

**NATIONAL UNIVERSITY OF PUBLIC SERVICE**  
**Doctoral School of Military Sciences**

Zsombor Rezsneki:  
**The importance of outer space in 21st century geopolitics**

SHORT THESIS  
for the degree of Doctor of Philosophy (PhD)

Supervisor: Klára Siposné Kecskeméthy CSc Colonel (retired)

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## **1. Presentation of the scientific problem, justification of the topicality of the research**

Today, knowing and using outer space is essential for our everyday lives. A very small part of humanity deals with outer space consciously despite the fact that it is almost a century old modern science. The previously achieved scientific and industrial results paved the way for the space sector during which the exploitation of the possibilities of the new area will benefit all of humanity. Space activity is very versatile and today there is no branch of science whith the highest level of cultivation are not affected by the field of space research. Nonetheless, geopolitics, as one of these scientific fields, is defined to examine what new challenges humanity faces in the 21st century. Space science supports the forces, tools and methods already applied to become even more dangerous or possibly to make completely new conflicts to appear.

At present, all countries are aware of the comparative advantage of independently applying and using the results of space research. To the fullest extent in the military force only the USA has the capabilities to develop and use technology and methodology based on space science. All countries have repeatedly and irreversibly faced the fact that improving their own space capabilities as a separate national security strategy is a must. The self-determination of a country involves the creation of a new military force that also applies the results of the space industry and space science. The time of wars fought with conventional means has definitively ended which in all cases have been replaced by means employed with space support. Today, at the operational level, it is unimaginable that the main role, from planning and organization to battlefield confrontation, would not be played by tools completed by space support. As today's wars and conflicts show many countries are still lagging behind to do this.

It is still depending on humanity for what purposes and in what way we will use the results achieved during space exploration. Knowing the historical conflicts, we cannot be much more optimistic. However, thanks to the effects of globalization and interdependence, perhaps we will be able to resolve the conflicts by interpreting the geopolitical challenges together. This is still based on the reconciliation forums of Western countries. The years ahead will reveal the expectation whether will any another country be able e.g. China, the Russian Federation (hereinafter: Russia) or India to develop their own way of asserting their interests and offer them to the world as an alternative. In my thesis, I took the main countries capable of space activities as a basis and I will evaluate their performance one by one as I progress through the themes of the thesis.

The 21st century has already begun, but we can hardly distinguish whether a modern version of the end of the 20th century or a new era of humanity could be already observed. After the first slow decade, the space activities amounted to significantly from 2010 at global level. More and more countries - although their geopolitical situation is still not completely clear - are joining the space race and with the completion of the Chinese space station we can witness a truly exciting race.

Thanks to the devices developed and used during space activities, due to their contact, countries that were far away from each other could become "neighbors". Exercising the activity outside the atmosphere, a spacecraft of any country can come close to the spacecraft of any other country and can easily generate a conflict between countries that have been separated by continents and oceans.

Near to the Soviet Union, another challenger – China – joined the opposition to the USA. In the first decades of the 21st century, others such as the European Union and Japan clearly wanted to ensure their development based on Western<sup>1</sup> ideas. At the beginning of the 21st century, there are significant signs new challenges are emerging for the West and that the USA is continuously looking for its partner which could be found in the most desirable way of a forming united Europe.<sup>2,3</sup>

However, this opposition appears more clearly not in science but in politics. Despite economic and military counterinterests, the USA carried out many joint scientific activities with China such as examining the results of the moon landing, or even with Russia. Accordingly, the EU, including the European Space Agency and Japan also participated in a huge number of joint projects with Russia and China.

In the 21st century, the West is increasingly spreading its own democratic principles in other countries. At the same time it must protect itself from external threats.<sup>4</sup> This also entails the maintenance of continuous armaments. The growing globalization activity of the West thus leaves other countries no other option than to secure their regional security.<sup>5</sup> In this regard, every state thinks of war as a defensive role which can be the basis of a preventive offensive in

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<sup>1</sup> Nyugat: nyugati típusú országok, régiók: elsősorban Észak-Amerika, EU és EFTA országok, Japán, Dél-Korea, Ausztrália, Új-Zéland, Tajvan (Kínai Köztársaság, a továbbiakban: Tajvan). A disszertáció során külön jelzem a fogalom bővítését vagy szűkítését az egyes országokra.

<sup>2</sup> Európa: ESA, EU és EFTA országok és ezek európai szövetségesei

<sup>3</sup> Zbigniew Brzezinski; Strategic Vision; Basic Books, 2012; p. 4.

<sup>4</sup> Francis Fukuyama; The End of The History and The Last Man; The Free Press, New York, 1992; p. 278.

<sup>5</sup> Barry Buzan & Ole Waver, 2003. i.m. 8-12.

terms of a given country.<sup>6</sup> According to this, research in outer space is a national security interest for all countries. Thanks to this, space activity will start to grow significantly in the next decade and will maintain dash until the balance is restored.

