

# ESA Enlargement

What Interested Countries Can Do to Prepare Themselves for  
Ultimate Accession - With a Special Focus on the CEE Region

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# Executive Summary

## Background

Since its establishment, the European Space Agency (ESA) has been a pole of attraction for all European countries wishing to conduct space activities in a cooperative, effective and profitable manner. In fact, since the ESA Convention entered into force, an increasing number of countries has started to move towards a closer relationship with the Agency, and new partners have progressively joined the founding members. Starting with 10 member states, ESA has grown to now have 20 member states with several more preparing to join.

This progressive enlargement was envisaged from the outset and, in a sense, the ESA Convention addressed all European countries. In fact, the core purpose of ESA “to provide for and promote cooperation among European States in space research and technology and their space applications”, as set out in Article II of its Convention, has gradually reinforced the idea of building up an Agency that is truly representative of European identity. It can be envisaged that all EU Member states will ultimately become ESA member

states, and that Switzerland and Norway, despite their lack of membership of the EU, will continue being part of ESA.

With the recent EU enlargements towards Central and Eastern Europe, the scene has been eventually set for the gradual enlargement of ESA by all the member states of the EU not yet members of ESA, bringing the total membership to 30 in the medium term (EU28 plus Norway and Switzerland). An analysis of this enlargement process firstly requires an in-depth review of the boundary conditions and the current support framework provided by ESA as well as a detailed investigation of the situation in each of the aspiring member states.

## The Framework for ESA Enlargement

The ESA Convention pays special attention to international cooperation and envisages the possibility of accession for all European countries.

Historically, the Agency’s composition has been built up as part of a gradual and step-by-step process. The original configuration is illustrated in Figure 1.

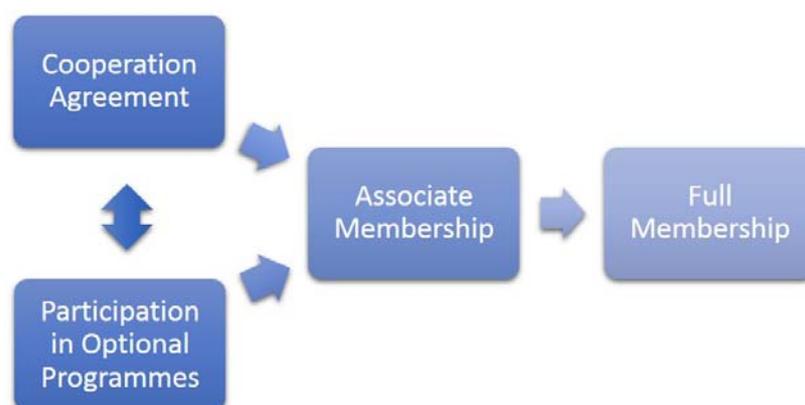


Figure 1: Original accession process

This process has followed an evolutionary pattern. Participation in ESA optional programmes and the acquisition of Associate Member status were not considered mandatory for a state to become a full member of ESA, but were intended as intermediary steps for easing the process of integration into ESA.

In many cases, however, the integration process proved to be both lengthy and complex, simply because different European countries were not at the same level in terms of space-related industrial and scientific capabilities. While some of them were characterised by economies of scale and advanced space capabilities, others were just new en-



entrants on the supply side of the space market and found difficulties in adapting to the ESA environment.

In this context, it is noteworthy that ESA was not only intended to accommodate the accession of new European member states, it was also designed to be enriched with new cooperative supportive mechanisms for new entrants. In fact, in the history of the Agency, cooperation schemes have been gradually modified and enhanced with new steps and supporting measures aimed at better harmonizing the integration process. The Plan for European Cooperating States (PECS) is a special measure for potential candidates that aims at strengthening the links between European Cooperating States (ECS) and ESA as well as assisting in the development of a national space industry. In addition, transitional measures accompany new member states during their first years (6 to 9 years) in ESA in order to ease the integration of their industry. Finally, the enhancement of the ESA education programme, the establishment of bi-annual consultation meetings and the invitation to the EU member states to attend ESA Councils, also respond to the logic of facilitating the accession of interested countries.

Despite the introduction of all these supportive measures (which are discussed in further detail in Chapter 2 of the present report), new entrants have still had a hard time adapting to the ESA environment and its exigent requirements, due to the size of their economies, the situation of their space industry or their modest level of investment in the space sector in the past. It is expected that future members may find similar or even harder difficulties.

In this respect, it becomes clear that, in addition to ESA, aspiring countries on their own also have to define instruments and implementation strategies to prepare their industries to win work in ESA. In spite of the geo-return principle, the experience of some new member states has shown that the ESA environment is very competitive, its requirements exhaustive, its standards high and its "culture" tremendously complex.

#### Discussing the Accession of New Member States.

Understanding the difficulties that aspiring member states might face in acceding to ESA and subsequently identifying possible tools to facilitate their integration requires a detailed investigation of the experience of and situation in each aspiring country. Taking these analyses into consideration, it is likely that both recent and aspiring ESA member states

will face several challenges in the coming years.

To meet these challenges, in March 2012 ESPI organised a workshop entitled "*ESA Enlargement – What interested countries can do to prepare themselves for ultimate accession*". The objective of the workshop was to set up a discussion platform with ESA aspiring member states to elaborate on the process of facilitating their participation in ESA. The event also saw the participation of several personalities from ESA as well as speakers from the policy-making side, the business sector, space industry and organizations, who together discussed the opportunities and challenges of aspiring members' integration processes. A summary of the workshop is at Annex A.1.

Based on the discussions and findings of the workshop, this report specifically analyses the experience and status of three recent ESA member states (namely the Czech Republic, Romania and Poland) as well as of potential future members of the Agency (Estonia, Hungary, Latvia, Lithuania, Slovak Republic and Slovenia). It must be noted that, although the integration process is addressed to all European states who are not yet members of the Agency, to date it is mainly focused on the CEE and the Baltic region and is being implemented at different levels, according to the status of the involved country. Therefore, the present report also concentrates on this region.

Countries such as the *Czech Republic*, *Romania* and *Poland* have already gained member status, while other countries such as *Estonia* and *Slovenia* are participating in the PECS programme. It is expected that they will join ESA in the 2015/16 timeframe. Countries such as *Latvia*, *Lithuania* or *Slovakia*, who have only signed a Cooperation Agreement, might join the Agency later, around the year 2018, which might also end up being the timeframe for the accession of Hungary. To date, Bulgaria and Croatia are the only EU member states that have not yet signed a Cooperation Agreement, despite their announced intention to participate in ESA activities.

Eastern European countries show similarities because of their common history: most of them gained valuable expertise in the space field during Soviet times and still have talented space scientists and engineers. However, the situation of each state is very different in terms of economic and political support for space activities and each of those countries has its own specificities in terms of expertise, space activity management, funding mechanisms, policies and priorities.

Most recent and potential future ESA member states have established an institutional framework for space activities. However, there are significant differences between the countries, ranging from very well established agencies to a few dedicated offices within a ministry. Another important factor in this context is the development of a national space programme that aims at strengthening the national space industry as well as preparing companies and scientific institutions for space activities in the international field. The process of institutionalisation seems to be proceeding – but not in all cases – hand in hand with the process of involvement with ESA. As a matter of fact, countries that have already joined ESA tend to have a much more institutionally entrenched framework for space activities than ECS or countries with a framework agreement. Space activities in Latvia, Slovenia and Hungary are mainly entrusted to more recently established and less entrenched structures, the exception being Estonia with a highly sophisticated set-up. Countries that have only signed Cooperation Agreements with ESA (Lithuania, Slovak Republic) have no specific institutional framework and no specific national agency is foreseen for the time being. In these countries, the responsible Ministry is the Ministry of Education.

Space activities in all recent and potential future ESA member states are undertaken according to different rationales and priorities. Yet, there are also broad common rationales such as the development of the national economy, industry and scientific institutions, the reinforcement of technological skills, further integration into Europe and the European market, and the will to exploit the societal benefits deriving from space applications. Apart from the recent ESA member states, most aspiring countries have not yet fully implemented a specific and robust space policy. All of them, however, have clearly identified the range of priorities they want to focus on. Taking into consideration the size of their economies, they generally do not aim at having a huge space programme in the near term: they concentrate their limited resources on a few fields or follow a niche strategy by putting emphasis on activities with high economic efficiency. An important priority is the participation in international space programmes that would bring recognition of their expertise vis-à-vis international partners.

The financial framework for R&D and space activities in the recently added and possible future ESA member states shows wide disparities between the different countries, both in absolute and relative terms. The average

R&D expenditure of these CEE countries for 2010 represented only 1,06 % of their GDP. With the exception of Slovenia (2,1 %), the countries have a very small expenditure on R&D, which is approximately half of the EU 27 average level of 2,0% and 1/3 of the target level set within Horizon2020. With regard to the space sector, expenditures are very limited and in fact lower than those of other EU and ESA Members States.

The range of capabilities and expertise of recent and aspiring ESA member states is very wide, taking into consideration their past participation in the Soviet Intercosmos programme and participation in space missions with other international partners. They show a remarkably high level of interest in space science, as well as in navigation and remote sensing applications. It is noteworthy that many of them are also involved in the production/manufacturing of components and software products related to space technology.

Another major variable in the enlargement process is EU policy. The growing interest of the EU in European space activities will in fact significantly influence the already complex framework of ESA relations with its members and aspiring countries. As a result, the enlargement process could also be affected. On the other hand, the EU might also have several motivations in promoting ESA enlargement, mainly given its political will to create a Space Agency for Europe, and could therefore deploy a number of its general tools to support the process (e.g. EU funding mechanisms, framework programmes, technology platforms and education and research activities).

### Recommendations

Based on the experiences of recent ESA member states, on the analyses of the current status of aspiring countries, and on the conclusions of the ESPI workshop on “*ESA Enlargement*”, the present report aims at discussing the possibilities of strengthening the current framework and introducing new tools to respond to the specific needs of different countries and subsequently enable them to achieve “happiness” within the ESA family.

Two main categories of such instruments are presented: those aimed at strengthening national industries and preparing them for the competitive environment in ESA, which can be referred to as industry-oriented, and those that are institution-oriented tools, intended to increase awareness among public and decision-makers in order to strengthen the space education system and to foster



cooperative and efficient relations between government, universities and industries. Firstly, the role of business angels is addressed with the aim of enlarging the national industrial base through the support of start-ups and spin-offs. Mentoring programmes for industry, academia and institutions are proposed with the objective of strengthening the industries, scientific institutions and capabilities of public stakeholders, respectively. The creation of Space Business Incubators in aspiring countries is discussed as business stimulants and instruments for raising awareness to obtain public and political support for space activities. Particular emphasis is placed on the possibility of establishing interest groups for industry and scientific institutions (following the NordicBaltSat<sup>1</sup> example) or public institutions (following the example of EISC). Finally, new possible instruments for ESA are also identified. In particular, the idea of a specific optional programme for ECS countries is highlighted, where industry would be submitted to limited competition. The possible pitfalls and limitations of all these measures are also analysed.

Based on these analyses, several recommendations and actions can be proposed:

#### For Aspiring Countries

1. At national level, the first recommendation concerns the appropriate *organisation and coordination of space activities*. It is essential for most of the examined countries – especially those that have just recently established cooperative links with ESA – to create a more specific framework for space activities in their country. The creation of a space agency is not in all cases a necessity, but having a defined framework for the coordination of space activities is indispensable.
2. Concerning national *space policies*, a primary step is the elaboration of a national space plan providing the basis for the decision making process and defining the national objectives of space activities. A clear long-term vision as well as mid-term objectives to ensure the accomplishment of the former needs to be identified. In the drawing up of a national plan, space priorities have to be defined by the government side and by industrial/scientific institutions in order to build sustainable cooperation based on strong fundamentals.
3. Efficient and mutually beneficial interplay (within and) among the *three pillars* (institutions, academia, industries) has proved to be fundamental in order to optimize the use of resources and integrate complementary capabilities and ideas. Internal coordination (i.e. among the different research institutions or different ministries involved in space activities, which usually have different visions and purposes) constitutes a precondition for relating with other national stakeholders and for the establishment of a “one voice” system towards ESA and other possible international partners.
4. Progressive *budgetary consolidation* appears to be compulsory for all aspiring countries. As the analysis has shown, with very few exceptions R&D expenditures of ESA enlargement States are still low in absolute terms and their R&D intensity represents only half of the EU average level of 2% and 1/3 of the target level set within Horizon 2020. Despite increases in recent years, the budget for space activities in ECS are still too modest, while Framework Agreement countries fail to secure the necessary dedicated budget. In order to avoid a too steep increase in involvement when passing from ECS status to full membership, budgets should be gradually enhanced. In addition, this will bring policy-makers into the arena in order to ensure a predictable and stable funding environment for long-term strategic activities.
5. When focusing on budgetary consolidation, governments themselves should elaborate arguments for the investment in space activities and for ESA participation, and present the benefits of this investment to the wider public - especially in terms of economic growth and the services to be offered. *Raising public awareness* (the creation of a “case for space”) and subsequent political support are preconditions for investing in space. A main tool in this respect is to develop an active and coherent public information strategy, complemented by promotion activities at national and regional scale.
6. Considering the size of the economy of current aspiring ESA member states and their limited financial resources, it is recommended that they follow a *niche strategy* by putting emphasis on selected market opportunities.<sup>2</sup> Small countries in particular, must carefully consider their

<sup>1</sup> The NordicBaltSat initiative (<http://www.nordicbaltSat.eu/front>) is described in more detail in Chapter 0 of the present report.

