

Barriers of entering space market. Case of entrepreneurs in Central Eastern Europe

Aleksandra Bukala^a, Katarzyna Malinowska^b, Michal Szwajewski^c

^a Polish Space Agency, Warsaw, Poland, Aleksandra.bukala@polsa.gov.pl

^b Centre for Space Studies, Kozminski University, Warsaw, Poland katarzynamalinowska@kozminski.edu.pl

^c Space Entrepreneurship Institute, Kozminski University, Warsaw, Poland, michal.szwajewski@sapce-ei.org

Abstract

Central European countries care about being a fully-fledged member of the space family. Is there however common characteristics of countries in this region so that we could derive common features of their space sector and identify the barriers as well as prospects for success? Countries of CEE region are in specific situation, on one side having space heritage gained behind the iron curtain, but on the other hand experiencing difficulties in integrating with European Space Agency's value chains. Is this a drawback, or maybe a chance to build up a truly modern space business in the region being able to face the challenges of changing space landscape? These countries face many challenges, including geographical location not favourable to perform spaceflights, difficulties in gaining capital necessary to grow or public clients with limited awareness of the benefits the space sector. The aim of the authors coming from various fields of expertise and having different point of view (engineer, lawyer and administration representative) is to identify the barriers of entering the space industry by the CEE, those which are common for the CEE countries and those which make them different. Our goal is to identify, evaluate and assess such barriers from a legal, business and administrative-political perspective. Authors will analyse the space sectors of CEE countries with special focus on Poland as the biggest economy in the region to identify common barriers as well as opportunities of this rich and diverse region.

Keywords: entrepreneurship, NewSpace, national space law, insurance, Poland, Czech Republic, Hungary, space agencies

Acronyms/Abbreviations

European Space Agency (ESA)

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies of 1967, Outer Space Treaty (OST)

Central Eastern Europe (CEE)

1. Introduction

Countries of CEE region are in specific situation, on one side having space heritage gained behind the iron curtain, but on the other hand experiencing difficulties in integrating with European Space Agency's value chains. Is this a drawback, or maybe a chance to build up a truly modern space business in the region being able to face the challenges of changing space landscape?

The objective of the paper is to analyse the chances and opportunities as well as threats faced by the space industry of the CEE region. They will be presented from the different point of view, i.e. having in mind the technological, legal and political - administration perspective. The special focus are the barriers of entering the space industry by the CEE, those which are common for the CEE countries and those which make them different. Our goal is to identify, evaluate and assess such

barriers. Authors will analyse the space sectors of CEE countries with special focus on Poland as the biggest economy in the region to identify common barriers as well as opportunities of this rich and diverse region.

For this study CEE region is defined as the following countries: Austria, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia, also recognised as Three Seas initiative signatories.

Sometimes called 'forgotten space pioneers', CEE countries have made a contribution to the advancement of space exploration. Though started their space adventure behind the iron curtain, today, many CEE countries established their own space programmes and work on their space laws. Today, all the CEE countries are all part of the ESA either as member states or cooperating states and continue to contribute to the exploration of space.

The paper presents the barriers of entering the space sector which can be identified from the space entrepreneurs perspective. Also, the specific perspective of the administration has been outlined. This perspective provides an understanding of the challenges faced by the administration and decision-makers to promote, support and develop a very specific market such as space.

The authors have also presented the legal perspective of operating in outer space. This aspect is presented from the perspective of space law, but also from the perspective of the space contracts practice .

The obstacles presented do not cover all aspects to be considered when doing business in space, but can focus on the most important ones from the perspective of CEE.

In this section, the focus is on the business perspective. The administrative and legal perspective will be presented in the following sections.

The understanding of the specific approach and position of the CEE countries to the space economy needs at least a short description of the history of entering the ESA space market. The Polish example may be indicative. The history of formal cooperation between ESA and Poland started in 1992. At that time Poland had cooperation agreement with ESA. After the 10 years later in 2002, a prolongation agreement was signed. In 2001 ESA defined dedication program called “Plan for European Cooperating States” PECS. Poland joined this program in 2007, the biggest advantage of which was possibility to participate in ESA programmes.