Satellites used in outer space - for mapping purposes - were already applied by the USA in the "second" (1966-1969) Korean War. Nonetheless, their true effectiveness was demonstrated in the Gulf War. Today, many countries - nearly 100 - are connected in several ways to the space sector. Currently, 10 countries and one intergovernmental organization are only capable of producing rocket systems suited for leaving Earth's atmosphere.

Today, outer space is presented in all major military, economic and scientific fields. The scientific results of outer space are now indispensable in the use of everyday technology. These results are used not only by the great powers, but also by all countries in their daily operations. Investigations related to the Earth cannot be imagined without space tools, and the experiments carried out by International Space Station are essential for getting to know our planet in details and having space travel.

At the beginning of the 21st century, the USA continues to determine the direction of space activities. It alone has the same results as the other countries combined. At the same time, activities in outer space are still linked to earthly goals. As I analyzed the sea routes indicated by Alfred Thayer Mahan in chapter 1. *The history, role and significance of space activity*, ensuring a presence in outer space is also essential for maintaining a great power position.

According to the current regulations, the resources of celestial bodies located in outer space are considered as the common heritage of mankind and the results of their exploitation must be used for the benefit of all mankind.<sup>7</sup> This phrase forms the basis of many debates between developed and developing countries as well as the USA and its competitors. The strength of the conflicts arising from the activities carried out in outer space does not yet threaten as harmful as that is caused by the "terrestrial" conflicts. The next decades may bring about a change. The 21st century cannot pass through without deeper regulation of outer space and becoming a new and more sophisticated scene of conflicts than before. At the same time, outer space gives countries an opportunity to prove their strength in another competition instead of waging war

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<sup>6</sup> Joseph A. Schumpeter; *Capitalism, Socialism & Democracy*; Routledge Taylor & Francis Group, New York, 2003; p. 352.

<sup>7</sup> According to the current regulations, the resources of celestial bodies located in outer space are considered as the common heritage of mankind and the results of their exploitation must be used for the benefit of all mankind Lee; *Law and Regulation of Commercial Mining of Minerals in Outer Space*; Springer Verlag, 2012; p. 15.

to each other. The necessary hostility - as in the past and sometimes nowadays on territorial claims - concentrates forces on the exploration of outer space.

## **2. Research hypotheses**

In accordance with the examination of the topic I set up the following hypotheses:

1. After World War II, a completely new field of science appeared, which has an outstanding role in the resolution of geopolitical conflicts. The USA has had superiority in space research since the beginning and has maintained this superiority ever since. The leading role of the USA in the field of space activities is unquestionable, but at the same time it adequately shares its results with other countries and inversely expects a similar attitude from others. Without the guidance of the USA the vision to which we thank the competition in space science would be lost.
2. The competition in early days between the USA and the Soviet Union has now become multipolar in the field of outer space which redefines many previous geopolitical conflicts and also results in brand new geopolitical challenges. After the collapse of the Soviet Union, Russia was left alone in the face of the USA, but in the following decades, several countries began to catch up significantly and in the field of space activities China or Europe became respectable rivals.
3. As a result of space activities the 21st century geopolitical challenges do not change in their own structure. Alliances and hostilities between countries remain intrinsically unchanged even after the growing activity of outer space. However, the situation in China and Russia has changed. Geopolitical conflicts are spreading, but they are not becoming more serious than they were in the 20th century. Space activities make conflicts much more refined (sophisticated), and compared to traditional geopolitical conflicts they are lower in scale and less intense.
4. Europe plays a significant role in the exploration of outer space and is the only entity that can actually perform at the level of the USA. Together as an ally they can maintain a leading role in the 21st century. Russia's space activities are increasingly limited and are only suitable for ensuring its own sovereignty. China's technological and economic dependence on the USA and Europe does not make it suitable for taking over the leading role in outer space.

### 3. Research objectives

The purpose of the research:

- Presentation of the development of outer space research and a summary of the results achieved so far.
- Defining the role of space activities in running conflicts and in the creation of new conflicts.
- Description of the energy sources and the general economic foundations necessary for activities in outer space.
- Examination of the international impact of space activities in the formation of alliances.
- Evaluation of the level at which the USA shapes the development of the global world and its role together with other Western countries is indispensable.
- Presentation of the secondary role of China and Russia in compliance with the primacy of the USA and Europe.
- Introduction of new definitions in order to facilitate social adaptation of domestic and international space activities.
- Compilation and delivery of a bibliography relating to the field of space activities and the presentation of the legal background.
- Definition of dangers and threats identified during space activities.

### 4. Research methods

The tool system of classical geopolitics is not sufficient to prepare the thesis. While traditional geopolitics examines the capabilities of every single country on land, water and air, in the case of outer space a complete geographical interpretation of the Earth needed, with proposals for the future. By the way critical geopolitics gives us the opportunity to carry out future research in a specific area, but outer space captures the essence of the Earth as a whole. The examination of geopolitical factors and the evaluation of geopolitical conflicts can only be analyzed comprehensively from the perspective of outer space. Going beyond the traditional framework of geopolitics I used the systemic geopolitical analysis as a research methodology.<sup>8</sup>

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<sup>8</sup> Ioannis TH Mazis; Methodology for Systemic Geopolitical Analysis according to the Lakatosian Model (2014); Forrás: [https://www.academia.edu/33792969/LXVI\\_Methodology\\_for\\_Systemic\\_Geopolitical\\_Analysis\\_according\\_to\\_the\\_Lakatosian\\_model\\_1](https://www.academia.edu/33792969/LXVI_Methodology_for_Systemic_Geopolitical_Analysis_according_to_the_Lakatosian_model_1); Letöltés ideje: 2023.04.28.; p. 475.