<sup>2</sup> Beyond reinforcing the industry, by creating a critical mass or by following a niche strategy, it is necessary to be aware of ESA standards and understand “ESA culture”.

broad scientific priorities and focus on the most promising fields. In this respect, it is important to bear in mind that being involved in the supply of space services offers much more growth potential than on the manufacturing side. In this context, the ESA IAP programme has proved to be a useful vehicle to start in this domain.

7. Given the shortage of young aerospace scientists, engineers and technicians in many aspiring member states, the space-related academic system should be strengthened and *educational activities* intensified and better integrated with the needs of the national industry and research institutions. The establishment of mentoring programmes or an institution of dedicated professionals such as professor-consultants could be of great help in realising these objectives. At the same time it is essential to motivate students to study and work in the fields of space engineering, technology and science including through their active participation in practical experiences in real space projects with industry and research institutions.
8. Enterprises and research institutions should encourage and support the establishment of *Clusters and Technology Platforms*. Especially for smaller countries with very few big companies, the creation of groups of interconnected companies and associated institutions (e.g. faculties, research centres, SMEs) in the space field offer, beyond research and market-oriented opportunities, the possibility to overcome the lack of financial resources and mobilize a critical mass of national public and private resources in order to bring tangible results in research and innovative technologies. As shown, other benefits of these networks include access to specialized human resources, suppliers and knowledge. In addition, information flow between the public administration and scientific/industrial institutions of the national space sector would be facilitated.
9. In relations with ESA, on the one side it is necessary to promote and learn about the ESA complex of technical, administrative and financial rules and procedures as well as activities and programmes, courses, traineeships, etc., and on the other side to make ESA learn about the country (priorities, financial situation, capabilities and expertise).
10. At the international level, enabling keys include developing *cooperation with international partners*, both industry (i.e. establishing prime-subcontractor relations with other industries, or encouraging foreign companies to invest in the space sector in ESA enlargement states) and public institutions (in sharing experience and looking for common means to meet common needs (not only in regard to ESA activities). Regional and sub-regional cooperation among CEEs should be fostered also through the development of *Interest Groups*. Such groupings could be institution-oriented (like EISC) or industry-oriented, modelled for instance on the successful experience of NordicBalt-Sat.
11. Active participation in the elaboration and implementation of the ESP, in particular with the aim of fully utilising the opportunities offered by the EU flagship programmes, Copernicus and Galileo, could be a priority. Taking common action towards the EU to facilitate the management of cohesion funds for space applications as a very efficient means for convergence should also be considered.
12. The creation of a dedicated *space incubator programme* in ECS countries through active involvement and coordination between the institutions in charge of space activities in ESA aspiring countries and their respective industries should be considered as another initiative of primary importance. It is worth-mentioning that the establishment of these incubator programmes within ESA enlargement countries would also work the other way round: non-space technologies would be transferred into the space industry. In this way, technology transfers would help to reinforce the national industry by opening space business opportunities for non-space industries, broadening their business area and thus improving their know-how and competitiveness. This objective could be best achieved by facilitating the linkage and the collaboration between these newly established Space incubators and the European Space Incubators Network (ESINET).
13. Finally, the possibility of offering *mentoring programmes* for industry should be seriously explored. In some cases, ECS already have a solid industrial base in non-space related sectors that might be able to be expanded into the space business. Providing space market experience, useful networks and expertise is therefore a primary requirement that could be met by the institutions responsible for space activities in the ESA aspiring countries setting up such mentoring programmes. They could be cost-effective



solutions that would be of great help for ECS. In the execution of such programmes collaboration with established firms and international initiatives (e.g. the Initiative on Space Promotion and Education – ISPE) should be pursued. Through this eventual international collaboration, mentoring programmes could be offered not only to industry, but also to support the institutions of ESA aspiring members in defining and implementing a coherent and effective space policy.

#### For ESA

The aim of easing the process of integration with ESA is hard to achieve if the actions of aspiring members are not complemented by the equally important support of the Agency. Although, ESA is already providing a range of supportive measures the establishment of new tools should be considered.

1. ESA might consider reviving the *Associate Membership* as a further intermediate step in order to alleviate the significant budgetary step-increase when passing from the ECS status to full membership. In this regard, it has to be remembered that the PECS programme has been introduced because the Associate Membership status was seen as a too broad involvement compared to the bare cooperation agreement. However, the same could be said when passing from the ECS status to a full membership. The much bigger involvement required by full ESA membership could therefore be mitigated if Associate Membership would again be possible and would constitute a further supporting measure in the path of rapprochement to ESA.
2. Some of the current mechanisms for cooperation and assistance for aspiring ESA members could be strengthened. Within the new *National Trainee Scheme*, for instance, opportunities are exclusively related to scientific and technical subjects. However, space policy issues are also of vital importance to ESA candidate countries, and therefore the Agency should consider offering policy related trainee programmes as well.
3. The ESA *education programme* could be leveraged more extensively in ECS countries and at the same time cross-fertilised with EU education programmes. Taking into consideration that the programme aims at ensuring the availability of a suitably qualified workforce for ESA and the European space sector in the future, it seems clear that this is also fundamental for aspiring ESA member states. In

addition, looking at the current results of the programme, it is worth noting that the ESA education programme has already produced remarkable results, which were highly beneficial for ECS. Specific education programmes could be of great potential benefit for countries on the road to full ESA membership. Harmonisation with the education programmes provided within the EU frame should be encouraged. Finally, the possibility of leveraging this programme in countries with only a Cooperation Agreement should also be considered.

4. ESA could also define new accompanying measures that would ease the way even further for aspiring countries. The establishment of specific *optional programmes* for ECS countries whose industries would be subject to limited competition might for instance be considered. Such an initiative would help industries in aspiring countries to be better prepared for the competitive environment in ESA and to establish partnerships between companies and institutions from these countries.
5. Finally, the possibility of offering *mentoring programmes* to ECS should be seriously explored by ESA as well. The provisions of such mentoring programme could be for instance contemplated in the PECS scheme or, alternatively when signing the ECS agreement.

#### For the EU

Given the various benefits the EU would gain from ESA enlargement, the EU itself, alongside with ESA and the aspiring member states, could play a more active role in advancing the expansion process.

1. Specific mechanisms for supporting the enlargement process could be established in coordination with ESA. Within the *cohesion policy instruments*, for instance, a dedicated budget for the development of space-based applications could be secured (and managed through an ESA-EU coordination group). The ERDF and the ESF are EU financial instruments that could be deployed in a space context. The particular goal for the ESF, for example, is the creation of new and qualitatively better jobs in the EU by co-funding regional, national and local projects. Space leads to innovation and research and therefore could be key to the creation of new or better jobs.
2. In addition, more *specific education programmes* – possibly linked to those of the ESA – could be offered to ECS.

3. The EU could fund *traineeships for graduates* in the space field that would be executed by and within ESA. Such traineeships could be offered particularly to young people of aspiring countries.
4. It is conceivable that the EU could start *nano-satellite projects, focused on aspiring countries*. By starting such projects, the EU would support those countries in developing their space industry and promoting space to the public. Moreover, it would further facilitate their ESA accession process.
5. The EU could develop *crowd-sourcing* platforms or associated prizes for the best ideas on space. This could be a powerful tool to stimulate young people and to engage a broad segment of the population. Such platforms could be designed especially for youth in aspiring countries under the guidance of experts from European institutions.
6. The EU could *extend its regional initiatives* in promoting education and training as a way of connecting neighbouring countries, by building a platform in the field of space for EU member states that are not yet members of ESA.
7. *Awareness-raising initiatives* (such as the European Space Expo) could be strengthened in ESA aspiring countries.



# 1. Introduction

From its establishment in 1975, the European Space Agency (ESA) was conceived as an inter-governmental organisation open to co-operation with other international organisations and non-member states. Its progressive enlargement with new European member states was envisaged from the very first stages.

The core purpose of ESA “to provide for and promote cooperation among European States in space research and technology and their space applications”, as set out in Article II of its Convention, has gradually reinforced the idea of building up an Agency that is truly representative of European identity. Starting with 10 member states, ESA has grown to now have 20 member states with several more preparing to join. It can be realistically assumed that ultimately all EU member states will become ESA member states, and that Switzerland and Norway, despite their lack of membership of the EU will continue to be part of ESA. At the present time all EU member states that are not yet Members of ESA cooperate with ESA in one form or another.

The recent (i.e. 2004, 2007, 2013) EU enlargements towards Central and Eastern Europe pose a new challenge in the gradual cycle of integration of all EU member states into ESA. As the Director General of ESA, Jean-Jacques Dordain, recently stressed in the Agenda 2015: “the most significant and visible changes for ESA in the years to come are undoubtedly the increase of the number of its member states with a progressive accession of all the EU member states to the Convention of ESA. This will make a different ESA, much closer to the membership of the EU, with many more member states, but still with programmes and budget driven by a few big contributors.”<sup>3</sup> The ESA enlargement process, however, is both lengthy and complex, and presumes a detailed investigation of whether aspiring member states have the necessary tools to integrate their industries and scientific institutions into ESA’s highly competitive environment.

<sup>3</sup> Cit., “Agenda 2015. A Document by the ESA Director General. 29 Nov. 2011. European Space Agency 29 Oct. 2013  
<<http://esamultimedia.esa.int/multimedia/publications/BR-303/pageflip.html>>.

To this end, in March 2012 ESPI organised a workshop entitled “*ESA Enlargement – What interested countries can do to prepare themselves for ultimate accession*”. The objective of the workshop was to set up a discussion platform to elaborate on the process of facilitating the participation of new member states in ESA. The event saw the participation of a number of personalities from ESA and the aspiring member states, demonstrating the relevance of the issue for the future of Europe in space. The International Cooperation program, the Education Office and the PECS program represented ESA. There were also speakers from the policy-making side, the business sector, space industry and organizations (a summary of the workshop is presented in Annex A.1). Based on the discussions and findings of this workshop, this report will first address the difficult transition from non-member state to member state and examine the current supporting framework provided by ESA in the enlargement process. An in-depth analysis of the boundary conditions contained in the ESA Convention, in particular the provisions of Article XIV and XXII as well as the more recent supporting instruments introduced by the Agency will be provided and the socio-economic and political benefits and costs of the enlargement will be discussed.

The focus will be then shifted to an analysis of the current status of recent and future ESA member states, namely the Czech Republic, Romania and Poland on the one side and on Estonia, Slovenia, Latvia, Lithuania, Hungary, Slovakia on the other. The section will provide a comparative analysis of the respective institutional frameworks, policies, budgets and capabilities; it will also examine the relationships with ESA and will finally identify the common challenges they face in achieving “happiness within the ESA family”. The chapter will provide some considerations on the complex ESA-EU relationships and on the role the EU can play in promoting ESA enlargement.

A specific chapter is dedicated to the potential instruments ESA and aspiring member states could use to ease the process of adaptation to the Agency. Experience has shown that despite various supportive measures new member states have had a hard time

adapting to ESA and its exigent requirements. There are questions as to how the existing tools can be deployed by national stakeholders in the best possible manner and questions on new possible tools must also be addressed. Can national stakeholders on their own define further accompanying measures that will ease their way even further? The possibility of setting up new mechanisms of support or specific measures directed to candidate states, including measures these states can take to help their industry and scientific organisations survive in the competitive environment in ESA, is therefore analysed and discussed. In particular, two

main categories of such instruments are presented: those aiming at strengthening the national industry and preparing it for the competitive environment in ESA, which can be referred to as industry-oriented, and the institution-oriented tools, intended to increase the awareness among the public and decision-makers in order to strengthen the space education system and to foster cooperative and efficient relations between government, universities and industries.

Finally, concluding remarks and a list of recommended actions will be provided.