That long period from establishing ESA and Poland accession to its structures, does not mean that Poland was not active in space activities, but that, due to political reasons, main focus was on cooperation with the Soviet Union. In in the 70s of last century, Institute of Aviation (ILOT) was developing a metrology rockets with the attitude of near 100km. In 1977 there was established the Space Research Centre of Polish Academy of Sciences (CBK). From that time, many instruments were designed, developed and launched by CBK. The career development paths from 1977 till 90s last century, were focused on scientific or engineering development. The education path followed the clear scientific track. Engineering activities in institutes led to obtain the scientific title, which ensured employment. As from 2007 the possibility of entering the space sector started to increase. Still the major role was being played by the Scientific Institutes, however on universities, which were closely collaborating with scientific Institutes as ILOT or CBK, students associations were starting to be set.

The basics of the engineering knowledge was available mainly in scientific institutes, which was due to a limited number of faculties related to the space sector, though this knowledge was well established due to significant number of instruments designed and developed. Participating students starts to gain more and more technical knowledge. New projects start to be run in students associations with, not well known at that time, knowledge about ESA standards.

2. Prospects for space industry in CEE

CEE region is in a very interesting situation. Most of the countries hold some, so called, space heritage gained either under Interkosmos programme or through other international cooperation within countries behind the iron curtain. But, their chances for broader international cooperation were extremely limited in the years of most dynamic growth of global space market in and after the “Apollo” era.

Ten out of twelve CEE/Three Seas countries are members of the European Space Agency or associated countries. All together they constitute the 7th power in ESA with more than 5% of total Agency’s budget.

Their specialities are very diverse reaching different fields and areas. But, this variety could be considered as advantage when it comes to joint projects. CEE countries may complement each other without stepping into direct competition, especially in broader cooperation with other powerful ESA countries.

CEE countries when acting separately tend to incorporate their industry, composed mainly of Small and Medium Enterprises (SMEs) into larger European or global supply chains. It is relatively easier within ESA thanks to Agency’s geo-return rule, but still difficult. It becomes particularly visible in ESA’s big flagship initiatives, like big scientific missions (JUICE, LISA, Athena) or European Exploration Envelope Programme. For example, CEE countries involvement in International Space Station development is marginal. The same with European Service Module for Orion spacecraft or the Gateway. Big programmes are difficult for small countries to participate in.

Therefore, many of CEE companies look for their luck in the so called New Space. These entities successfully compete on ever growing private space market offering niche solutions with cubesat technologies and miniaturised payloads. They are also eager to explore new customers eg. from Arabic countries, as well as Africa. But also, South America, Australia and far East. This is particularly visible on the example of Poland, where companies push Polish Space Agency to organise connections, including stands on International Space Fairs organised in above mentioned regions.

When describing the space sector in CEE region, it is worth to mention downstream technologies. Use of space becomes more and more popular and SMEs from CEE region seem to performing very well in this area. Especially, solutions that offer the practical use of Earth Observation data are well advanced, attractive and competitive.

When it comes to governance of the space sector in various CEE countries, the analysis becomes more tricky. The organisation of the space sector is very different among CEE countries. In most cases responsibilities for space policy remain distributed among many

administrative bodies without clear indication on who is ultimately responsible for certain area. This leads to inefficiency of the administration of space sectors in most of the CEE countries. For example, as for the cooperation with NASA, so far Poland is the only signatory of the Artemis Accords in the region.

Although, as indicated in the introduction, the CEE countries share a common history of the beginnings of their space exploration and a similar start in the world of democratic space conquest, each is in a slightly different place. This undoubtedly makes it difficult to compare them according to uniform criteria. The six CEE countries are differing as regards the implementation of the space strategy and national space programme, the institutional help for the local space industries, the establishment of national space agency. Due to the differences in the size of their economies, also difference in space sector numbers cannot be a decisive indicator for comparisons. There are also some similarities, such as set up relations with ESA (though of different nature) as well as lack of national space laws.