Based on this, I defined the systems and subsystems through which I examined outer space as a supra system and research activity. I designed the geopolitical factors (military, economic, political, social) that are reflected by the individual indicators - for example, the number of armed forces, political system, Gross Domestic Products, legal regulations, economic line, mineral resources, technology, social preparedness – examining in terms of space activities. I group the countries and divide them according to their autonomy and capabilities. I evaluated the examined countries according to geopolitical factors and reduced their number in regard to their space capabilities placed them in the current situation.

During the dissertation, I examined the countries and regions - as systems - in their interrelated relationships, during which I determined the development path of the space capability of the evaluated countries and analyzed the level of the space capability. Going through the sole investigated systems I analyzed the interdependence of the leading countries in terms of space capability.

I examined the systems in the context of space activities as a supra system, which encompasses the geopolitical situation that has been developed or will be developed as a result of space activities. In the dissertation, I analyzed the subsystems where the given space activity takes place in a specific geographical location. In the thesis, I also used a mixed research method, during which I used qualitative and quantitative methods to apply geopolitical factors. During the analysis I analyzed measurements and statistical data as quantitative and legislation as well as historical sources as a qualitative method.

I processed and analyzed the data used and written in the scientific literature, then compared them continuously and summarily one to another during the preparation of the thesis. I checked the authenticity of the information and data found during the research. The sources used are mostly general sources available to everyone, so during my analysis there was no suspicion that they would be questioned or interpreted differently by the literature of Western countries or Russian and Chinese sources.

I evaluated the materials discovered independently and systematically, drew conclusions and put them into final form and formulated new research results. In addition to qualitative and quantitative methods, the research method is unique and the peculiarity of which is the systemic geopolitical analysis developed by Ioannis Mazis. I partially used it in my dissertation and extended in order to achieve the goals. At the same time, due to the unique characteristics of outer space, the research method is complex and uses several methods or some parts are applied separately. I combined the systemic geopolitical analysis with the quantitative, qualitative and



comparative methodology, and arrived to my conclusions with the induction method from subsection to subsection, thereby answering the main questions of my research.

The research objectives based on the selection and continuous maintenance of the direction of the research method. The central element was a comparison of the USA, Europe, Russia and China. In the methodology of systemic geopolitical analysis systems are denoted by countries or, as in the case of Europe, by regions referred to territorial size or division. I used the designation Europe or EU (including EFTA) or ESA during the dissertation. However, from the point of view of space activity, they overlap each other and I mean the same region under them. In some specific cases, I always marked it if I narrowed down the region based on some aspect, for example to Western Europe. The systems are connected by the subsystems where specific space activities are carried out such as launch stations, professional organizations or space stations orbiting the Earth. The final element of the methodology is the "Supra-system" which gives the peculiarity of the systemic geopolitical analysis. The difference of the "Supra-system" can also be found in its name, according to which a faint line separates it from the name "Super-system". In the Hungarian language, both mean a superior system, but designation "super" means something on top of something and at the same time gives a physical expression to the word connected with it. Nonetheless, the name "supra" refers more to the term phenomenon. Based on this, we can talk about an essence-defining and even more a comprehensive analysis method. Thus, the main element of systemic geopolitical analysis is space activity, which permeates or embraces the special activities of the countries of the Earth in a given place and at a given time relating to the nature of the outer space domain.<sup>9</sup> I considered the investigation of this phenomenon to be the main element of my dissertation and the analysis through the different geopolitical factors (military, economic, political, social) according to individual geopolitical indicators (e.g. the number of armed forces, political system, GDP, legal regulation, economic line, mineral resources, technology, social preparedness). Space activity manifests itself in the most comprehensive way in the countries of the Earth in accordance with their economies, international relations and political systems.

It is very important to point out that the analysis of each country and region according to the capability and autonomy detailed in the subsection *1.1 Countries participating in space activities* does not refer to the current state, but is undergoing process of the 21st century. This is the reason why, regardless of small number of spacefaring countries and the nearly 100 countries directly or indirectly connected with space exploration and no matter how good their

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<sup>9</sup> Amelybe a világűr értelmezése érdekében felállított nemzetközi és nemzeti szervezeteket is belefoglaltam, ezáltal teljes és átfogó módszertant alkottam.

results are, they cannot be the subject of my elaboration. Establishing the existence or lack of capacity and autonomy is essential in the case of the four most significant countries or regions. The primacy of the USA, Europe, Russia and China in the field of space activities cannot be questioned, even if Japan, India or any other countries have also achieved nice results. If a distinction can be made between the four most developed countries or regions evaluating space activities or autonomy and capability of countries and regions can be questioned, then the presentation of the other less developed countries in this way is even more pointless. At the same time, other countries carry out prominent space activities, so it is definitely necessary to mention them in each space activity based on their relationship with the four most performed countries or regions in space activities. The role of other countries has already been analyzed in chapter 1. *The history, role and significance of space activities*, from which I drew conclusions for the following chapters. The main direction of the dissertation is limited to the analysis of processes existing in the present but is continuously operating in the long term future. Examining the extremism would excessively influence the direction and scope of the thesis.