## 2. The Setting

### 2.1 Boundary Conditions

Since its establishment in 1975, ESA has undergone a process of gradual expansion, which, beyond the programmes and the budget, has manifested itself in the direction of international cooperation with third states and organisations and the accession of new member states. As a matter of fact, almost twelve years after the ESA Convention entered into force, the founding members were joined by Austria and Norway, followed by Finland in 1995. In the last 13 years, enlargement has progressed faster and Portugal, Greece, Luxembourg, the Czech Republic, and most recently Romania and Poland have joined the Agency.<sup>4</sup> It is expected that other countries will follow and join the Agency in the medium term. Eastern European countries such as, for example, Estonia, Latvia and Slovenia, are showing a strong interest in further developing their space activities and their cooperation with ESA. This eastward expansion could be beneficial to Europe's space activities and strategies and carries opportunities as well as challenges for both the European space programme and the new member states. The challenges include, for example, the implementation of ESA's industrial policy, which is based on free competitive bidding and a fair geographic return. Relations between ESA and CEE countries started in the early 1990s thanks to PRODEX (Programme de Développement d'Expériences scientifiques). PRODEX is an optional programme launched in June 1986 by the ESA Council. It aimed to provide funding for the industrial development of scientific instruments and experiments proposed by scientific institutes or universities. The Programme was open to both ESA member states and to non-member states.

<sup>4</sup> ESA now has 20 member states: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland and the United Kingdom. "New member states." 2013. European Space Agency 29 Oct. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/New\\_Member\\_States](http://www.esa.int/About_Us/Welcome_to_ESA/New_Member_States)>.

The agency has introduced an integration process and special measures to facilitate the accession of interested countries. The Plan for European Cooperating States (PECS) is a special measure for potential candidates. It aims at strengthening the links between European Cooperating States (ECS) and ESA as well as assisting in the development of a national space industry. Also, special measures accompany a new member state for the first few years of ESA membership in order to ease the integration of its industry.

The situation of each state is very different in terms of capabilities and ambitions. Many Eastern European countries gained expertise in the space field during the Soviet era and still have talented space scientists and engineers. However, some of these countries are facing serious political and economic crises and political support for space activities differs strongly from country to country.

The ESA Convention pays careful attention to international cooperation.<sup>5</sup> In Article XIV, the Convention defines different mechanisms for establishing co-operating links between the Agency and third states or international organisations.<sup>6</sup> According to the Article, cooperation may take the form of specific agreements or participation in one or more ESA programmes. Furthermore, it may also translate into granting Associate Membership to non-member states (see Figure 2).<sup>7</sup> These different forms of cooperation can, of course, be combined. The provisions of Article XXII define the arrangements for accession to the Agency Convention.

<sup>5</sup> When dealing with ESA cooperation, there is a difference between "internal cooperative relations" among ESA member states and "external cooperation", which involves non-member states and other bodies. Internal cooperation is not explicitly mentioned in the ESA Convention and is rather taken for granted.

<sup>6</sup> For an analysis of the origins and the provisions of Article XIV see: Baudin, Catherine. "Cooperation and International Agreements. Article XIV of the ESA Convention." Legal Aspects of Cooperation between the European Space Agency and Central and Eastern European Countries. Proceedings of the International Colloquium Charles University, 11-12 Sept. 1997, Prague, Czech Republic. European Centre for Space Law, 1998.

<sup>7</sup> See Article XIV of the ESA Convention. Resource document: "ESA Convention and Council Rules of Procedure." Dec. 2010. European Space Agency 29. Oct. 2013 <<http://esamultimedia.esa.int/multimedia/publications/SP-1317-EN/pageflip.html>>.

**Article XIV**  
COOPERATION

1. The Agency may, upon decisions of the Council taken by unanimous votes of all member states, cooperate with other international organisations and institutions and with Governments, organisations and institutions of non-member States, and conclude agreements with them to this effect.

2. Such cooperation may take the form of participation by non-member States or international organisations in one or more of the programmes under Article V, 1 a (ii) and V, 1 b. Subject to the decisions to be taken under paragraph 1, the detailed arrangements for such cooperation shall be defined in each case by the Council by a two-thirds majority of the States participating in the programme in question. These arrangements may provide that a non-member State shall have a vote in the Council when the latter examines matters pertaining exclusively to the programme in which that State participates.

3. Such cooperation may also take the form of according associate membership to non-member States which undertake to contribute at least to the studies of future projects under Article V, 1 a (i). The detailed arrangements for each such associate membership shall be defined by the Council by a two-thirds majority of all member states.

Historically, Agency composition has grown as part of a gradual and step-by-step process, which is illustrated in Figure 3. This process has followed an evolutionary pattern, according to which the cooperation established by Article XIV constituted a kind of precondition or springboard for any subsequent accession pursuant to Article XXII.<sup>9</sup> The acquisition of Associate Member status is not mandatory for a state to become a full member of ESA but allows associate members to take part in the agency’s deliberative bodies and also in its programmes and activities. For example Austria, Norway and Finland went through Associate Member status before they later joined ESA as full members, while Portugal, Greece and Luxembourg skipped this interim status and moved directly from Cooperation Agreements to full membership. Also the Czech Republic and the most recent member states Romania and Poland skipped associate membership, but went through the enlargement process via a Cooperation Agreement, ECS Agreement and PECS. The different accession processes of these latter ESA member states are shown in Figure 4.

Figure 2: Article XIV of the ESA Convention<sup>8</sup>

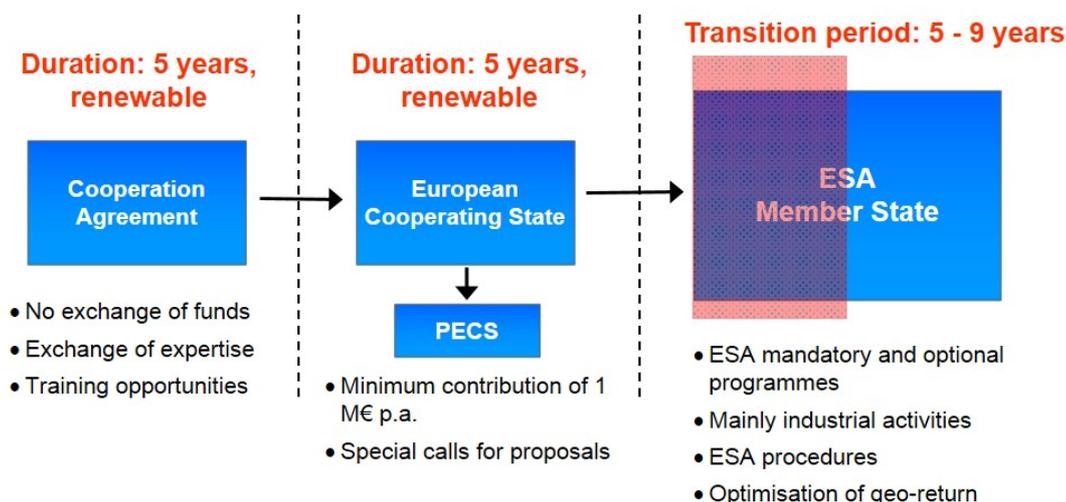


Figure 3: The path from cooperation to membership

<sup>8</sup> *Ibid.*

<sup>9</sup> Poncelet, Jean-Pol, Anabelle Fonseca-Colomb, and Giulio Grilli. "Enlarging ESA? – After the Accession of Luxembourg and Greece." *ESA Bulletin* 120 (November 2004): 51-53.



### Case 1: Austria, Norway, Finland



### Case 2: Portugal, Greece, Luxembourg



### Case 3: Czech Republic, Romania, Poland

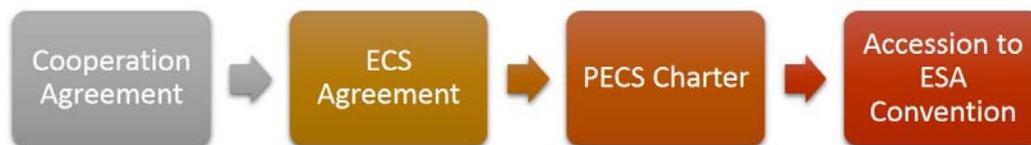


Figure 4: Different accession processes of ESA member states

The ESA accession process has evolved over time and has been gradually modified and enriched with new steps and supporting measures aimed at better harmonising the integration process. The following sections analyse the boundary conditions and specific steps for ESA accession, and focus on new steps and supporting measures introduced for aspiring countries.

#### 2.1.1 Article XIV.1 and Cooperation/Framework Agreement

As discussed above, Article XIV of the ESA Convention contains three paragraphs, each dealing with a different category of cooperation. The first paragraph, given its broad wording, covers a wide range of relations; from simple non-formal arrangements (exchange of letters, trainings, etc.) to formal types of cooperation, which are generally reflected in Framework Agreements. Cooperation/Framework Agreements constitute the first level of formal cooperation with ESA. These agreements exclude any exchange of funds or participation in ESA programmes, but provide the basis for cooperation and for progressing further. In concrete terms, the purpose of these agreements is threefold: they aim at a better exchange of information; at initiating joint training programmes (including exchanges of scientists and engineers); and at facilitating arrangements for specific projects (Implementing Arrangements). The main advantage of such agree-

ments results from the fact that “they establish a number of guiding principles common to the implementation of joint projects”.<sup>10</sup> In many cases, after the signature of Framework Agreements, special implementing arrangements are established for the execution of specific projects. A Cooperation Agreement has to be approved by the ESA Council, by unanimous vote of all member states. At this stage, a country that signs the agreement has very limited financial responsibilities.

The procedure leading to the signature of such agreements can be summed up as follows:

1. The State willing to cooperate must present a formal request to ESA.
2. The two parties then negotiate the terms of the Agreement.
3. The relevant Programme Board, the International Relations Committee (IRC) and the Administrative and Finance Committee (AFC) examine and formulate recommendations with a simple majority vote regarding the cooperation Agreement.

<sup>10</sup> *Cit.*, Baudin, Catherine. “Cooperation and International Agreements. Article XIV of the ESA Convention.” Legal Aspects of Cooperation between the European Space Agency and Central and Eastern European Countries. Proceedings of the International Colloquium Charles University, 11-12 Sept. 1997, Prague, Czech Republic. European Centre for Space Law, 1998: 14.

4. The Agreement goes for final approval to the Council, which requires a unanimous vote of all member states.
5. The Agreement is signed by the Director General (DG) of ESA and the Minister in Charge of Space Affairs of the cooperating state.

ESA Cooperation/Framework Agreements are built on a common model. After laying out the purpose, they define the areas and form of cooperation, the mechanisms of cooperation and the modalities of implementation. They subsequently contain regulations concerning information, data (and personnel) exchange, privileges and immunities and, finally, provisions on the settlement of disputes and entry into force.<sup>11</sup> Cooperation Agreements have so far provided a valuable opportunity to learn about Agency procedures and programmes and to start preparing the industry and scientific institutions of the involved country for the integration process.

### 2.1.2 Article XIV.2: Participation in ESA Optional Programmes

Cooperation under Article XIV.2 of the ESA Convention envisages the participation of non-member states or international organisations in one or more of the Agency's programmes under Article V, 1 a (ii) and V, 1 b. More precisely, a state may participate in mandatory activities, 'ensuring the elaboration and execution of a scientific programme, including satellites and other space systems'. With respect to optional programmes, the participation of a state may include "(i) the design, development, construction, launching, placing in orbit, and control of satellites and other space systems; and (ii) the design, development and construction and operation of launch facilities and space transport systems"<sup>12</sup>

Compared to framework agreements, this represents an "advanced form of cooperation and demonstrates the willingness of a non-member state to become actively involved in ESA programmes and activities"<sup>13</sup>. As far as

the procedure is concerned, the decision of the Council has to be taken by the unanimous vote of all member states, while the detailed arrangements for such cooperation shall be defined in each case by the Council with a two-thirds majority of the states participating in the corresponding programme.<sup>14</sup> A "participation agreement", signed between the Agency and the non-member state defines the arrangements approved by the participating states. These arrangements – as the ESA Convention explicitly stresses – enable non-member states to "have a vote in the Council when the latter examines matters pertaining exclusively to the programme in which the State participates".

In practice, under a "participation agreement" there is little difference between member and non-member states, since also the latter "have the right to vote, attend meetings of the body in charge of monitoring the programme and benefit from the Agency's efforts to ensure an industrial return in proportion to the country's contribution"<sup>15</sup>. It goes without saying that the Agreement also imposes on the participating state the obligation to respect the legal terms defined by ESA for the implementation of the programme.

For many former ESA non-member states, such as Finland, Austria and Norway, the possibility of participating in ESA optional programmes was beneficial in preparing their accessions to the ESA Convention.