Pausing for a moment on the importance of the National Space Strategy [1] and the National Space Programme, the example of Poland can be set. Even just the adoption of a (Polish) space strategy constituted a strong impulse for the development of the sector, thanks to which numerous institutions and entities finally obtained a clear picture of the desired directions of development. The most important assumption of the strategy was to bring about an increase in the turnover of the Polish space sector and to achieve a 3% share in the European space market in 2030. Achievement of this goal would be a very significant strengthening of the potential of the Polish space industry. It would also mean a qualitative and quantitative leap in the capabilities of this industry. In addition, the strategy aims to bring about a state in which the Polish public administration will be able to use satellite data to fulfil its tasks more quickly and efficiently, and national companies will be able to fully satisfy internal demand for such services and export them to other markets. The strategy also aims to ensure that the Polish economy and public institutions have access to satellite infrastructure to meet their needs, especially in the field of security and defence.

This should be juxtaposed with the European strategy for the development of the space sector. What has been recently stressed, the EU space programme covering the period to 2027, constitutes also the chance for the CEE region, the more that it has recently been perceived more and more as a successful explorer of a unique niche in spacetech (mentioning just few start-ups like EduroSat in Bulgaria, SpaceIt, Romania's ARCASpace, SpaceKnow in Czechia and many others, are paving their tracks in space tech.[2]

There is however also the other side of that coin. One has to be aware of the limitations of the CEE space sector, the gap between the assumptions of the space strategy and reality (as in Poland), i.e. the non-existence of an upstream market, the relatively low level of public investment in the space sector, poor access to space funds and capital, and the lack of awareness of the space potential among local authorities, the lack of cooperation between industry and scientific institutions, and the lack of recognition of the space sector as a priority. This reality seems to be changing, and it is also reflected in the shape of the draft law.

The balance for the above shortcomings can be searched in a concept of creating a new model for the development of the economy, based more on knowledge, innovation and technological progress than on low production costs. Space sector in all the CEE countries was recognized as one of the industries that can contribute to achieving this goal. Its key advantages are: strengthening contacts between science and industry, creating innovative technologies, and stimulating foreign cooperation. [3]

In addition to each CEE country looking for its own niche and way forward in the space sector, efforts are being made for regional cooperation to create a counterbalance to the highly developed and technologically established countries of Western Europe. This can be seen, for example, in Memorandum of Understanding of the Visegrad Group Countries on Enhancing Cooperation in the Field of Space Research and Peaceful Use of Outer Space signed in December 2021. This can help overcome at least part of the shortcomings mentioned above. Thus, such issues as sharing experience and knowledge, fostering academic, scientific and industrial cooperation in space-related research, development and innovation, and to support the forming of joint consortiums to increase the competitiveness of the space industry in international space programs as well as initiating joint projects to increase the visibility of the Visegrad Space Cooperation outside of Central Europe – all can be of importance as a counterbalance of unique know-how and high entry barriers, that have made it so far the exclusive domain of larger countries and big global firms.[4]

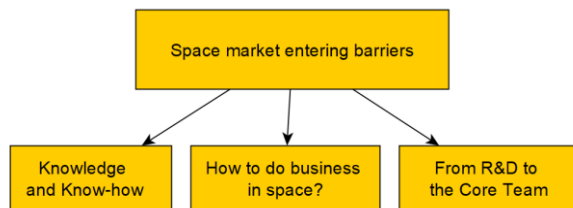
3. Space market entering barriers in the CEE

Entering the space market is a complex task for entrepreneurs. There are many factors that determine the attractiveness of the sector, which determine whether entrepreneurs intend to enter this ecosystem. CEE is quite specifically situated from that point of view, both geographically and historically. These connotations cannot be ignored, as form an important specifics of that region. Historically, in the early 70s, 80s or even 90s of the last century, there were few, if any, private companies

operating in the space sector. Activities in the space sector were reserved for national companies or scientific institutions. Moreover, most of the links to the space sector led to the Soviet space programme [16].

New businesses are linked to the new opportunities that entrepreneurs are seizing. The decisive turning point has been the entry into the European Space Agency community (for all these countries which did it). Based on this starting point, this paper presents the analysis of the barriers from the entrepreneurs' perspective from CEE.

The range of the barriers which can be identified from the entrepreneurs' perspective is wide. From the perspective of CEE, the authors propose to group them into three main categories.



The first group of obstacles is called "knowledge and know - how". To do business in space, companies must offer the knowledge and technology and know how to implement it.