Based on the quantitative method, I analyzed the geopolitical factors selected during which I compared statistical data. Accordingly, I examined the social and economic conditions for conducting space activities as well as the development of international relations. Due to the finite number of pages in the dissertation, the four most developed countries or regions with space activities were not analyzed to the same extent in each chapter. I narrowed the focus of the study based on specific aspects. At the same time, each space-capable country or region has been processed to a certain degree in addition to the comparison of major countries or regions.

In order to map the space activities more precisely, I carried out legal and historical research using a qualitative method. I focused on the process and development of the supra system i.e. space activities. I analyzed the main legislation as primary sources and with a historical review of space activity I have already successfully defined goals that indicate the differences between the four most advanced countries or regions performing space activities. During the composition of the dissertation, the examination of space activity encompasses the essence of all chapters. However, the main direction was the determination of the relationship of the four most developed countries or regions to each other and to set up the leading role in terms of space activity. In doing so, I examined some "traditional" economic, social, military and political elements that are at first sight far from space activity, but at the same time form its basis. Without the "traditional" areas space activity, as today's most complex social and economic appearance, cannot be imagined. Space activity, overarching the internal interests of

individual countries or regions, pervades all human behavior in a given geographical area. Furthermore, within the framework of the qualitative method, I conducted a semi-structured interview with three public figures who are closely related to space activities.

## **5. Short description of the research by chapter**

In the first six unnumbered chapters of my dissertation, after the introduction to the thesis, I present the scientific problem and also justify its relevance. I will explain my research hypotheses, my research goals, the applied methodology and then I will summarize the literature on the research topic. In the following five numbered chapters, I examine the factors related to the performance of space activities, focusing as a rule on the activities of the four most developed countries or regions in the field (USA, Europe, Russia and China).

In chapter 1. *The history, role and significance of space activities*, I define the development of space activities and the role of the main participating countries. In addition to the importance of the conquest of the Moon, I analyze the activities of the four most developed countries or regions with launch vehicle and satellite capabilities and systematized the operations of space travel and space stations. In chapter 2. *The resource demand and economic environment of space activities*, I present in separate subsections the availability of minerals and other conditions that are extremely important in the space industry and related to other industries as well as the economic background necessary for the performance of space activities. In this context, I comprehensively analyze the educational and economic enterprise features.

I open the chapter 3. *The political and social environment of space activities, international collaborations* with an overview of autocracy and democracy and organize the new alliances created as a result of space activities. I examine the political systems in their structure and the main contradictions among them. I will describe the existing and newly created alliances on the basis of the missile systems and satellite capabilities already analyzed in the previous chapter. I begin chapter 4. *Dangers and threats created during space activities* with an overview of the weapons that can be used in outer space and then I also analyze global risks in general. In the subsections that follow, I summarized the role of outer space in reducing threats and analyzed the legislative background. I paid special attention to the emergence of private companies and the presentation of space mining as a future challenge. In the second part of this chapter, I analyzed in detail the relationship between nuclear weapons and space activities. I drew stories that have occurred and studied the nuclear capabilities and the international agreements that regulate them.

I close the series of numbered chapters of my dissertation with chapter 5. *Legal regulations and interviews*, in which I comprehensively analyze the current state of legal regulations affecting space activities. Many legal provisions were also included in previous chapters but they are related to the basis of the current (sub)chapters to the extent required. This chapter deals with all the legal regulations are essential for the continuous performance of space activities. In the rest of the chapter, I review the content of three semi-structured interviews and connect them with the conclusions found in my dissertation. I honestly asked for the opinions of three professionals with years of experience in space activities. In each case, at the end of the numbered chapters, I summarize and evaluate the main results of the research carried out in the given topic under the title *Conclusions*. In the chapter *Summary Conclusions and New Scientific Results of the Dissertation*, I reflect on the hypotheses formulated at the beginning of the thesis and on my research goals. This is followed by the *Recommendation* and *The possible uses of the research results*, as well as the *References* chapters. For the sake of clarity, I prepared three lists, these are the list of *Publication activities*, the list of *Figures and tables* and the *List of Abbreviations*. I attached an appendix to my dissertation which I marked as *appendix No. 1*.

## **6. Summary of conclusions**

Scientific research applying outer space has an influence on all other scientific fields. Nowadays, it is no longer conceivable that any sovereign country or other public or private organization would not come into contact with the results of space research in some way during its operations. In the activities, carried out in outer space, the USA clearly assumes the leading role and many other countries are also involved in the exploration of outer space. Countries can be grouped as developed and emerging countries according to the degree of their ability and autonomy. Based on the facts examined in the dissertation, I came to the conclusion that only the USA has full capacity and independence.