### 2.1.3 Article XIV.3: Associate Member State

The step following a Cooperation Agreement and/or the participation in ESA programmes used to be Associate Membership. Associate Member State status is defined in Article XIV.3 of the ESA Convention, which states that cooperation with ESA "may also take the form of according associate membership to non-member States which undertake to con-

<sup>11</sup> As an example, see: "Agreement between the Government of the Republic of Latvia and the European Space Agency Concerning Space Cooperation for Peaceful Purposes." 2013. The Government of the Republic of Latvia and the European Space Agency 29 Oct. 2013 <<http://likumi.lv/doc.php?id=195876>>.

<sup>12</sup> See Article 5 of the Convention for the Establishment of a European Space Agency. Resource document: "ESA Convention and Council Rules of Procedure." Dec. 2010. European Space Agency 29. Oct. 2013 <<http://esamultimedia.esa.int/multimedia/publications/SP-1317-EN/pageflip.html>>.

<sup>13</sup> *Cit.*, Baudin, Catherine. "Cooperation and International Agreements. Article XIV of the ESA Convention." Legal Aspects of Cooperation between the European Space

Agency and Central and Eastern European Countries. Proceedings of the International Colloquium Charles University, 11-12 Sept. 1997, Prague, Czech Republic. European Centre for Space Law, 1998: 18.

<sup>14</sup> See Article XIV.2 of the Convention for the Establishment of a European Space Agency, Resource document: "ESA Convention and Council Rules of Procedure." Dec. 2010. European Space Agency 29. Oct. 2013 <<http://esamultimedia.esa.int/multimedia/publications/SP-1317-EN/pageflip.html>>.

<sup>15</sup> *Cit.*, Baudin, Catherine. "Cooperation and International Agreements. Article XIV of the ESA Convention." Legal Aspects of Cooperation between the European Space Agency and Central and Eastern European Countries. Proceedings of the International Colloquium Charles University, 11-12 Sept. 1997, Prague, Czech Republic. European Centre for Space Law, 1998: 18.



tribute at least to the studies of future projects under Article V, 1 a (i).<sup>16</sup>

Associate Membership implies a more active involvement of non-ESA member states in Agency programmes and activities and is considered a halfway house to full ESA membership. As for "Participating Agreements", the status of Associate member state requires a unanimous vote, but the detailed arrangements are subject to the two-thirds majority approval. It requires only a minimum level of participation in ESA mandatory programmes and a contribution to the ESA general budget on the basis of average national income. Programmatically, the Associate Member must participate in some of ESA's mandatory activities<sup>17</sup> and can participate in optional programmes with a guaranteed minimum industrial return as well as in scientific and technical research studies, receiving the results of such studies.

Regarding representation, the arrangements provide that a non-member state "shall have a vote in the Council when the latter examines matters pertaining exclusively to the programme in which that State participates or when its financial interests are involved. In addition, the Associate Member shall have observer status in the Council for matters of common interest. The Associate Membership Agreement usually also contains dispositions on preferential use, where each party commits to giving preference to products or services available from the other.<sup>18</sup> The Associate Member should therefore use the European space transportation systems, facilities and products of ESA for its own needs, and in having access to the Agency's facilities and services shall bear the costs related thereto.

The participating state may renew or end the Associate Membership Agreement after 3-5 years, or change its nature by applying for accession under article XXII of the ESA Convention. After participating in some optional programmes of the Agency, Austria, Norway and Finland were the first countries to get Associate Member status, in 1979, 1981 and

1987 respectively, which was a prelude to their subsequent accession.<sup>19</sup> In fact, once the Associate Membership agreements had been renewed, each country confirmed its intention to accede to the Convention. The acquisition of Associate Membership status is not mandatory for states to become full members. This is shown by the fact that Austria, Norway and Finland became associate members before they joined the agency as full members, whereas Portugal, Luxembourg and Greece skipped this step and moved from Cooperation Agreements direct to full ESA membership. Also the guidelines concerning Associate Membership Agreement adopted by the ESA Council in October 1985 affirm that Associate Membership and accession have to be treated separately and that the former is not "a preliminary for accession."<sup>20</sup> Nevertheless, Associate Membership status has always aimed at making interested countries more familiar with the Agency's procedures and programmes. Experience has shown that, despite the various supportive measures, new member states have had a hard time adapting to ESA's competitive environment and its exigent requirements. Some cases have shown that particular problems arise if a state is less familiar with Agency procedures and programmes, especially regarding the inclusion of companies in activities and the application of industrial policy.

At present, Canada enjoys a status similar to that of an associate member of ESA, but this cannot be understood as a step towards full membership (Canada not being a European state), as demonstrated by the fact that Canada has been in this position for over thirty years.

#### 2.1.4 The European Cooperative State (ECS) Agreement and PECS

The ECS agreement allows indirect access to current ESA programmes and activities and should create and strengthen the industrial expertise and capacity of the country.

In October 1999, ESA organised a workshop in Hungary to analyse cooperation between the agency and CEE countries and to identify its possible evolution in the future. During

<sup>16</sup> See Article XIV.3 of the Convention for the establishment of a European Space Agency. Resource document: "ESA Convention and Council Rules of Procedure." Dec. 2010. European Space Agency 29. Oct. 2013 <<http://esamultimedia.esa.int/multimedia/publications/SP-1317-EN/pageflip.html>>

<sup>17</sup> According to the Guidelines concerning the Associate Membership Agreement adopted by the Council in October 1985, the Associate Member shall not have the right to participate in all the mandatory activities, i.e. the Basic Research Technology Programme (TRP).

<sup>18</sup> Madders, Kevin. "A New Force at a New Frontier: Europe's Development in the Space Field in the Light of its Main Actors, Policies, Law and Activities from its Beginnings up to the Present." Cambridge: Cambridge University Press, 1997: 419.

<sup>19</sup> Poncelet, Jean-Pol, Anabelle Fonseca-Colomb, and Giulio Grilli. "Enlarging ESA? – After the Accession of Luxembourg and Greece." ESA Bulletin 120 (November 2004): 51-53.

<sup>20</sup> See Baudin, Catherine. "Cooperation and International Agreements. Article XIV of the ESA Convention." Legal Aspects of Cooperation between the European Space Agency and Central and Eastern European Countries. Proceedings of the International Colloquium Charles University, 11-12 Sept. 1997, Prague, Czech Republic. European Centre for Space Law, 1998: 20.

this meeting ESA and the participating states, the Czech Republic, Hungary, Poland and Romania presented their respective future plans and programmes in the space field. Participants came to the conclusion that one of the main difficulties for aspiring countries was the big step from a general Cooperation Agreement to an Associate Membership Agreement. The initially proposed path of cooperation to become a member state of ESA simply did not suit their needs or financial capabilities.<sup>21</sup> Indeed, an Associate Membership agreement, which obliged financial participation at a rate of 50% of what the state would pay to the general budget as a full member, constituted too steep an increase of expenditure. Therefore, participants proposed an intermediate step that would facilitate the integration of aspiring countries and better fit their situations. Following this workshop, the ESA Council decided in December 1999 to set up an ad-hoc working group to examine the Agency's enlargement process. One recommendation of this group was the establishment of a specific framework that would facilitate the accession process and be better suited than Associate Membership.<sup>22</sup>

The recommendations of the Working Group led to the creation of the new concept of European Cooperating States (ECS). The ESA Council agreed this new status in 2001 as a new step towards full membership. It was decided that states willing to assume ECS status must be European and have already signed a framework agreement with ESA. Hungary was the first state to sign an ECS Agreement in 2003. To date, ESA has concluded five more Agreements: with the Czech Republic in 2003, Romania in 2006, Poland in 2007, Estonia in 2009, and Slovenia in 2010. ECS status should create and strengthen the industrial expertise and capacity of non-member states in order to have fair industrial participation in future ESA programmes and an equitable geographical return after accession to the Convention. It enables states to have indirect access to programmes and activities while also fostering their understanding of ESA's organisation and functioning as well as European space products and procedures. Another important objective is to ensure coherence between the space activities of ECS and ESA member states, for example by avoiding duplication of activities.

ECS Agreements are signed for five years and cancel any previous agreement. It must be

<sup>21</sup> Baudin, Catherine, Karl Bergquist. "Towards an Enlarged Partnership – ESA's Relations with the Czech Republic, Hungary, Poland and Romania." ESA Bulletin 107 (August 2011): 84-86.

<sup>22</sup> *Ibid.*: 85.

underlined that there is no obligation to accede to the ESA Convention after this period, "but the objective is clearly to associate the ECS to ESA programmes and activities and to prepare in the most efficient manner for a future accession to the Convention"<sup>23</sup>. After the five years term countries can decide whether to continue cooperation with the Agency under a new ECS Agreement (as was the case for Hungary), to apply for Associate Membership, or to apply directly for full membership.

ECS status is directly associated with the Plan for European Cooperating States (PECS), launched by the ESA Council in 2001 and operational since 2003<sup>24</sup>. PECS provides the opportunity for European Cooperating States to take an indirect part in ESA programmes and activities with a limited financial contribution of at least one Million Euros per year, "in accordance with the rules and procedures of ESA" (i.e. non-distortion of competition, complementarily with existing ESA activities, transparency and fair equitable treatment, etc)<sup>25</sup>. Compared to Associate Member status, ECS status involves lower participation in ESA internal costs, and can be easily afforded by the country concerned. The subscription to the PECS Charter, describing the projects to be undertaken and their funding, is normally made at least one year after the signature of the ECS Agreement. Thus, Hungary signed the Charter in 2003 and became the first PECS country of ESA, followed by other Eastern European countries as summarised in Table 1. Most recently, Estonia and Slovenia signed the PECS Charter in 2010, and Latvia will follow in the near future after its signature of the ECS Agreement in March 2013. As can also be seen from Table 1, Hungary signed the Charter for a second time in 2008. To date, Bulgaria and Croatia are the only EU member states that have not yet signed a Cooperation Agreement, although Bulgaria has already announced its intention to participate in ESA activities and sign an agreement<sup>26</sup>.

<sup>23</sup> *Cit. Ibid.*: 86.

<sup>24</sup> Poncelet, Jean-Pol, Anabelle Fonseca-Colomb, and Giulio Grilli. "Enlarging ESA? – After the Accession of Luxembourg and Greece." ESA Bulletin 120 (November 2004): 49-53.

<sup>25</sup> See Article 10 of ESA Procurement Regulations. Reference Document: European Space Agency. Procurement Regulations. Paris: ESA, 2008. Document available at: <[http://emits.sso.esa.int/emits-doc/ESA\\_HQ/EIO-PROCUREMENT\\_REGULATIONS.pdf](http://emits.sso.esa.int/emits-doc/ESA_HQ/EIO-PROCUREMENT_REGULATIONS.pdf)>.

<sup>26</sup> "ESA council opens up to ten EU member states." 21 Nov. 2011. European Space Agency. 2 Dec. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/ESA\\_Council\\_opens\\_up\\_to\\_ten\\_EU\\_Member\\_States](http://www.esa.int/About_Us/Welcome_to_ESA/ESA_Council_opens_up_to_ten_EU_Member_States)>.



	Cooperation Agreement	ECS Agreement	PECS Charter
Hungary	1991	2003	1 <sup>st</sup> : 2003 2 <sup>nd</sup> : 2008
Czech Republic	1996	2003	2004
Romania	1992	2006	2007
Poland	1994	2007	2008
Estonia	2007	2009	2010
Slovenia	2008	2010	2010
Latvia	2009	2013	-
Cyprus	2009	-	-
Slovakia	2010	-	-
Lithuania	2010	-	-
Malta	2012	-	-

Table 1: Key dates in the ESA Enlargement process

The main objective of the PECS programme is to associate Cooperating States with ESA programmes and activities in order to prepare them in the most efficient manner for possible future accession to the ESA Convention. It should create and strengthen their respective industrial expertise and capacity and therefore allow fair and equitable industrial participation in future ESA programmes, with a view to future accession to the Agency. In that respect, yearly reviews of projects are organised between ESA and the ECS to discuss convergence and complementarity of industries in the ECS with the space industries of ESA member states<sup>27</sup>.

The PECS programme provides indirect access to existing ESA programmes and activities and allows gradual participation in internal ESA costs. The key areas covered by the programme are space sciences (including astronomy, astrophysics, solar system exploration, etc.), Earth observation (for example environmental monitoring or meteorology), telecommunication and navigation, life and physical sciences (e.g. space biology and medicine), space technology, as well as ground segment engineering and utilisation. In November 2009, for instance, the Czech Republic flew its first ESA payloads on the

Proba-2 mission, with the design of both instruments supported through PECS<sup>28</sup>.