The second group of obstacles is called "How to do business in space". Entrepreneurs need to know about all the formal aspects necessary to operate in this sector.

The third group is called "From R&D to the Core Team". The space business requires a maturation of the processes, the operational aspect of the business and the technologies to enter the core team of key subcontractors of high TRL systems.

3.1. Knowledge and know-how barriers

In order to enter the space sector, the company must demonstrate a certain knowledge or know-how that is useful for space programmes. This requirement applies to both the institutional and the new space market. As mentioned in the Introduction, the most important knowledge in CEE is based on the experience of scientific institutions and former employees of these institutions. The first companies that started operations in Poland were spin-off companies and subsidiaries of foreign companies. Both types of entrepreneurs relied on the same resources. Over time, educational opportunities were recognized and focused more on the space sector. [5] This provides an opportunity to educate and train new resources to develop the companies or expand the portfolio of projects.

To overcome this obstacle, it is important to focus on the technology sector and find a specialisation. Cooperation with scientific institutions is important and brings advantages. The combination of technology and

knowledge of the specifics of space projects can bring the necessary business advantage.

The situation is different for subsidiaries of foreign companies. From the perspective of the national market, this situation can be both an obstacle and an opportunity. On the one hand, competition with experienced foreign companies in scientific programmes is difficult. The flight heritage and background of these companies is solid. On the other hand, such companies offer a great opportunity to develop well-trained, inexperienced staff. Knowledge transfer is fast and the "learning by doing" approach is most effective. Over time, employees seek new opportunities and knowledge transfer takes place throughout the industry.

Nevertheless, it is a major challenge for new entrants to propose technological solutions that allow them to be visible and attractive in the space market. The situation may be different in the case of new space, where the requirements are lower.

3.2. How to do business in space – barrier

Doing business in space is a specific issue. The structure of funding is complex. The list of possible programmes available to each country is always a matter of country strategy. In the case of an institutional market like ESA, entrepreneurs need to understand the distinction between mandatory and optional programmes. How to apply and enter the ESA schemes and tendering processes. Once identified the most promising, the hurdles begin to rise as the application process is non-trivial. Please keep in mind that previous experiences in the space sector of CEE were in most cases directly linked to the Soviet programmes, where the selection process was not transparent and in many cases based on political decisions. In the case of the ESA programmes, the technological argument is one of many where the management aspect also plays a role. In addition, there are the requirements of the European Committee for Space Standardisation, where the product assurance and quality control aspects play an important role. The elements described here are obvious to people working in the space sector, but very often create such barriers that ultimately lead to the decision not to enter the industry. In each new Member State, ESA organises training courses entitled "How to do business with ESA" or "How to write successful proposal". Such initiatives are crucial for the business development of any company.

We must not forget the new space market where purely commercial activities are planned. The new era of CubeSats and small satellites has produced entrepreneurs who are not in the institutional market. They produce their own products, which may be of low quality and at a low price, but are fast and easily accessible. In many cases, these companies were founded by former employees of the institutional market who have

experience and the necessary know-how. At the beginning of this century, it was not possible to implement such an approach in CEE. Over time, however, such initiatives have become visible with success through the support of national foundations. The long-term perspective is still in question.

This group of obstacles includes those related to administration and all aspects of law. These types of obstacles and perspectives are described in the following chapters.

3.3. From R&D to Core Team – barrier

The last group of identified barriers is based on observation of the developing space market in CEE. Companies identify the technology area in which they want to grow their business and provide their know-how. They then invest time and resources to explore the ecosystem of the space sector. As part of this process, they are well positioned and know how to apply for the projects and even start applying for the prime contractor tenders for science missions in the mandatory programme. In this case, the companies that have overcome the first and second group of obstacles face the challenge of professionalizing their operations. The size of the company grows from a group of 3 or 5 people to 30 or 50 people on board. The management and operational situation starts to change. The processes which were known and trained as a part of the business now need to be defined, implemented and controlled precisely. New staff are hired with limited knowledge of the specifics of the space requirements, but with good technical skills and need to be trained. Knowledge management starts to play an important role in project implementation. Project management rules need to be introduced and former managers need to become top managers or hand over this role to experienced managers and let them organise the company. The PA & QA standards are also starting to play an important role as the technical complexity of the projects is much higher. The demands of the main contractors on the core team members are much higher than in R&D projects.