At the same time, Europe (the EU, including EFTA countries and the ESA) is similarly capable of implementing the full spectrum of space activities and integrating the results of space research into its economy. At the same time, from a technical point of view, it is independent and plans the direction of its own space activities independently of other countries, but in accordance with the direction of the US space activities. Russia fell short in the race to conquer the moon, but its technical capabilities are world-class in many areas and it already implemented the main space activities decades ago such as the launch vehicle or the space station. However, in the technical field, it does not meet the extensive and deeper capabilities

of the USA and Europe. China is economically too dependent on Western countries and its technical ability does not meet that of Russia.

The fundamentals of space capability is shaped by rocket technology, of which a given country can also achieve its other space activities. If one has to ask for help of other countries for riding, it cannot be considered independent of carrying out space activities. At the same time, many countries have missile systems but their satellite technology or other space research activities fall far short of their opportunities. I consider the USA, Europe, Russia and China to be the main countries or regions that carry out space activities since these countries are suitable for implementing their political objectives in the field of outer space. For this reason, I reduced the number of countries with missile capabilities in the dissertation to the four space superpowers and built the main direction of my thesis around them.

Staying with the examination of autonomy and capability, China and Russia have an important role in space activities but the assumption that they fully and equally share the space superpower role of the USA and Europe has been overturned. During the Cold War, the Soviet Union as a clear leading power was not technically capable of realizing the moon landing, nor was it economically capable of financing the planned space programs. The Soviet Union was the second largest economy in the world, just like China today. Russia barely participated in space activities until the end of the second decade of the 21st century. However, we can state that Russia's technical ability is advanced enough to keep up with the USA, but its space activities lag far behind it. China is economically capable of participating in the fight against the US and Europe to change the world order, for which it also has the political will. However, its technical ability is clearly demonstrated by the fact that the development of space technology was fulfilled with Russian, American and European help.

Western European countries clearly took the pioneering role in the development of space activities. However, in World War II their role forced them to stop. The research that created the basis of space exploration and carried the possibilities of nuclear weapons led the USA and the Soviet Union to continue what the warring European countries had begun. Thanks to this, the development of space research started at the same time as the Cold War. Today, nearly 100 countries have space vehicles, but apart from those dozen countries or regions, in most of the world we cannot talk about space activities in a broader sense or praise an established space economy.

The closest to the USA's performance are Japan and Western European countries, whose outward space travel far exceeds that of Russia and China as well as all other countries. However, their numbers have not yet reached the number of outward space programs carried

out by the USA. At the same time, Western European countries provide assistance to Russia, Japan, China, India and other countries, which suggests that they have complete independence and that any obstacles or shortages that arise can only be understood in the short term. We can state that in the area of the most significant space programs carried out today - including the return trip to the moon and the space station projects - China does not have outstanding experience. Neither does Russia, its activities carried out exclusively on the International Space Station - Salyut and MIR space stations operating for a much shorter period of time -, it can rely on. However, Western countries have several decades of scientific and technological development.

The continuous maintenance of space activities requires minerals and other technical solutions, that can be delivered in a coordinated and comprehensive manner. Currently, supply chains are structured in such a way that the busiest shipping routes go through China. Thanks to its population and geopolitical location, China as a major manufacturer and producer of mineral raw materials provides an excellent solution for the world's space industry to function without problems. Although China is the world's largest producer of rare earth metals this role does not make it a monopoly. Many countries have exceptionally large reserves, however, during the development of the supply chain China assumed the role of world distributor. At the same time, China can only sell its mineral resources to countries whose industries are advanced with their technology and they are able to pay for the purchased mineral resources. At the same time, China suffers from a significant shortage of electronic components, which form the basis of modern industry in addition to space activities. Based on China's role as a mineral producer and its place in the supply chain, I came to the conclusion that China's situation made it vulnerable to its customers and technology suppliers. China's largest customers are rich western countries and its largest electronics and other technology suppliers are also western countries. Although China's economic power can exceed that of Russia, the economic power of the USA and Europe is almost five times that of China. The smaller Western European countries represent a serious challenge for China, in terms of all indicators, and so far it has not been able to catch up with these countries either in terms of economic efficiency, economic complexity or international company structure.

Taking into account the technological developments in the space industry, the USA and its allies created a new group with the Artemis Agreement, which can bring a boom in the space industries to countries smaller than China and Russia but at least as developed. The accession of India, Saudi Arabia, Brazil, Argentina and the UAE to the Artemis Agreement clearly shows that anti-Westernism as a key word can only be the basis of any alliance in a given period or in a given situation. Thus, it becomes a wishful thought rather than a cohesive force. China and

Russia cannot operate a foreign policy in which they are entrusted by more developed or richer countries with their programs of space activities. It foreshadows the difficulty of cooperation with other traditional but high-level economic activities. General economic activities compared to China and Russia can be developed in the same way in any country, even with Western help too. Thus, on the part of China and Russia, a loose trade relationship with other countries will not be enough, it is still necessary to use the power to shape the other's policy. This is essential for cooperation on space activities such as lunar landing under ILRS. Space activities must be a supportive and community-strengthening program.