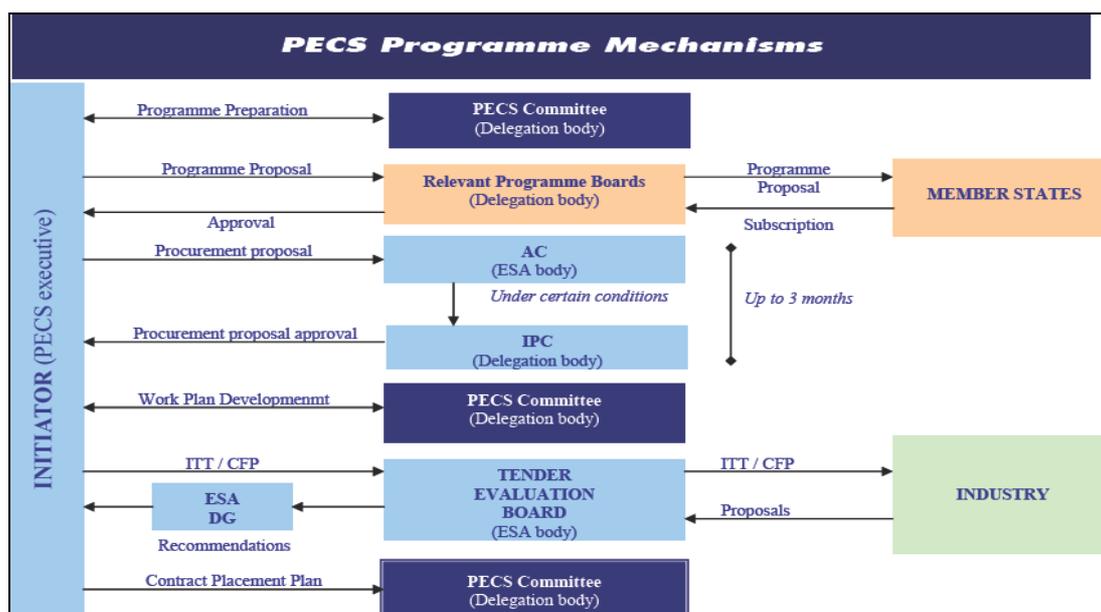
In order to prepare the industries of European Cooperating States for the competitive environment in ESA, calls for proposals are made according to the standard procedures of the Agency, including the use of EMITS (Electronic Mailing Invitation to Tender System), so that companies and institutions can get used to these procedures. A specific PECS committee, composed of representatives of the ECS and observers of ESA member states, monitors the execution of the activities. The programme mechanism is illustrated in Figure 5.

Industries in aspiring countries gain from the PECS programme as the respective states secure funding and provide continuity for national space related activities over a longer period. Thus, it stimulates industrial activities and cooperation at both national and international level and allows access to ESA technological knowledge and support. Additionally, organisations and institutions can become more familiar with ESA standards and procedures and prepare for full and effective membership, in order to be able to compete at equal level with other member states for industrial returns. Through PECS, ESA has demonstrated its capacity-building efforts. Three former PECS countries, the Czech Republic, Romania and Poland are now full members of the Agency. Current ECS Hungary, Estonia and Slovenia, having shown their willingness for closer cooperation, may follow in the near future and, equally important, countries like Latvia and Lithuania have expressed strong interest in the PECS programme and may soon apply to participate.

Even though the procedures within the PECS programme, including the use of EMITS and the call for proposals, help to prepare industries in aspiring countries for later accession they still might have problems in surviving in the competitive environment in the Agency. Therefore, additional measures could be useful in this respect in order to secure adequate geo-return right from the start. Furthermore, it should be noted that many aspiring countries have said they have problems with the PECS mechanism as they find it cumbersome and complicated.

<sup>27</sup> Fonseca, Annabelle. "ESA: From Cooperation to Accession." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

<sup>28</sup> "Slovenia's PECS Signature Kicks off Busy Year." 22 Feb. 2010. European Space Agency 29 Oct. 2013 <[http://www.esa.int/SPECIALS/PECS/SEMR8C3KV5G\\_0.html](http://www.esa.int/SPECIALS/PECS/SEMR8C3KV5G_0.html)>.

Figure 5: PECS Programme Mechanism<sup>29</sup>

### 2.1.5 Moves towards EU Members

Another step toward the progressive involvement of non-member states was made in June 2011, when the ESA Council decided to invite EU member states that are not Members of ESA to attend ESA Council meetings and some subordinate bodies as observers for agenda items of common interest to ESA and the EU. Observer status was granted to 10 countries: Bulgaria, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, the Slovak Republic and Slovenia. Eight of these countries had already established formal cooperation with ESA, either as part of European Cooperating State Agreements or general Cooperation Agreements. In October 2011, all these 10 EU countries that were non-members of ESA started to attend ESA Council meetings as observers. Observer status is defined by the Rule 23 of the ESA Council Rules of Procedure that were approved in 1979:<sup>30</sup>

- It is granted by unanimous decision of the Council.
- It gives the right to be represented in meetings of the Council.
- It gives no voting rights.

<sup>29</sup> Zufferey, Bernard. "The Plan for Europe Co-Operating States (PECS). Towards an Enlarged ESA Partnership." Presentation. ESTEC, Noordwijk, the Netherlands. 22 Nov. 2006.

<sup>30</sup> See Rule 23 of European Space Agency Council Rules of Procedure. Resource Document: "ESA Convention and Council Rules of Procedure." Dec. 2010. European Space Agency 29. Oct. 2013 <<http://esamultimedia.esa.int/multimedia/publications/SP-1317-EN/pageflip.html>>.

The ESA Director General also initiated a series of bi-annual consultation meetings. These meetings are held in different ESA establishments with the participation of non-ESA EU member states.<sup>31</sup>

Finally, a new National Trainee Scheme was also presented in May 2011 by the ESA Director General, targeting non-ESA EU members and inspired by the successful Portuguese Trainee Programme introduced in conjunction with the Portuguese accession. The programme was designed for engineering and science graduates from non-ESA EU member states interested in receiving on-the-job training on space technologies for 12 months. The National Trainee Scheme has three main objectives:

- To help meet national space industry needs of skilled staff;
- To support effective cooperation with ESA by creating links;
- To increase awareness of ESA<sup>32</sup>.

The realisation of these objectives constitutes a step forward for these countries in preparation for accession to the ESA Convention. The programme is based on an agreement between ESA and the national entity. It is funded by national entities willing to send their students. Therefore, this national entity selects trainees and proposes them to ESA, which decides whether to accept or deny the proposition. Practical implementation started in 2011, when indications of areas of interest were received by ESA and training opportuni-

<sup>31</sup> Fonseca, Annabelle. "ESA: From Cooperation to Accession." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

<sup>32</sup> *Ibid.*



ties were prepared and distributed to participants. Despite thirty training opportunities available in 2012<sup>33</sup>, no agreement has been signed yet and very limited feedback on the training opportunities was received by ESA.<sup>34</sup>

Furthermore, it must be underlined that trainee opportunities are currently exclusively related to scientific and technical subjects. However, as space policy issues are of vital importance to ESA candidate countries, it could be of interest for the Agency to offer law policy related trainee programmes as well.

Another important measure potentially benefiting a country intending to join ESA is the Education programme.<sup>35</sup> It is a programme that aims at ensuring the availability of a suitably qualified workforce for ESA and the European space sector in the future (by motivating students to work in the fields of space engineering, technology and science, and by providing university students with 'first' practical experience in real space projects – mainly via micro/nano/pico-satellites programmes). Education can use space as a theme "to enhance the literacy of young people in science and technology and motivate young Europeans to pursue a space related career"<sup>36</sup>. In a parallel way, it can increase the continuous professional development for teachers. In concrete, the main objectives of the Education programme are<sup>37</sup>:

- To support teachers to meet the very diverse needs of 20 member states.
- To provide university students with practical experience in real space-related projects.
- To support the academic development and career prospects of postgraduate students in member states.
- To inform and inspire teachers and students through a variety of initiatives.

Although it must be pointed out that ESA is not an educational institution, education is an important activity as the space sector is facing strong lack of interest by young people.

The Education Programme is implemented at different levels. At the primary/secondary level, the ESERO project "implements an

<sup>33</sup> Training opportunities in 2012 by ESA facilities: ESTEC (18), ESOC (8), ESRIN (3), ESAC (1).

<sup>34</sup> Maura, Fernando. "The ESA National Trainee Scheme." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

<sup>35</sup> "ESA at the Forefront of Space Education." European Space Agency. 10 Dec. 2013 <<http://www.esa.int/SPECIALS/Education/ESAMCJZPD4D0.html>>.

<sup>36</sup> Marée, Hugo. "ESA Corporate Education Programme." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

<sup>37</sup> *Ibid.*

annual series of teacher (primary & secondary) training sessions in cooperation with national partners. They use and disseminate existing ESA/ESERO education materials, and if appropriate, develop specific resources tailored to the needs of the education community. The ESERO offices also organise national ESERO teacher conferences for secondary and primary education"<sup>38</sup>. At intermediary and tertiary level there are also a number of activities. The projects deal with micro and hyper gravity activities ("Fly Your Thesis", "Drop Your Thesis" and "Spin Your Thesis"), micro satellites (ESE0), nano satellites (CanSats), rocket and balloon experiments (REXUS and BEXUS), etc.

Even though the Education Programme was originally conceived for member states, ECS countries could also potentially gain from its opportunities, for example by taking part in current educational activities (e.g. parabolic flights, Cansat activities, etc.) or participating in training and systems engineering workshops. Many of the projects have already resulted in beneficial effects for ESA recent and future member states. Thanks to the CubeSats project, for instance, Romania, Hungary and Poland each succeeded in launching their first satellite on the VEGA maiden flight on 13 February 2012. In 2011, 97 students from ESA aspiring member states took part in ESA tertiary education projects (Estonia (7), Hungary (9), Poland (40), Romania (27), and Slovenia (14))<sup>39</sup>.

## 2.1.6 Accession to the ESA Convention

After the conclusion of a five-year PECS programme, the ECS can: a) continue to cooperate with ESA by signing an extension to the PECS Agreement for another 5 years, as was the case for Hungary, b) apply for Associate Membership, or c) apply directly to become a member state. When a state intends to join the Agency as a full member, it can make a direct request to ESA. Article XXII of the ESA Convention lays down the procedure for accession, which can be summarized as follows:

- A formal letter is sent by a Prime Minister or a Minister in Charge of Space Affairs to the ESA Director General.
- The ESA Director General will then present the request to ESA member states and will ask for the mandate to start negotiations.

<sup>38</sup> *Cit.*, "European Space Education Resource Office." European Space Agency 29 Apr. 2013 <[http://www.esa.int/Education/Teachers\\_Corner/European\\_Space\\_Education\\_Resource\\_Office](http://www.esa.int/Education/Teachers_Corner/European_Space_Education_Resource_Office)>.

<sup>39</sup> Marée, Hugo. "ESA Corporate Education Programme." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

- Admission by accession will follow a unanimous Council decision on the Membership application.
- It enters into force after the ratification and the deposit of the instrument of accession of the involved State with the Government of France<sup>40</sup>.

As accession to the ESA Convention involves acceding to a treaty, it goes without saying that only a government can take such an initiative. Article XXII states that any state may apply for membership, but according to the object and purpose of the Convention set out in Article II, only European states may come into consideration. Another relevant aspect for accession to the ESA Convention is in Article XIII.4.a. The article affirms that "any State that was not a party to the Convention ... shall make, in addition to its contribution a special payment related to the current value of the assets of the Agency. The amount of this special payment shall be fixed by the Council by a two-thirds majority of all member states".<sup>41</sup> This "entrance fee" can be used to reduce the contributions of the other member States unless otherwise decided by the Council.

It should be recalled that since the establishment of ECS status, the Czech Republic, Romania and Poland are the first examples of expansion through the ECS process. Estonia, Slovenia, Latvia, Lithuania, Hungary and Slovakia are expected to follow the same pattern.

### 2.1.7 Transition Measures towards New Members

When new members started to join the Agency in larger numbers, it became clear that it would not be possible to immediately apply the clause of "geographical fair return" explicitly provided for in the Agency's industrial policy. Starting with the ratification of Portugal, ESA decided to establish a period of transition in order to enable the New Member States (NMS) to adjust their industry to the Agency's requirements. The transitional arrangements – usually in the form of 5-9 years Industry Incentive Schemes – are set out in the Accession Agreements and provide

for a portion of a country's contribution to mandatory activities to be used directly for funding those activities intended to help national firms adapt to the Agency's requirements.<sup>42</sup> However, it was also agreed that no guarantees for the industrial return would be given in relation to mandatory activities, and no provision would be made for any compensation at the end of the transition period. Any statistical records for that period are discarded and only subsequent industrial-return valuations will follow the method applied to all the member states. The implementation of the new member state's industry incentive scheme is followed by the Office for Support to New Member States and European Cooperating States, which also acts as secretariat for specific task forces for NMS. In order to advise ESA's Director General on the use of the contribution, a specific Task Force is set up which is composed of representatives designated by ESA's Director General and the government of the involved country, and co-chaired by an ESA representative and one from the interested country. The executive of this Task Force (its secretary) is also nominated by ESA's Director General.