This process requires a change in mentality and realising that the space business is very demanding across a wide range of specialisations. In this case, there are internal organisational barriers and also the availability of specialised resources in project, operational, knowledge, risk and quality management. Knowledge management is crucial to transfer and retain knowledge within the organisation. One of the most important aspects is the retention of knowledge and know-how when a team member decides to leave the company. It can be observed that the most important and best team members are not only important for the national companies but also for the whole European space market.

4. Politics and administration barriers

As was mentioned in the beginning, Poland seems to be well prepared from the institutional point of view to play an important role in the European space sector. The space strategy has been adopted and the works over the national space programme are well advanced. The interests of the Polish space sector seem to be well protected by the Polish Space Agency. The rationale of its establishment as outlined in the statement of reasons within the bill on POLSA pointed out that the main barriers to the development of the space sector in Poland were of an organizational and financial nature, and suggested that these challenges could be overcome with the creation of a centralized government institution that would manage funds for research and development of space technologies, and apply these technologies to sectors of significant importance to the national interest. Thus the main reason for the establishment of POLSA was to coordinate the opportunities of the Polish space sector companies and research institutions to access the opportunities associated with the ESA membership. Therefore, the Agency was created to support the Polish space industry and coordinate the space sector by combining the world of business and science, ensuring the coherence of the Polish space policy and programs, representing the Polish economic and scientific interests before ESA, obtaining ESA funds for Polish entrepreneurs, and promoting the development of satellite technology. [6]

Still, in spite of these hopes, the experts show that the administrative barriers are still existing and these are mostly institutional ones. This is especially seen in the relatively low level of public investment in the space sector, poor access to space funds and capital, relatively low contribution to ESA.

What is particularly stressed by the experts is also the low public support for space activities due to ignorance of the capabilities of the space sector in Poland and its achievements. This translates into low investment in innovation and weak demand for the services of space companies in Poland from the public and industrial sectors.[7].

5. Legal barriers

Law has accompanied the exploration of outer space since its dawn. Initially in the form of United Nations resolutions and progressively adopted Space Treaties, then through bilateral or multilateral agreements on specific projects (such as the IGA on the International Space Station), and national laws governing space activities. Despite the great diversity of approaches and concepts, these regulations have been guided by the same goal, namely to establish common rules and boundaries for human activities in space, so that they take place

while respecting the interests of all parties and ensuring security.

If so, space law should combine political and declarative aspects of highly general statements with a practical approach, going down to the level of technical conditions for performing space activities. Space law may be then perceived as a tool for risk management of space endeavors. It should not only be consistent with the political goals, including national space policy and space programme, supportive for the space entrepreneurs undertaking this ultrahazardous activity, same time guarantying the public safety in line with the stage of technological development. First thing however, space law should exist.

Analysing the barriers faced by the space entrepreneurs in CEE region, three issues may be of importance. Firstly, the existence or not national space laws and, secondly their content, especially within the field of subject and scope of the space activities, licensing requirements, as well as liability for damage and third party liability insurance. The third, not less important issue consists of the manner of enforcing the law by the public authorities.

5.1. Lack of national space law: barrier or opportunity?

Looking for the common features of the space legal order in the CEE countries, the first, striking issue is lack of the dedicated space legal regime. From the other side, all the countries of the region declare their enthusiasm in drafting the laws on space activities.

Should lack of the space laws automatically be perceived as a barrier for the entrepreneur to enter the space market? The opinions in this respect are divided. On the one hand, the space law, which in principle always introduces (according to Article VI of the OST) licensing and supervision rules, can be seen as a nuisance, and its absence can be seen by entrepreneurs as a manifestation of economic freedom. The other side of that coin, is that lack of national space law means also lack of risk sharing regime, where the State can guarantee, at least partially, the coverage of the liability for damage. Needless to say, lack of dedicated regulation brings even more risks to the State, which is bound to adopt space law by force of OST and which bear full liability for space damage caused by its nationals.