The USA, Europe, China and Russia are facing many regions and countries with similar capabilities, which results in a more fragmented geopolitical situation. The USA and Europe are currently able to coordinate this. The space industry tasks under the auspices of the UN mainly cooperating of Western countries, affecting the entire planet, are carried out. China and Russia do not participate in the expansion of space activities to the same extent as the USA or Europe. Russia and China are still following the principles that contribute to the development of their own capabilities and, due to their political system have once again fallen behind in the integration of achievements into society. This is well illustrated by the number of private companies and the volume of space industry spending in each geopolitical region. Based on the above, we must come to the conclusion that both Russia and China just select those elements of space activity that serve their political interests. However, while in Russia it is sufficient to demonstrate military power through space technology, for China economic goals are also important and compared to its size has to participate in several space programs. Thanks to the political system, both countries have the maintenance of the dictatorship as their primary goal, so the space programs are also subordinated to this goal.

As a result, the space programs of China and Russia are lagging behind, and the results achieved so far are mostly based on Western guidelines. The space stations and satellite systems of China and Russia no longer compete with the space programs of the USA or Western European countries but rather with the plans of private companies. In my dissertation, I presented what results China achieved with the help of Russia (Soviet Union), and in addition to this, how much Western countries helped China's space activities with the joint projects participated. Overall, we can conclude that after the USA and then Europe, it is not China that comes next in the space power rankings but still Russia. Of course, from an economic aspect, Russia is not capable of the performance that China is capable of, but it is not yet lagging behind China on technology, although the overall picture of space achievements favors to China. I proved that the construction of the rocket systems, satellites, constellations and the space station

was already done in the Soviet era (more than 30 years ago). At the same time, Russia failed to turn its successes in outer space into geopolitical advantages, and because of its political organization, analyzed in chapter 3. *Political and social environment of space activities, international cooperation*, it was unable to develop a geopolitical relationship with any - economically developed – country. Thanks to that, for Russia could not assume a leading role in the field of space activities.

Based on the identification of geopolitical dangers and threats, I came to the conclusion that outer space is far from receiving the attention in societies that its current or future particularity can deserve. At the same time, space technology helps to reduce main geopolitical threats since we can most accurately assess the state of our planet with space instruments installed in outer space. However, in order for these devices to orbit the Earth extensive space science is required. The space activity that started in the 20th century will become available to many countries in the 21st century. These result in new geopolitical conflicts, but they do not necessarily become more threatening. As a consequence, it can be concluded that the USA continues to maintain its decades-long advantage in space activities, constantly signaling to those following that it is not worth taking risks in order to change the world order. Shall a situation arise where China or any other country takes the leadership over the USA and Europe, we can agree that we will be dealing with a country that provides a better response to economic and social challenges. Thanks to this, this response is also reflected in its technical superiority. No one would mind that. At present, the cooperation between China and Russia can be interpreted as a defensive behavior rather than an offensive strategy.

In the 21st century, space exploration cannot cause a greater danger or a more threatening situation than the nuclear weapon of the 20th century. The possibility of using a nuclear weapon is still negligible, but its destructive effect cannot be averted according to the current state of space research. It can be concluded that space activity does not draw up an individual high-risk and single high-threat geopolitical conflict, nevertheless it makes the settlement and resolution of existing or created geopolitical conflicts to be much more sophisticated.

Based on the data analyzed in the economic and technical background of the dissertation, I came to the conclusion that the USA and Europe only have a comprehensive space industry that affects all areas and ensures social, military, economic and technological superiority for them. We can also state that the superiority established in the performance of space activities is based on not economic but on tactical grounds, foresight and future vision. A sophisticated space capability is an advantage for every country, consequently, if the



achievement of the most sophisticated space technology was based on economic foundations, dictatorial countries such as China and Russia would have already set up the money - even at the cost of social damage - that is necessary for the space activities to establish superiority. The contrary of the underlying assumption is true, developed society creates the conditions for space exploration. Apart from the USA and the countries of Western Europe, all other countries follow the well-trodden path, follow the events of outer space from a decent distance and develop their space vehicles according to their current strength. China and Russia do not choose a different field of research, but want to close up with the USA or Europe, which continuously carry out pioneering tasks. It is open to China and Russia, or any other country, to carry out pioneering tasks of their own, for example to reach the center of the Earth.