The main goal of the Task Force is to maximise the country's industrial return and to guarantee the best possible adjustment of industry, in order to avoid critical issues when the transition period finally terminates. It has the role of supporting the identification of transitional measures and recommending them to the ESA DG for implementation. In addition, the Task Force strives to become a facilitator for the implementation of the normal ESA procurement procedures and fosters long-term relations between new member state firms and well established European space companies.

#### The Most Recent Cases

After the ratification of the ESA Convention by the Czech Parliament and Senate, the Czech Republic entered a transition period that will end on 31 December 2014 (6 years after the ratification). This transitional measure was defined in the Treaty for the Accession of the Czech Republic to the ESA Convention. The concept, "already proven with previous new ESA members" (Portugal, Greece and Luxembourg) aims to help to ensure that Czech industry and academia develop the capabilities to participate in ESA programmes.

The specific Task Force created in this frame is the advisory body for the Czech Industry Incentive Scheme. It also has the task, dur-

<sup>40</sup> See Article XXII of the Convention for the Establishment of a European Space Agency. Resource Document: "ESA Convention and Council Rules of Procedure." Dec. 2010. European Space Agency 29. Oct. 2013 <<http://esamultimedia.esa.int/multimedia/publications/SP-1317-EN/pageflip.html>>.

<sup>41</sup> *Cit.*, Article XIII of the Convention for the Establishment of a European Space Agency. Resource Document: "ESA Convention and Council Rules of Procedure." Dec. 2010. European Space Agency 29. Oct. 2013 <<http://esamultimedia.esa.int/multimedia/publications/SP-1317-EN/pageflip.html>>.

<sup>42</sup> European Space Agency. European Space Technology Master Plan 2011. Paris: ESA, 2011: 65.



ing those 6 years, to advise ESA's Director General on the implementation of measures aimed at adapting the Czech Republic's industry, scientific community and other organisations to ESA's requirements.<sup>43</sup> Together with the relevant ministries, the Task Force is helping the Czech industry to develop skills and opportunities in order to become more familiar with ESA business culture and procedures, and more competitive with ESA member states' industry. For this purpose, the Czech Industry Incentive Scheme allocates 45% of the mandatory contribution to ESA over the mentioned period. The remaining funding is allocated for mandatory and optional programmes, in which the country has to compete with other ESA member states.<sup>44</sup>

The same kinds of measures have been approved for Romania. Also, the Polish government arranged a series of Incentive Schemes when the accession arrangement entered into force. More precisely, during the transition period – that will last five years (until the end of 2017) – ESA will channel 45% of Poland's overall contribution to ESA's mandatory activities to adapting Polish industry and scientific community.<sup>45</sup>

### 2.1.8 ESA Membership: Benefits and Costs

Accession to the ESA Convention represents the final stage of the process towards cooperation with the Agency. It is quite clear that current cooperation with ECS is pursued by ESA in order to enable these countries to join the Agency in the nearer future. From the perspective of the aspiring state, ESA membership can bring not only political and economic benefits, but the costs of such membership should not be dismissed. ESA membership, as a key for expanding countries space programmes, involves both political and economic benefits. From a political point of view, ESA membership is a tool for broader political integration into Europe. The membership gives the country the status of a full partner and enhances the country's prestige and international position. Membership also entitles the country to affect the decision making process, both inside the ESA system (where, in general, the "one member one vote" principle operates) and in the Commission. It can also bring indirect benefits to the relationships that the country has with other

space faring nations, such as the United States or Russia. Membership also demonstrates, at political national and international levels, how space is important for the country. In addition to this, membership makes it possible for aspiring countries to become more involved in joint EU-ESA programmes and can support their development and address some of their societal issues (development, environmental protection, etc). Finally, it should not be underestimated that becoming an ESA member might raise public interest and will to invest in space-related activities.<sup>46</sup>

The economic benefits of ESA membership are even more visible. Firstly, membership would allow the ECS to participate in the European scientific programme, which is important to gain significant experience and promote national expertise. Secondly, by deepening cooperation with the Agency the member state automatically reserves funding and provides continuity for national space-related activities. Thanks to the geographic return principle as well as the possibility of having access to ESA technological knowledge, the country stimulates industrial activities and cooperation at both national and international level, and has access to the European technology market and the possibility of participating in more European programmes. This eventually leads to the development of the general economy and to the creation of a sort of virtuous circle, thanks to which the country will be able to further develop its space activities.<sup>47</sup>

It is exactly in the economic field, however, that ESA membership is also the most challenging. Participation in ESA mandatory activities is costly. Considering that membership, as set out in the provisions of Article XIII of the ESA Convention, requires compulsory participation based on national GDP to cover the general expenses of ESA and the mandatory scientific programmes, the accession of a country will of course oblige it to boost its space budget (as happened recently for Poland), even without considering potential additional contributions to optional programmes. In this context, it has to be recalled, however, that the PECS programme was introduced because Associate Member status was seen as too broad and constituted a much bigger involvement, which did not suit the needs or financial capabilities of aspiring countries. Although, securing the minimum 1 Million Euro PECS contribution

<sup>43</sup> "Czech Flag Raised Over ESA." 14 Nov. 2008. European Space Agency 18 Apr. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Czech\\_flag\\_raised\\_over\\_ESA](http://www.esa.int/About_Us/Welcome_to_ESA/Czech_flag_raised_over_ESA)>.

<sup>44</sup> "Czech Space Alliance." The Czech Space Alliance. 10 Dec. 2013 <<http://www.czechspace.eu/>>.

<sup>45</sup> Manikowski, Piotr. "Developments in Space Activities in Poland". Space Policy 29.1 (2013): 35-39.

<sup>46</sup> *Cit.*, Mathieu, Charlotte. "Space in Central and Eastern Europe. Opportunities and Challenges for the European Space Endeavour. Addendum Exploratory Study on Estonia and Slovenia." ESPI Report 8 October 2007: 8.

<sup>47</sup> *Ibid.*: 23.

can be achieved without any difficulties by most of the aspiring countries, securing over years the much bigger investment that membership requires is a very significant step-increase, which could to some extent be mitigated if Associate Membership was requested as a further intermediary step.

Another challenging issue is adaption to the ESA working process, especially harmonisation to ESA standards. CEE countries have already gained considerable expertise during their participation in the space programmes of the USSR. However, it might be difficult but also expensive for them to match their quality and management standards with those that ESA requires.

Finally, another systemic issue has to be raised. Today, ESA promotes the application side of space-related activities. Space-based applications are already playing a crucial role in every country's space-related activities and will do so even more in the future. Nevertheless, if an aspiring country focuses only on the development of applications, its industry will have problems in absorbing the geographical return, as operational space applications will not normally be funded by ESA and hence will not be reflected in the return.

In this context, the benefits for ESA and its member states deriving from the enlargement of the Agency should also be discussed. Benefits that can be expected from the ongoing enlargement process, which supports the entry of further Eastern (and Southern) European countries, can be summarised in the following points:

1. First of all, the enlargement will expand the current dimension of ESA and, presumably, the ambitions of its space programme;
2. ESA and Europe will benefit from highly motivated engineers and some specific expertise in certain domains gained during the Cold War period. This could, as a consequence, produce a potential interest to develop missing critical technologies and to reach the final aim of European Technology non-Dependence (ETnD);
3. The enlargement will expand and reinforce the overall European scientific and industrial base;
4. It will enrich the market with new niches, will create new companies and will increase employment;
5. From an industrial point of view, new member states can offer several opportunities, as these countries have lower production costs, which can help increase the competitiveness of the European space sector in certain domains. A new member state will in fact specialise not in

the whole range of space activities, but presumably in subsystems and equipment, aiming at becoming a subcontractor of bigger industries. The development and production capabilities should therefore result in lower cost. From the market point of view, new member states open opportunities for growth in delivering space-based services (telecommunications, navigation, integrated applications, etc.) and through participating in a more integrated fashion in national security and defence programmes;

6. Also for political reasons, ESA and the European space industry should be interested in contributing to the enlargement process since most space activities are already performed at European level in terms of budget, programmes and through a European technological and industrial base. The European Space Policy and the European Space Programme are becoming more and more tangible realities and new member states are part of the decision processes. Therefore it is wise to nurture the "appetite" for space (see the reluctant voting patterns for Galileo and GMES budgets). Another reason is that institutional space budgets may be reduced because of financial constraints, unless space-based solutions prove to bring added value to Europe at large in terms of economic results and benefits to citizens. Ideally, new member states could be good targets to demonstrate this "space utility". ESA should not stay outside this major trend and the space industry must participate in this evolution.<sup>48</sup>
7. Space is an integral part of 'The European Project'. Space builds bridges within Europe, and between Europe and the rest of the world. It is important that these bridges are built with and by all European States. The International Space Station is probably the best example. Although a great success, for 'European identity' it would have been better that the European partner would have been 30 European States rather than the 10 it actually is.
8. The enlargement could, of course, raise institutional challenges, beyond the political ones. As underlined by Charlotte Mathieu, enlargement of the Agency "might have first an impact on the ESA industrial policy as well as an impact on the governance of the Agency, since it

<sup>48</sup>. Maquet, Gilles. "Discussing Accompanying Processes." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.



might affect the working rules of the Agency".<sup>49</sup>

From an industrial point of view, European industry will face several challenges<sup>50</sup>:

1. The potential business volume of new member states is recognised as small (budget estimate for all NMS for 2020 is about 170 Million Euros). Other countries may be more relevant for strategic alliances for ESA programs;
2. The market attractiveness of new member states should be compared with export possibilities outside Europe;
3. Local industries are not yet "ready for space" and strong management and supervision is necessary;
4. At government level, the organisation of space in terms of governance is not always clear and therefore it is more difficult to understand government priorities at the industrial level and in terms of space applications.

## 2.2 Current Status of Recent and Future ESA Member States

In the last decade, most Central and Eastern European Countries have expressed their intention to join ESA in the near future. By the end of this decade the Agency will probably be composed of 29 members, which, after the most recent accession of Poland, is 9 more than today. The ESA integration process is open to all EU member states that are not yet members of the Agency. To date, however, it is mainly focused on the CEE region and the Baltic region and is being implemented at different levels, according to the status of the country involved.

Countries such as the *Czech Republic*, *Romania* and *Poland* have already gained member status, while other countries such as *Estonia*, and *Slovenia* are participating in the PECS program. It is expected that they will join ESA in the 2015/2016 timeframe. Countries such as *Lithuania*, or *Slovakia*, which have only signed a Cooperation Agreement, might join the Agency later, around the year 2018, and this might also end up being the timeframe for accession by *Hungary*. To date, Bulgaria is the only EU member state that

has not yet signed a Cooperation Agreement, despite its announced intention to participate in ESA activities.

Despite the fact that CEE countries present similarities because of their common history, and are for this reason considered a homogeneous group, each of those countries has its own specificities in terms of expertise, space activity management, funding mechanisms, policies and priorities.

This part of the study focuses on the experience of three recent ESA members (Czech Republic, Romania and Poland) and on the status of the most likely future members of the Agency (namely Estonia, Slovenia, Latvia, Lithuania and Slovak Republic). Table 2 shows an overview of the status of these countries. A detailed overview is also provided in Annex A.2.

	Cooperation Agreement	ECS Agreement/PECS Charter	Accession Agreement	Full Membership
<b>Czech Republic</b>	1996	2003 / 2004	2008	2008
<b>Romania</b>	1992	2006 / 2006	2011	2011
<b>Poland</b>	1994	2007 / 2008	2012	2012
<b>Hungary</b>	1991	2003 / 2003	-	-
<b>Estonia</b>	2007	2009 / 2010	-	-
<b>Slovenia</b>	2008	2010 / 2010	-	-
<b>Latvia</b>	2009	2013 / -	-	-
<b>Lithuania</b>	2010	-	-	-
<b>Slovak Republic</b>	2010	-	-	-

Table 2: Status of recent and prospective ESA member states, covered in the present report

The analysis is divided into five main sections. A general overview of the economic weight of recent and future ESA member states within the EU economy is provided first. The following paragraph then reports on the organisational aspects of space activities. An outline of the main rationales for space activities in these countries and the main programmatic lines, strategies and financial framework will be presented. The fourth

<sup>49</sup> *Cit.*, Mathieu, Charlotte. "Space in Central and Eastern Europe. Opportunities and Challenges for the European Space Endeavour. Addendum Exploratory Study on Estonia and Slovenia." ESPI Report 8. October 2007: 25.

