanity.

The intensification of technological development and the introduction of high technologies emphasise for Ukraine the necessity of expanded scientific, technological and production cooperation with other countries. It is also caused by the need to integrate scientific and research potentials, in order to solve the global problems, primarily ecological, water and foodstuffs supply, climate change and other.

That is why mutual interaction in the aerospace sector belongs to the most important and promising fields of international scientific and technological cooperation. Ukraine has the required scientific and technological potential for this purpose; it is enough to say that the country is among the group of seven nations possessing closed cycles in aircraft production. It maintains versatile cooperation ties in research, technology development and production with foreign partners operating in this field.

In this sense, international production and scientific cooperation are efficient tools to distribute the growing expenses and to achieve desired concentration of scientific and technological achievements and qualified labour. Ukraine, due to its possession of actively operating research and technological potentials and production facilities, has all the prerequisites needed to participate in international cooperation.

On the other hand, the development rate of space activities in the contemporary world is extremely high. One could withstand competitive pressure at space technology and services market

only if the solution of the entire mix of issues relating to development, production, test, and equipment operation is resolved continuously and systemically, with the use of latest advances in science. To achieve this, it is necessary to maintain comprehensive mutual interaction with research institutions and producers as well as partners from other countries.

Simultaneously, large-scale space exploration projects require extensive interaction, fruitful international cooperation, effective state support, and sufficient human and financial resources. It is extremely honourable to participate in such projects that shape the country's image, but one is to be highly responsible for his commitments. At the same time, such participation signifies recognition of the country's potential in this field. During the period of independence, Ukraine has not merely proved to be ready for such cooperation due to its scientific, production and technological achievements; in fact, it has demonstrated success in the implementation of most prestigious international projects. It serves as prerequisite for further integration of the country in the system of international cooperation in space exploration and the use of space science and technological achievements for the benefit of the humanity.

Ukraine is currently developing scientific and technological ties with different countries along multiple directions. Production and technological cooperation is advancing with the participation of Western as well as CIS countries.

Principle efforts are being concentrated in the area of international cooperation on creation of favourable international legal conditions for participation of Ukraine's space sector enterprises in international space projects, as well as for supporting foreign economic activities of enterprises in their stable and expanding presence in the market of space launch services.

Ukraine's policy in the field of international cooperation with other states follows several basic principles, including:

- Adherence to Ukraine's international commitments pertaining to the space area.
- Implementation of priorities and objectives outlined in the sphere of Ukraine's foreign policy.
- Consolidation of the positions held by Ukrainian companies at the global market of space equipment and services.
- Focusing on priority areas of space activities [3].

Currently, Ukraine implements a number of engineering projects on promising models of space vehicles that might be of interest to countries of Europe, North and South America, Asian and Pacific regions.

Joint R&D of science workers and producing entities participating in the international Sea Launch consortium and Kosmotras international

space company have proved to be fruitful. They safeguard provision and dissemination of satellite communication services and digital TV broadcasting on the territory of USA and Latin America, Internet access and data transmission for users in Northern and Central America, Alaska and Hawaii, digital TV broadcasting to Japan and other Asian countries. Currently, preparation activities are underway to reorganize the Sea Launch complex, in order to find new options for further exploitation of this unique installation, with reduced operating costs and more launches.

Good prospects exist for cooperation of Ukraine with the European Union member-states based on their fixation in the Partnership and Cooperation Agreement as of 1994. It stipulated that the parties were to develop cooperation in the areas of science and technology, including space research which requires creation of a basis for mutual economic, social, financial, civil, scientific and technological, and cultural interaction. The EU-Ukraine Action Plan adopted on February 21, 2005 within the implementation of the European Neighbourhood Policy emphasised the necessity of consultations on possible utilization by the EU of Ukrainian facilities in the area of distant transport carriage and further advance in cooperation in space activities.

On December 1, 2005, important landmarks in the development of international interaction between Ukraine and the EU were set by the signing of the agreement on Ukraine's participation in the European GALILEO Programme of satellite radio navigation extending on the fields of scientific research and development, industrial production, provision of services and development of markets, standardization, certification and frequency control, as well as by the conclusion of the first agreement between Ukraine and the EU in the area of civil aviation providing unobstructed access of European airlines to the Ukrainian market and creating opportunities for Ukraine's accession to the EU's Common Airspace (negotiations on the subject were launched in December 2007). The agreements envisage subsequent extension to Ukraine of the European Geostationary Navigation Overlay Service (EGNOS) [4].

Currently, the following principal directions of cooperation between Ukraine and the European Union in the field of aerospace sector may be noted:

- Development of joint projects on restructuring of the aerospace sector in Ukraine within cooperation in high technology areas and industrial conversion.
- Development of a Global navigation satellite system.
- Development of cooperation in the field of aerospace science, life science and microgravitation, exploration of the Earth from the outer space.

- Exchange of information on distance sounding of the Earth in case of emergency.
- Provision of data on space environment control and seismic monitoring.
- Common use of the information received from space vehicles of Ukraine and EU member-states and exchange of information from artificial satellites of the Earth belonging to them.
- Common use of existing terrestrial space infrastructure of Ukraine and EU member-states.
- Participation in conferences, symposiums, seminars on space subject which are held under the EU aegis.