During the analysis of the legal regulations, I found that the national internal regulations of each country concerning outer space differ and are very incomplete. The UN General Assembly continuously passes resolutions that serve as recommendations in the development of the national legislation of the member states as well as shows direction for the incorporation of international regulations into domestic space policy. Thanks to the small number of spacefaring countries, there is still time to create a legislative environment, but apparently neither China nor Russia takes an active leading role in the educational and information-sharing forums organized by the UN. The most complete answer to comprehensive problems affecting all countries of the world comes from developed countries. China is the only member of the G20 - Developing Nations and G33 - Forum for developing countries analyzed in subsection *3.4 New federal systems among the main spacefaring countries*, which justifies the image that it does not yet belong to the developed countries. China is not particularly suitable for a leadership role. The initiatives, related to the space industry analyzed in chapter 4. *Dangers and threats created during space activities*, take place with the participation of the USA and Western Europe (and not Europe) in a world-wide way.

In my dissertation, I came to the conclusion that, in addition to the USA, Europe has the organizational reserve that the world needs and I did not find such a significant reserve presented by Russia and China. India's rise and successful space program make it well positioned to challenge and even overtake China or Russia.

In summary, we can draw the conclusion that the USA and Western Europe have the vision to move space exploration forward. The space faring countries economically developed, politically democratic can significantly support this exploration. If the leading powers do not understand this and prefer regionalization and blocs then regardless of the level of development the common language well known by all states and understood and spoken by everyone will

come ahead: warfare. In the future, no matter how we want to examine the development of space research in individual countries, we must be mindful of the fact that we are dealing with an increasingly sophisticated field looking from Earth. Our investigation cannot be limited solely to the results of current space activities. In order to establish the degree of independence, we must also examine the pillars, sources and direction of development of the space research of the given country.

## **7. New scientific results**

- 1) I proved that the USA has a comprehensive space capability that no other state has yet achieved. It has maintained this supremacy since the beginning of the space age, the 1950s, and there is no sign of any other state catching up in the following decades. I confirmed that in the field of space activities all countries strive to partially or fully achieve the space research goals set by the USA, and the USA can help them in this as well.
- 2) I proved that the great powers try to utilize the results of space activities for their own political and economic purposes during which new geopolitical conflicts appear. I also confirmed that in the field of space activities, in addition to the USA and Russia, Europe and China have emerged as key players, and more and more states want to play a significant role in space activities.
- 3) I proved that the new geopolitical conflicts, arising as a result of space activities in the 21st century, will not become more threatening than they were in the 20th century. I also proved that more states achieve the necessary capability to carry out space activities. Thanks to this, space activities become the scene of a more sophisticated and significant number of geopolitical conflicts. I have proved that during the performance of space activities the alliance systems are modified and their borders are more clearly visible which is shown by the side-choice of the emerging countries, showing up in the closer alliance between the USA and Europe or Russia and China, too.
- 4) I proved that China and Russia are not autonomous actors on space activities and that the guide line is still the alliance of the USA and Europe. I have established that Russia cannot compete with Western countries either economically or

technologically when performing space activities. At the same time, I confirmed that China depends on the economic and technical support of Western countries and regions for its space activities, and that it needs Russia's help in developing its space technology capabilities.

## **8. Recommendation**

Nowadays, the importance of outer space is outstanding in all fields of science. The results achieved have a direct impact on the Earth and are directly applied in the economic, technological and social fields.

I recommend my dissertation primarily to scientific professionals committed to activities in outer space. Due to the rapid spread of space activities, it also provides authentic, objective and current information for economic, military and political decision-makers. It is hoped, as myself I used the results of many scientific fields, that the researchers, experts and other interested parties who follow me will benefit from my dissertation. The dissertation can be used not only in geopolitics, but also in international relations, international studies, economics or law courses as well as acquiring basic knowledge in the technical and social sciences. My dissertation can be useful in the research areas of the University of Public Service's Doctoral School of Military Science as well as in the training of doctoral students.

The chapters of my dissertation provide appropriate help to those researchers working in the interdisciplinary field who examine social and economic tasks in relation to each other, comprehensively and extensively in several countries. I also specifically recommend my dissertation to those leaders who responsibly make the decisions that establish the country's long-term development direction. Accordingly I recommend an immediate comprehensive examination of all areas of society from the point of view of space activities. The topic has particular importance and in Hungary, or at any university in the world, more and more training courses are constantly being launched to teach space activities. My dissertation in the field of outer space helps students participating in basic and master's programs to acquire a comprehensive knowledge. In Hungary, the ministry(s) supervising space research can also supplement their professional activities with useful knowledge and connect many elements of my dissertation with their goals that are already underway or planned in the future.

## **9. Possible applications of the research results**

Although many experts in space activities live in Hungary and therefore the problems of the new field of science are being processed continuously, there is currently no analysis

available based on a broad system of criteria in a structure and discussed in similar depth to my dissertation. During my doctoral training, I partially published the early results of my research or presented them at various conferences, which materials I constantly updated along with other materials prepared for educational purposes. They are useful aid to specialists and other university instructors in their own fields. Thereby shaping the long-term alliances I helped political and other leaders to examine further my analyzes during their decision-making in order to evaluate the progress among the countries ahead of them and the pioneering countries. No country can be sure that the country ahead of it has a better ability to interpret the activities of pioneer countries than it has itself. In my dissertation, during the analysis of specific space activities, any state can assess whether, in the long term, it relies on the observations - tools and methods – of a country ahead interpreting the actions of the pioneering country correctly. Perhaps one could chooses its own approach to learning about outer space and to incorporating its results into society.