Having even only this issue in mind, we may state that in all countries of the CEE region exists a legal barrier of that kind. Though all of them joined the space treaties, none of them so far adopted national space law. As was mentioned, what is however perceived by experts as a barrier, by entrepreneurs may be seen as an opportunity. It results visible so from the statements of US NewSpace, stressing that CEE region may even have an advantage over the western part of the continent given a lack of

regulatory pressure on start-ups in the spacetechnology sector.[2]

Poland seems to be the most advanced in this process and will serve as an example for the analysis in this respect. Nevertheless, it should be mentioned that the Slovak Ministry of Foreign and European Affairs initiated preparation of Slovak space legislation in cooperation with other ministries. It was stated that the adoption of the Act on Space Activities in the Slovak Republic is a necessary pre-condition for the further development of the space activities in Slovakia, including determining the competencies of state administration authorities[8]. Similar situation takes place in Czech Republic, where national space register has been established by the Government Decree 326/2014 and the draft law implementing Article VI of the Outer Space Treaty has been under preparation for several years, the responsible institution is the Ministry of Transport. [9]

5.2. Shape of space law

On the tenth anniversary of attempts, Polish space legislation finally has a chance to become part of the global *Corpus juris spatialis*. The official works commenced in 2012, when Poland joined the European Space Agency. However, the first draft of the law 'on space activities and the National Register of Space Objects' has not been published until 2017. Subsequent versions of the draft were subjected to industry discussions and expert analysis in 2020 and have now become a legislative priority in 2022. [10]

Poland has ratified four Space Treaties (excluding the Moon Treaty), which implies an obligation to adopt national space legislation. However, the necessity to adopt the law is determined not only by international obligations but also by the internal assignments set in the Polish space strategy. The ambition of the Polish legislator is thus not only to fulfill Poland's international obligations, but also to make the space law a lever for the development of the Polish space sector. The big question that has been keeping authorities and experts involved in the process of drafting the Polish Space Act awake at night is how to reconcile the interests of the state, i.e. first and foremost public security considerations, with the needs of the space entrepreneurs and prospect of the sector's development. How to make the law real, but also a facilitator, and not a barrier.

Having in mind the subject and scope of the law, it seems important to adapt the shape of national legislation to the stage, capabilities and ambitions of the domestic space industry [11], as expressed in the Strategy for Responsible Development, the National Space Strategy and the assumptions of the National Space Programme (although not yet officially adopted by the government).

For this reason, there should be a careful adoption of the patterns coming from other states, as they may prove to be inadequate to the geographical, political and economic factors of the country and region.

Looking at the Polish draft space law, we may see that it shall regulate both space activities and, partially, suborbital activities insofar as they take place in outer space. To this end, the draft assumes a broad, general concept of space activities. This is also with a view to applying it to the new types of space activities, such as *in-orbit servicing* and space mining. It does not cover *Near Space (High Altitude)* activities below the outer space boundary, and the intention is to include this type of activity in the aviation law regime as a new, separate chapter or, alternatively, to cover it in a completely separate act. On the other hand, the type of high-altitude activities that will at least partially take place in outer space will be qualified as space activities. Thus, the proposed definition of space activities will include: "the *launching or attempted launch of a space object into outer space or the commissioning by an operator of such a launch. It is also any other activity carried out by the operator in that space or commissioned by the operator to carry out such an activity, including the operation or control of a space object and the deorbiting of a space object, also in case the space object is not intended by the operator to complete one full revolution around the Earth*".

Special attention should be given to the intended regulation of suborbital flights. Dealing with this issue results from Poland's special interest in this field of activity, due to the real possibilities and research work carried out in this field. It is worth noting that analyses are being conducted on the possibility of establishing a launch site for suborbital flights in Poland, as well as activities performed in the air-launch mode. The regulation is intended to respond to interest in this area, although it is considered too early to draft legislation on launch sites for suborbital rockets.

The other major issue that may form a barrier for an entrepreneur is the regime of liability for space damage. These have been designed in the Polish draft law in such a way as to encompass each type of space activities and link it with partial assumption of liability for damage by the State. It is justifiable that, in the conditions of the nascent space industry, the State should assume part of the risk, e.g. by guaranteeing liability in excess of the guarantee sum in third-party liability insurance, but there is no justification for holding the State Treasury liable in a situation where insurance exists (up to the guarantee sum). The limitation of liability will not apply in the case of damage caused intentionally, or activities carried out without authorisation.