Ukraine has compiled valuable experience of cooperation in aerospace sector through the participation in such European programmes as FP7, Twinning 1, Twinning 2, and Horizon 2020 etc.

New prospects for EU-Ukraine interaction in the aerospace sector have been opened by the adoption in 2010 of EU's new innovation development strategy under the title 'Europe 2020' [5]. Its key component is the 'Innovation Union' initiative [6] targeted, in particular, at integrating research and innovation to solve global problems. In 2012, the European Commission produced the Working Programme for implementation of this Initiative, designed in particular for integration of research and innovation to find solutions of the global problems. The Working Programme 2012 outlines three most important social and economic problems granted priority status in strategic research and innovation: eco-innovation (reduction of carbon dioxide emissions and efficient use of natural resources); security and mobility (optimisation of efficiency and security of the transport system); competitiveness at the expense of innovations.

In order to solve these social and economic problems, the following priorities have been determined:

- Rising ecological standards for air transport.
- Enhancing the efficiency of time control.
- Safeguarding satisfaction and security for clients.
- Rising economic efficiency.
- Protection of flight vehicle and its passengers.
- Innovation in the development of air transport of the future.

The implementation of this Programme is to become an important step in the development of air transport and provision of its efficiency and security.

For Ukraine, these priorities have acquired utmost importance in the context of implementation of the Association Agreement between Ukraine and the EU, including creation of a Deep and Comprehensive Free Trade Area. This

Agreement, as well as the currently operating EU-Ukraine Association Agenda to prepare and facilitate the implementation of the Association Agreement [7] provide, inter alia, for full conformity of Ukraine's aviation rules to EU's *acquis communautaire*, including the harmonisation with the EU of the legislation pertaining to flight security and adoption, for this purpose, of a new Air Code. This is to become a precondition for Ukraine's inclusion into EU's Common Airspace.

Ukraine also cooperates in the aerospace sector with the United States of America. The partners in the Antares cooperation project from the Ukrainian side are Yuzhnoye State Design Office, PA Yuzhmash, HARTRON-ARCOS, HARTRON-UCOM LTD, PJSC CHEZARA, and RAPID PLANT. The Antares, which is operated under the NASA contract, is to make space freight deliveries to the International Space Station. The programme has set a target to make by the end of 2018 five launches of the Antares space carrier, followed by another six launches in the period of 2019-24. Currently, Ukraine and the USA continue negotiations on cooperation in the field of rocket engine construction [7].

Cooperation with American Orbital ATK, Inc. has brought fruitful outcomes. A new contract was signed on rendering services in the modification of the Antares space carrier facilitating integration of new engines to be used during next launches. This modernisation of the Antares space carrier is to rise considerably its energy capacity and, simultaneously, its economic efficiency. The new vehicle configuration is to enable Orbital ATK, Inc. to provide launches in the long-term period under the US government program and to enter the market of commercial launches of space vehicles [8].

China is also an important partner country for Ukraine in the development of cooperation in the aerospace field. In April 2016, they signed a new long-term programme of bilateral cooperation in space for the 2016-2020 period, which embraces over 70 joint projects. The main part of them envisages creation of space rocket equipment needed by China to implement its Lunar exploration programme and the mission of the Solar system planets exploration, as well as cooperation in the area of constructing new materials and Earth remote sensing [9].

Ukraine's Strategy of Sustainable Development named "Ukraine - 2020" envisages further development of the country's space sector. It includes several priority objectives of the sector:

- Signing of an agreement between Ukraine's government and the European Space Agency (ESA) on granting Ukraine a status of a European Cooperating State.
- Expanding cooperation with EU member

states, countries of America, Middle East and Africa, Asia and Pacific region, and their space agencies as well as other corresponding entities.

- Continued implementation of a number of international projects, including Tsyklon 4, Antares and VEGA.
- Provision of the reception of information from foreign satellites and measures to integrate the national Sich satellite system with international surveillance systems [10].

Thus, creation of new rocket technologies is now to become the main priority of Ukraine's space sector, including new engines, new satellites, and new types of rockets. In particular, there is a plan to develop the Sich national satellite group for Earth remote sensing, which implies construction and preparation for launches of space vehicles accompanied with further development of on-Earth infrastructures. Preparation has also started aimed at the formation of a Ukrainian segment in the International Global Monitoring AeroSpace System (IGMAS), which is to become in future a component of the common European Research Area.

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5 Conclusions

Efficient development of high technology industries on the whole and in the aerospace sector, in particular, is viable in the contemporary globalizing world only under conditions of broad international cooperation, integration, for this purpose, of intellectual, financial, and manufacturing resources.

This necessity reveals itself for Ukraine primarily in the area of the aerospace sector where the country possesses a potential for international competitiveness. The implementation of this potential substantially depends on the development of Ukraine's interaction in the aerospace area with Russia and its integration with the European Union, as well as corresponding adaptation of its internal legislative and regulative system along these lines.

New prospects arise in the context of expanding cooperation in the aerospace sector with the United States of America and China.