The research topic encompasses a large area and requires a much more comprehensive scientific and social collaboration in a given country in order to take a secure position in the occurrence of new geopolitical conflicts. The material of the dissertation can be well used incorporating some elements of the methodology I have outlined into the decision-making mechanism. To the future, to analyze the connections more broadly and to determine the direction in which research or economic activity needs. During my dissertation, I used many tables and figures to prove the results which can be used for further analysis and to deepen their knowledge.

My dissertation can certainly be useful material for those who have dealt with space activities before or for those who have not yet found the connection point between their own field and some activity in outer space. I consider it that anyone who takes my dissertation into their hands will most likely find the guiding thread with which I managed to contribute in a different approach to their field. During the preparation of my dissertation a number of directions revealed what research areas I should investigate in the future. It is definitely worth investigating the impact on society and politics in each country. Military and economic use of space vehicles offers excellent new opportunities as a deeper research activity, as well.

## **10. List of publications by the author in the topic**

1. History of NASA - Lélektan és Hadviselés, 2021. 3. évf. 2. sz. pp. 107–116.,
2. Employment of Atomic Weapon, Constitution and Society, Hadtudományi Szemle, 2024. 17. évf. 1. sz. 27 p. Nyilvános

3. A térbeli közlekedés biztonságának megteremtése, Hadtudományi Szemle, 2020. 13. évf. 4. sz. pp. 41–52.
4. Űrverseny a Hidegháborúban, p. 216. In: Barna Boglárka Johanna, Kovács Petra, Molnár Dóra, Pató Viktória Lilla szerk.) XXIII. Tavaszi szél Konferencia 2020, Absztraktkötet: Mi és a tudomány jövője. Budapest, Magyarország: Doktoranduszok Országos Szövetsége (DOSZ), 2020. 600p.
5. Az USA fölénye az Űrversenyben 1. Hadtudományi Szemle, 2021. 14. évf. 4. sz. pp. 99-115.,
6. Rakétaképesség a Világűrbe, pp. 89–97. In: Baráth Noémi, Mezei József, Rendészet-Tudomány-Aktualitások 2021A rendészettudomány a fiatal kutatók szemével - Tanulmánykötet. Budapest, Magyarország: Doktoranduszok Országos Szövetsége, Rendészettudományi Osztály, 2021. 168 p.
7. A Nyugat hajnala: a filozófiától az űrkutatásig – Lélektan és Hadviselés, 2022. 4. évf. 2. sz. pp. 9–38.
8. 21. századi geopolitikai kihívások: Avilágűr hatása a geopolitikára, pp. 42–50. In: Szelei Ildikó (szerk.) A hadtudomány és a 21. század 2022. Budapest, Magyarország, Doktoranduszok Országos Szövetsége (DOSZ), Colocrom Media Kft. 2022. 359 p.
9. Az USA fölénye az Űrversenyben 2. Hadtudományi Szemle, 2022. 15. évf.1. sz. pp. 139–151.
10. „...az egész emberiség javára”, A NASA története, Mediterrán Világ, 2022. 18. évf. 51. sz. pp. 114-126.
11. Az atomfegyver bevetése 1.: a 20. század fegyvere, Hadtudományi Szemle, 2023. 16. évf. 2. sz. pp. 77–95.

## 11. Professional-scientific curriculum vitae of the author

### Certifications:

from 2019 - at present	University of National Public Service, doctoral student
from 2015 to 2017	Chatolic University of Pázmány Péter, Law Expert specialized in European Law (L.LM)
from 2008 to 2011	Universty of Szeged – economist (Postgraduate)
from 2004 to 2008	University of Pécs - lawyer
from 2000 to 2003	Police Academy - detective

Scientific activities during doctoral school:

Lectures:

Transport networks (HLKOB21)

The geopolitical significance of outer space in the 21st century

NATO history - on course (INBTB63) - Outer space in the 21st century

Transport networks (HKMTTM22)

The geopolitical importance of outer space Geopolitics (MA - HKMTTTM22)

21st century geostrategy of space Transportation networks (BA - HKHPKA306)

Participation in conferences (presentation):

- |  |             |
|--|-------------|
| XXIII. Conference of Tavaszi Szél  | 16.10.2020. |
| - 11 <sup>th</sup> International Scientific Conference                   |             |
| „National and International Security 2020”                               | 23.10.2020. |
| - Mediterrán Symposium XXI.  | 16.04.2021. |
| - Critical Thinking of Public Administration Doctoral Conference         | 10.04.2021. |
| - Law enforcement-Science-Current Affairs Migration and Military Science | 23.04.2021. |
| - Geopolitical challenges in 21st century                                | 24.02.2022. |
| - Conference of Military science and the 21st century                    |             |
| „Atomic bomb: Weapon of 20th century                                     | 21.02.2023. |
| - Critical Rethinking of Public Administration                           |             |
| „People on Atomic Weapon through Constitution”                           | 21.04.2023. |