Closely related to the liability regime is the insurance obligation. Indeed, the draft imposes an obligation to insure the third party liability of entities conducting space

activities. It will be introduced as a condition for carrying out space activities and specified precisely as to the guarantee sum and duration in the license. On the other hand, the amount of the guarantee sum will be defined in the regulations only in a threshold manner, such that the liability and insurance limit is not to exceed EUR 60 million. The specified insurance obligation as to the amount will be based on an individual risk assessment verified during the licensing process. In this way, the legislator intends to diversify the insurance requirements by relating them to the real level of risk and thus, also as far as possible, not to place a barrier to the newcomers in the space industry. An additional solution is to be an exemption from the insurance obligation for scientific, educational missions or those carried out in the interests of State security. In these cases, the State will assume full liability for damages.

In view of the above, the Polish draft seems to meet the requirements of both the Space Treaties and those developed in the international space law doctrine of such basic features to which national space law should conform. This is because it assumes the reflection of the national space strategy, coordination with international space law (both hard and soft law), and also fits into the system of national law, primarily aviation law (due to the intention to regulate suborbital flights). It introduces a legal regime for the preservation of safety on the ground and in space, as well as a liability regime linking the domestic legal system with international obligations [12].

Having this in mind, it seems that the Polish space law has all the chances not to create particular barriers to enter the space market by the entrepreneurs. Its subject and scope is drafted broadly and in a flexible way. The liability for damage is to be partially assumed by the State and the insurance obligation will be adjusted each time to the actual level of risk.

5.3. Culture of enforcement of the national space law

The third issue, the methods of enforcing the law, the approach of the public administration to the entrepreneurship in Poland may be the most problematic.

A long tradition in Poland, dating even back to the 19th century, is the lack of trust in State bodies. This feature is somehow common for the CEE countries due to the unfortunate heritage of the XX century communistic system. This trend has not changed dramatically today either. According to surveys, entrepreneurs do not believe in the efficiency of public institutions and that they work in their favour. This feature may be somehow common for all the CEE and it's visibly opposite to the 'western' tradition of enforcing the law, and cooperating between authorities and entrepreneurs [13] (e.g. explicitly provided in the American Code of Federal Regulation possibility of oral

consultations with the FAA as regards the licensing process and requirements).

Undoubtedly, the administration's rigid approach to the application of space law, without taking into account the purpose of the operation of specific provisions, and a strong aversion to the risk of interpreting the law favourably for entrepreneurs can be a significant barrier to entry and operation in the space sector, particularly given that space activities are subject to constant oversight both at the licensing stage and during operation.

Thus enforcing space law in a manner respecting the interests of both sides seems to be the greatest challenge for the CEE countries.

In this respect, every effort should be made to ensure that a reasonably structured law also retains its flexibility in action (e.g. basing administrative acts on objectives, while allowing the operator a large degree of freedom as to how to achieve these objectives), including through procedural facilities (e.g. the possibility of consulting the authority, or obtaining approval of individual elements of the activity in parts, etc.). A law in action that does not create a barrier for entrepreneurs is also the need for administrative staff with high competence, experience and culture - not only technical, but also in terms of their ability to conduct an active partnership dialogue with representatives of this regulated industry from participation in legislative work through the process of applying the law. This can make the state authorities, with all their firmness for safety reasons, act as a kind of patron for the development of this sector of the national economy.

It is necessary, therefore, to go beyond the traditional administrative culture specific to CEE countries (Poland in particular), so that high-risk activities for all its participants do not receive an additional legal barrier to entry into this very young sector.

5.4. Understanding of contractual aspects

Issues analysed in this subparagraph, though legal ones, are also directly linked to the section 3.2. of the paper "How to do business in space". Understanding the specifics of contractual issues is an important part in operating in ESA market and may appear as a barrier for the newcomers from the CEE region. One of the most important aspect, which face the new entrepreneurs are Intellectual Properties Rights. Understanding of the solutions used in the ESA project required acceptance, especially the concept of sharing the IPRs is low.

It is so in spite of ESA declarations that its central objective of IPR policy when contracting with industry is to encourage registration of IP from ESA contracts to better protect the contractor's and the Agency's interests, exploitation of IP from ESA contracts. The proper

understanding and know how in this respect is still missing and may be perceived as a constraint for the unexperienced newcomers [14].