<sup>50</sup> Maquet, Gilles. "Discussing Accompanying Processes." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

paragraph deals with the main space-related capabilities and expertise while the fifth paragraph provides an overview of the status of international cooperation both with the main international organisations in the field of space and with ESA. Finally, some considerations on the challenges these countries will face by joining ESA will be presented.

### 2.2.1 Economic Weight of ESA Aspiring Members

In order to better assess the current status and future prospects for space activities in potential future ESA member states, in CEE countries in particular, it is necessary to first provide a general overview of their economic situation, since this directly influences the development of space activities. The development of space activities requires a solid economy capable of sustaining long-term investments in R&D.

The economies of CEE countries (namely Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia) are currently undergoing a process of fast economic development. Since the fall of the communist governments in 1989, CEEs have been consistently liberalizing their economies and have successfully completed the transition from a centrally planned economy to a primarily liberal market economy. Between 1995 and 2001 they all acceded to the WTO and by 2004 to the EU, thus opening great opportunities for their economies.

With an average annual growth of 1,7% for the period 2007–2011 (as shown in Table 3), the overall CEE economy is one of the fastest growing within the EU. This rate is remarkable, considering the economic recession of the last years. In the pre-crisis period 2007 to 2008, in fact, the annual growth of these countries was around 5% of their GDP, while in the years 2010/11 the rate was 2,75%. This shows that CEE countries have been less affected by the financial crisis than other EU countries. According to World Bank indicators, most CEE countries can already be considered as High Income Economies having an annual pro-capita income higher than \$12,476. In addition they have low public debt (see Figure 8) compared to the Euro zone and, with some exceptions, have a good current account balance.<sup>51</sup>

The Foreign Direct Investments (FDI) inflow has grown exponentially. Poland, the Czech Republic and Hungary receive large flows of

FDI, but the other CEE countries also present good prospects.<sup>52</sup> Thanks to a combination of cheap labour costs, good infrastructure and proximity to large European markets, many multinational enterprises have been attracted to the region.<sup>53</sup>

The actual economic weight of CEE countries, however, should not be overestimated. Their GDP is only a small portion of the total GDP of the EU (as shown in Figure 6 and Figure 8). Thus, current ECS (namely Estonia, Slovenia and Hungary) together constitute only 1,93% of the total GDP of the EU27. Countries such as Lithuania, Latvia and Slovakia, which to date have only signed cooperation agreements with ESA, represent even less, namely 1,36% of EU GDP. Only Poland, Romania and the Czech Republic, which are already full members of ESA, account for a considerable percentage of total EU GDP - about 8,58%. In addition, despite the steep increase of FDI inflows stimulated by years of political and economic liberalization, the region still attracts only a small percentage of global FDI inflows. The percentage is low not only compared to other EU countries, but also to the emerging economies in the rest of the world<sup>54</sup>, and in no case has the magnitude of the inflow exceeded the range of \$ 10 billion.<sup>55</sup>

Also concerning R&D, the average R&D intensity of CEE countries (R&D expenditure as a percentage of GDP) for 2010 stood at only 1,0%.<sup>56</sup> With the exception of Slovenia, these countries have a very small expenditure on R&D, which is approximately half of the EU 27 average level of 2%, and is also far short of the target of 3% set by the Lisbon Treaty. In the space sector, the economic weight of CEE countries is even smaller: in 2011 the Czech Republic, Romania and Poland, which are all now members of ESA, accounted for 0,61% of ESA income from member states plus Canada.<sup>57</sup> It is expected that ECS (Estonia, Hungary, Latvia, and Slovenia), given the size of their economies, represent an even lower percentage.

<sup>52</sup> "World Investment Report 2012. Towards a New Generation of Investment Policies." 24 July 2012. United Nations Conference on Trade and Development 13 May 2013 <<http://www.unctad-docs.org/files/UNCTAD-WIR2012-Full-en.pdf>>.

<sup>53</sup> Rugman, Alan M. and Simon Collinson. *International Business*. New Jersey: Prentice Hall, 2009: 593.

<sup>54</sup> *Ibid.*

<sup>55</sup> "World Investment Report 2012. Towards a New Generation of Investment Policies." 24 July 2012. United Nations Conference on Trade and Development 13 May 2013 <<http://www.unctad-docs.org/files/UNCTAD-WIR2012-Full-en.pdf>>: 60.

<sup>56</sup> Eurostat. *Science, Technology and Innovation in Europe*. 2012 Edition. Luxembourg: Eurostat, 2012: 29.

<sup>57</sup> *Cfr.*, European Space Agency. *European Space Technology Master Plan 2011*. Paris: ESA, 2011: 33.

<sup>51</sup> "The World Factbook." 2013. Central Intelligence Agency 4 Dec. 2012 <<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2187rank.html>>.



	2007	2008	2009	2010	2011	Average
<b>Bulgaria</b>	6,4	6,2	-5,5	0,4	1,7	1,84
<b>Czech Republic</b>	5,7	3,1	-4,7	2,7	1,7	1,70
<b>Estonia</b>	7,5	-3,7	-14,3	2,3	7,6	-0,12
<b>Hungary</b>	0,1	0,9	-6,8	1,3	1,7	-0,56
<b>Latvia</b>	10,0	-4,2	-0,3	5,5	5,5	3,3
<b>Lithuania</b>	9,8	2,9	-14,7	1,3	5,9	0,06
<b>Poland</b>	6,8	5,1	1,6	3,9	4,3	4,34
<b>Romania</b>	6,0	9,4	-8,5	0,9	-0,4	1,48
<b>Slovakia</b>	10,5	5,8	-4,9	4,2	3,3	3,78
<b>Slovenia</b>	6,9	3,6	-8,0	1,4	-0,2	0,74
<b>Average</b>	6,97	2,91	-6,55	2,39	3,11	<b>1,76</b>

Table 3: GDP growth (annual average in % for the period 2007-2011)<sup>58</sup>

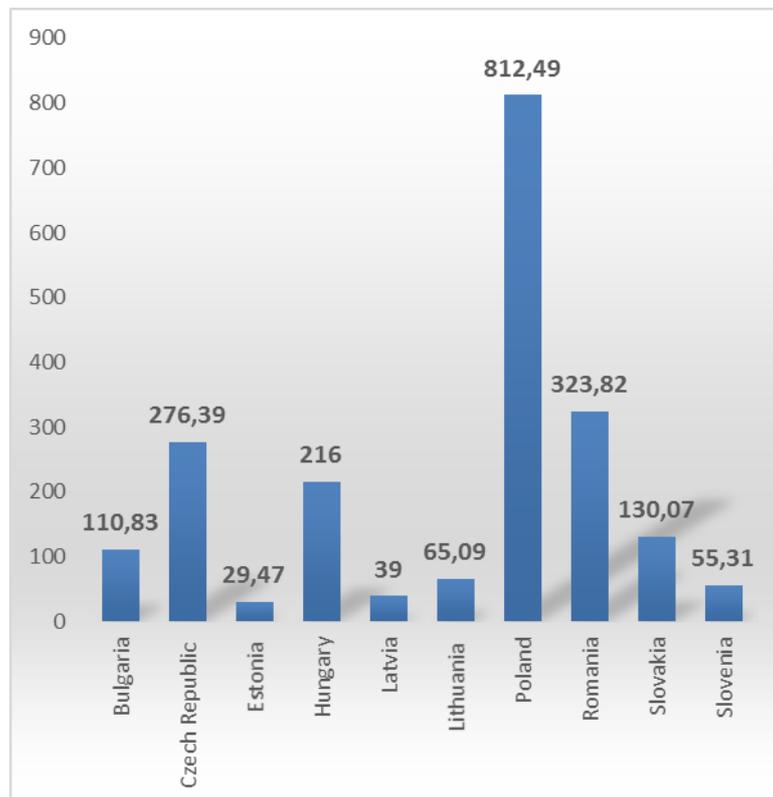


Figure 6: GDP (Billion \$) for 2011<sup>59</sup>

<sup>58</sup> Average calculated on the World Bank data. Resource Document: "GDP Growth (Annual %)." 2013. The World Bank 14 Apr. 2013 <<http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>>.

<sup>59</sup> "World DataBank." 2013. The World Bank 14 Apr. 2013 <<http://databank.worldbank.org/data/home.aspx>>.

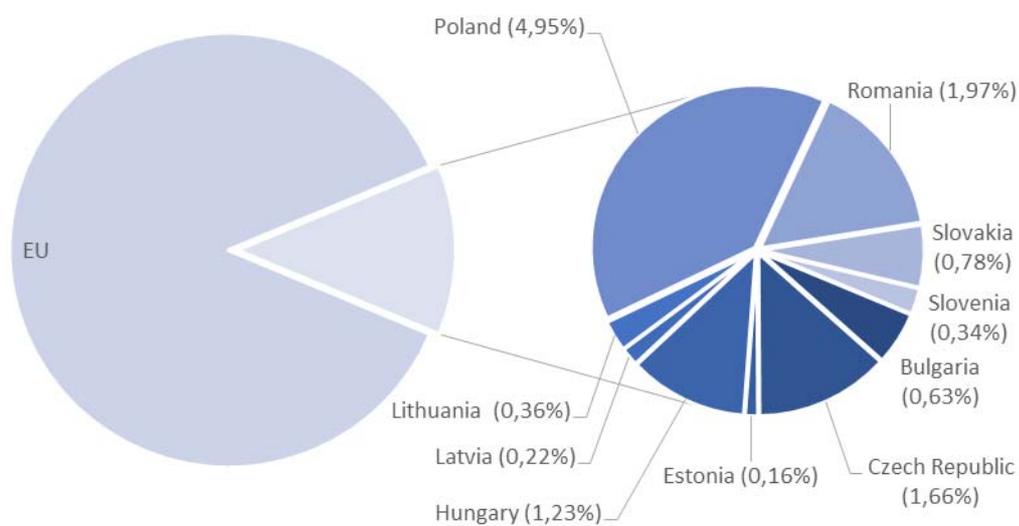


Figure 7: Proportion in % of EU27 GDP<sup>60</sup>

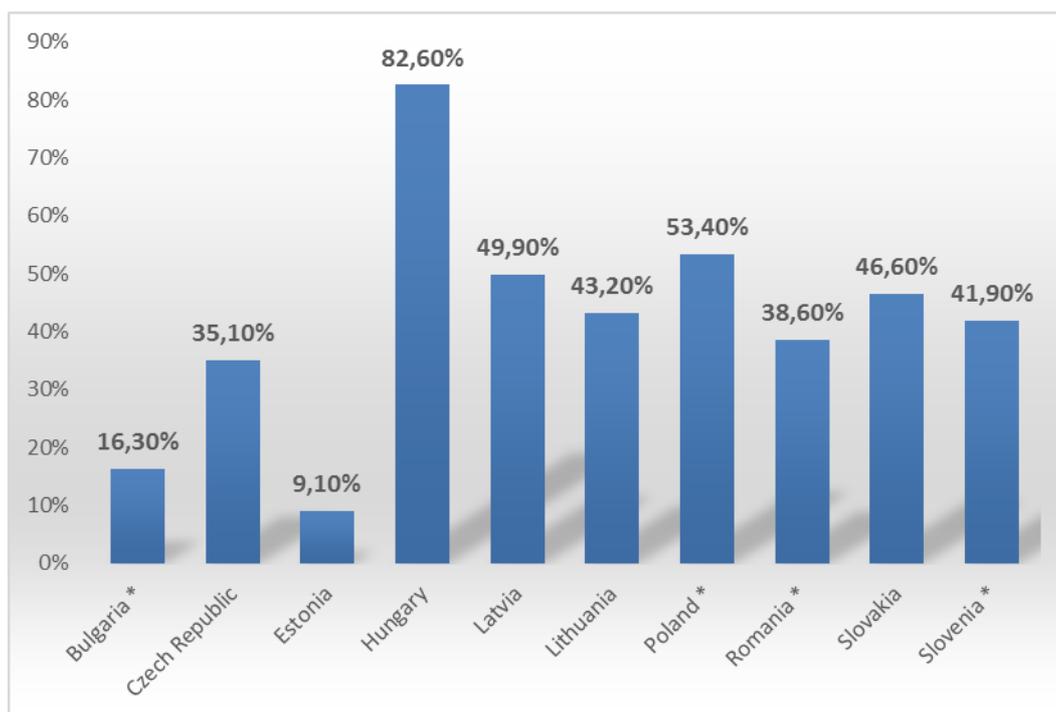


Figure 8: Government debt, total (% of GDP)<sup>61</sup>

<sup>60</sup> *Ibid.*

<sup>61</sup> "Central Government Debt, total (% of GDP)." 2013. The World Bank 11 Jan. 2013

<<http://data.worldbank.org/indicator/GC.DOD.TOTL.GD.ZS>>.