6. Conclusions

The barriers presented in the paper were to show the perspective of the problems that new member states from the CEE region might face. In the case of a new space market, the obstacles are also applicable, but the specific barriers entering the ESA market do not apply, rather commercial aspects play a role. Importantly, the barriers described are used as lessons learned.

The groups of barriers identified at the beginning of the paper can be developed into more specific barriers and used for risk analysis in the development of the business or new economic sector in the country. At each step, the aspects of know-how, management and business development need to be considered.

As a conclusion for the legal considerations, it may be said, there is a chance that not only the Polish Space Act, but also the other CEE space laws will be important not only for their internal legal systems, but also will form a lever for development of the local space industries. The challenges faced by the entrepreneurs and administration is not to freeze the legal regulations but stay flexible and open for the dialogue, as it became a industrial and regulatory practice, where the authorities act as partners and not just controllers, having in mind that both sides' objective focus on economical success and the highest safety. Such an approach is the fundament of the success of the American space industry, so let it be so also in the CEE region.

An analysis of legislative efforts in Poland, including an attempt to incorporate the features and needs of the Polish space sector, indicates that there is a good chance that Poland will soon have a stable legal basis for the development of space activities. Countries following a similar path, including the Czech Republic, show the ambitions of the CEE region in the area of space exploration development. It seems that this can have a very positive impact not only on the coherence of this area of law, even though it is not subject to harmonisation in the European Union, but also on the sustainable and stable development of the space industry in Europe.

References

[1] Polish National Space Strategy – resolution adopted by the Council of Ministers on 26.01.2017 (Polish Monitor of 17.02.2017, item. 203)

[2] N. Đorđević, Central and Eastern Europe's spacetechn start-ups are ready for launch, September 9, 2021; <https://emerging-europe.com/business/central->

[and-eastern-europes-space-tech-start-ups-are-ready-for-launch/](#); accessed on 31.08.2022

[3] Z. Brodecki, K. Malinowska, Regulacja odpowiedzialności za szkodę i jej ubezpieczenia w przyszłym polskim ustawodawstwie kosmicznym, PiP 2/2019

[4] Memorandum of Understanding of the Visegrad Group Countries on Enhancing Cooperation in the Field of Space Research and Peaceful Use of Outer Space signed in December 2021

[5] K. Malinowska, M. Szwajewski. The role of the key educational paths for ESA new member states as a risk reduction index for the newcomers. 4th Activities on Space Educational Activities, Barcelona, April 2022.

[6] Bill on Polish Space Agency of 14.09.2014 (Dz.U.2020.1957)

[7] sectoral analysis by P. Kurczak Kaczmarek of Kozminski University 2021][unpublished]

[8] Ministry of Education, Science, Research and Sport of the Slovak Republic, A conceptual framework of space activities in the Slovak Republic For years 2020+

[9] K. Štenclová, Článek VI. Kosmické smlouvy a jeho implementace v podmínkách České republiky, Diplomová práce, Právnická fakulta UK, 2021]

[10] 2017 Draft law on space activities and the National Space Objects Register. Available from the Government Legislation Centre: [//legislacja.gov.pl/projekt/12300856](http://legislacja.gov.pl/projekt/12300856); (accessed 20.08.2022).

[11] I. Marboe, *National Space Law*, in: [eds. F von der Dunk], *Handbook of Space Law*, Edward Elgar Publishing, 2015, p. 185

[12] H. R. Hertzfeld, *Issues in Developing National Space Policy and Laws*, U.N. Workshop on Space Law, Abuja, Nigeria, November 2005, <http://www.unoosa.org/oosa/en/ourwork/spacelaw/publications.html>. (accessed 20.08.2022)

[13] Zsolt Boda, Gergö Medve-Bálint: “Does Institutional Trust in East Central Europe Differ from Western Europe?” EQPAM Volume 3 No.2 April 2014]

[14] ESA, Industry and Intellectual Property, https://www.esa.int/About_Us/Business_with_ESA/How_to_do/ESA_Industry_and_Intellectual_Property; accessed 31.08.2022