\* "The World Factbook." 23 Oct. 2013. Central Intelligence Agency 11 Jan. 2013 <<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2187rank.html>>.



## 2.2.2 Organisation of Space Activities in Recent and Future ESA Member States

Most of the recent and potential future ESA member states have established an institutional framework for space activities. However, there are significant differences among the countries, ranging from very well established agencies to a few dedicated offices within a ministry. Another important factor in this context is the development of a national space programme, which aims at strengthening the national space industry as well as preparing companies and scientific institutions for space activities in the international field. The process of institutionalisation seems to be proceeding in most cases hand in hand with the process of involvement with ESA. As a matter of fact, countries that have already joined ESA tend to have a much more institutionally entrenched framework for space activities compared to ECS or countries with a framework agreement. Space activities in Latvia, Slovenia and Hungary are mainly entrusted to more recently established and less entrenched structures, the exception being Estonia with a highly sophisticated set-up. Most countries that have only signed Cooperation Agreements with ESA (e.g. Slovak Republic) have no specific institutional framework and no specific national agency is foreseen for the time being. In these countries, only some offices within ministries are generally in charge of space activities and policies, and in all cases, the responsible ministry is the Ministry of Education.

As of April 2011, when the Government endorsed significant changes to Czech Space governance, the Ministry of Transport has coordinated space activities in the Czech Republic. The Ministry represents the Czech Republic at the EU Space Council and in ESA and deals with contributions to ESA programmes, as well as with European space policy issues. This Ministry is also in charge of participation in the EU Framework Programme for R&D, including the space theme programme<sup>62</sup>. In addition, the Ministry of Transport is responsible for the implementation of GALILEO and for follow-up applications of satellite systems, while the Ministry of Environment represents the country in EUMETSAT and is involved in COPERNICUS and in the Group on Earth Observation (GEO).<sup>63</sup>

In order to better coordinate all space activities, the Ministry has established Coordina-

tion Council for Space Activities under its leadership. Also other ministries and public entities participate in this Council in order to ensure that their interests are reflected in Czech Space Policy and activities: the Ministry of Industry and Trade, the Ministry of Education, Youth and Sports, the Ministry of Environment, the Ministry of Foreign Affairs, the Ministry of Defence, the Office of the Czech Government, and the Government Commissioner for GSA.<sup>64</sup> The Council works through three cross-sectional expert working groups involving also industry and academia; one on "Industry and Applications" chaired by the Ministry of Industry and Trade, one on "Science", chaired by the Ministry of Education, and one on "Security and International Relations", chaired by the Ministry of Foreign Affairs.<sup>65</sup>

The Czech Space Office (CSO) and the Czech Space Alliance also play a substantive role in Czech space activities. CSO is a private non-profit organization financed by the Ministry of Education aimed at increasing Czech participation in ESA programmes. It constitutes an information and advisory centre for space activities, while providing administration and technical support to the Ministries<sup>66</sup>. By comparison, the Czech Space Alliance is an SME association of 16 companies established in 2006, with the aim of helping its members win ESA industrial contracts. CSA has already proved to be beneficial for Czech industries. During the PECS programme, from 2005 to 2008, CSA members won 9 out of 12 industrial contracts, and after their accession to ESA, members of CSA won 16 out of 23 industry contracts in the Czech Industry Incentive scheme, and 10 out of 10 contracts in ESA's call for tenders.<sup>67</sup>

In *Romania*, space activities are co-ordinated by the Romanian Space Agency (ROSA). The organisation was established in 1991 as an office in the Research Department under the Ministry of Research and Technology (currently, the Ministry of Education, Research, Youth and Sport) and then reorganised by a Government decision in 1995 as an independent public institution with its own legal personality and its own research centre. ROSA reports to the Minister of Education and Research and directly to the Prime Minister for specific items defined by the law. The

<sup>64</sup> "Czech Space Portal." Coordination Council of the Minister of Transport for Space Activities. 29 Apr. 2013. <<http://www.czechspaceportal.cz/en/section-1/czech-space-portal/>>.

<sup>65</sup> *Cfr.*, European Space Agency. European Space Technology Master Plan 2011. Paris: ESA, 2011: 89.

<sup>66</sup> "About Czech Space Office" Czech Space Office 29 Apr. 2013 <<http://www.czechspace.cz/en/about-us/about-cso>>.

<sup>67</sup> "Czech Space Alliance" Czech Space Alliance 29 Apr. 2013 <<http://www.czechspace.eu/>>.

<sup>62</sup> *Cfr.*, European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 85.

<sup>63</sup> *Ibid.*

mission of ROSA is to promote, coordinate and develop space research and application programmes/projects in Romania, and, as a Government representative, to promote international cooperation in the space field. On behalf of the Government, ROSA is the national representative in the cooperative agreements with international organisations, such as ESA and the Committee on Space Research (COSPAR), as well as bilateral governmental agreements. Together with the Ministry of Foreign Affairs, ROSA represents Romania in the sessions of the UN COPUOS and its Subcommittees. Within the EU, ROSA is the national representative in the European GNSS Agency and the Copernicus-GMES Committee, as well as FP7 Committees for Space, Security Research, Aeronautics and Galileo.<sup>68</sup>

The national space agency acts as project integrator and developer in the main areas of space research and technology: space science, Earth Observation, GNSS, space dynamics, space applications for agriculture, disaster management, space information systems, and space infrastructure development<sup>69</sup>. The scope of ROSA activities is, however, broader than just space, as the agency also supervises aeronautics and security activities. After public tender, ROSA became the contract authority for the National Aeronautics and Space R&D Programme, co-financed by the state budget, and the contract authority for the National Security Programme. Its involvement in security activities is reflected by its participation in different security-related councils and committees. On the basis of a decision by the Government, ROSA provides the secretariat for the Inter-Ministerial Group for Security Research and the President of ROSA was appointed as the Executive President of this Group.<sup>70</sup>

ROSA is composed of the Headquarters (administrative, cooperation and programme management divisions) and the ROSA Research Centre (RRC)<sup>71</sup>. The RRC was organised in 1998 as an entity represented legally by ROSA which joined all research contracts in a unique management structure. Another step was the joint venture agreements concluded with CRUTA – the Romanian Centre for Remote Sensing Applications in Agriculture – an SME laboratory organized initially as an independent branch of the ISPIF (Re-

search and Development Institute for Land Use) and the Institute of Space Science in Bucharest. Since 2001, the RRC has been selected by the Ministry of Education and Research as a Centre of Excellence in Space Applications. The fields of science and technology knowledge developed by the RRC are<sup>72</sup>:

- Space dynamics, in particular small satellites and tethered systems, magnetic fluids and magneto fluidic composites;
- Space science
- Earth observation (remote sensing) satellite data retrieval, processing, algorithms and software development, applications development;
- Space information systems integration (including Global Navigation Satellite Systems);
- Space technology for risk management and security.

The expertise covers newly developed advanced technology in remote sensing (satellite and airborne), geographic information systems (GIS), global positioning systems (GPS), geomatics and area-frame techniques. The research in the RRC is project-oriented. The overall objectives are to produce science and technology, to transfer the results to the users and to generate physical and human infrastructure (capacity building).

In *Poland*, space activities are mainly entrusted to the Space Research Centre (SRC), which falls directly under the Polish Academy of Sciences. The centre, established in 1977, is not just an administrative body, but is an interdisciplinary research institute that acts as a kind of national space agency by undertaking space research and developing space technologies and applications.<sup>73</sup> Its branches are located in Warsaw, Wroclaw and Poznan and it currently has 150 employees. Different ministries, mainly the Ministry of Economy and Ministry of Science and Higher Education, share responsibility for Polish space activities. While the latter supervises research and R&D activities, the former is responsible for the funding of the ESA programme and activities. Other involved Ministries are: the Ministry of Environment, which supervises GMES activities; the Ministry of Transport which supervises Galileo activities; and the Ministry of National Defence, which is responsible for the security aspects.

In addition, the following consultative bodies support the Government:

<sup>68</sup> ROSA Information Document, "Romanian Space Agency. Space tools for a better life".

<sup>69</sup> ROSA Information Document, "Romanian Space Agency. Space tools for a better life".

<sup>70</sup> "Romanian Space Agency – General Information." 2013. Romanian Space Agency 29 Apr. 2013

<<http://www.rosa.ro/index.php/en/about-us/general.pdf>>.

<sup>71</sup> *Ibid.*

<sup>72</sup> ROSA Information Document, "Romanian Space Agency. Space tools for a better life".

<sup>73</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 125



- The Consultative Board for Space Policy set up in the Ministry of Economy in 2008 to implement Polish Space Policy at national and international level and provide overall political coordination.
- The Committee on Space and Satellite Research of the Academy of Sciences established in 1966, which is in charge of defining national space research policy and coordinating the activities of the Polish research centres involved in international space projects. It consists of scientists from the various fields of space research and it is structured in five commissions: Astronautics and Space Technology, Remote Sensing, Satellite Geodesy, Space Biology and Medicine and Space Physics.
- The Task Force Poland ESA, aimed at reinforcing the integration of Poland within ESA during the transitional period.<sup>74</sup>

In the next few years, as recommended by the 2009 Polish Space Strategy, a national space agency should be created in order to coordinate and better harmonise all space activities in Poland. As underlined by P. Manikowski, professor at the Poznan University, "there are three possible models to choose from: a small office (e.g. Hungary), a coordinating body (e.g. Romania), or an independent Agency (e.g. France, Germany)".<sup>75</sup> In November 2013, Poland announced its intention to set up a Polish Space Agency (POLSA) by the beginning of 2015.

Despite the fact that *Estonia* has a long tradition in space studies, there was no specific institutional framework for space activities until June 2007 when, after the signature of the Cooperation Framework Agreement with ESA, Enterprise Estonia (EAS) – a public business development and support agency established by the Ministry of Economic Affairs and Communication – was nominated as the implementing body for the Agreement.<sup>76</sup> Since then, EAS has played a crucial role in the promotion and coordination of space activities in Estonia. The agency also carries out the tasks of a national space office in Estonia, being the intermediary for Estonian companies/institutions.<sup>77</sup> Therefore, EAS acts as a national contact office for space related entrepreneurial services, providing services from funding, general assistance, representation and provision of information between Estonian space related companies and inter-

national private and public sector organisations.<sup>78</sup>

Additionally, in 2010 the Ministry of Economic Affairs and Communications established the Estonian Space Affair Council (SAC), which is responsible for the initiation and governance of space related actions and programs at national and international level, as well as coordination of funding. Another relevant institution is the Estonian Space Policy Working Group (SPWG), created by the Ministry of Education and Science in 2006, which is now carrying out the tasks of an advisory body and acts as a think-tank on space matters<sup>79</sup>.

Compared to the above-mentioned countries, there is no specific institutional framework for space activities in *Slovenia* and no specific national space agency is foreseen for the time being.<sup>80</sup> The Ministry of Economic Development and Technology (MEDT) acts as the national coordinator of space related activities and at the same time is also the administrative unit in charge of implementing the PECS Agreement. It also leads the Slovenian delegation to ESA and has overall responsibility for Slovenian participation in different ESA programmes and activities, including financial budgeting. In this role, the MEDT conveys and safeguards the country's political, institutional, legal, financial and industrial interests through its delegations in the relevant ESA bodies.<sup>81</sup> At national level, in October 2009 Slovenia allocated 10 M€ to the Centre of Excellence Space.Si, a consortium established in the same year and consisting of three universities, two Public Research Institutes, and six enterprises. The New Centre for Excellence has the main purpose of enabling Slovenia to join ESA.<sup>82</sup>

<sup>78</sup> "Estonian Space Office." 2013. Enterprise Estonia 29 Apr. 2013 <<http://www.eas.ee/en/for-the-entrepreneur/innovation/estonian-space-office/general-information>>. Enterprise Estonia is a member of Eurisy since 2008 and a member of IAF since 2009.

<sup>79</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 89.

<sup>80</sup> *Ibid.*: 131.

<sup>81</sup> *Ibid.*: 131.

<sup>82</sup> Space-SI has already achieved many results. Concerning applications, for instance, it has successfully and efficiently integrated accurate meteorological predictions applied to the acquisition and analysis of satellite data in the September 2010 floods. Together with the University of Ljubljana and the Slovenia Environment Agency, it developed a real time weather forecast programme. Different space exploration-related projects were launched and the centre already installed a ground control infrastructure that will be operational this year. Many workshops and conferences have also been organised by Space-Si. In June 2012, for instance, the Centre hosted the 2012 CNES/ESA Small Satellites System and Service Symposium. See website "Slovenian Centre of Excellence for Space Sciences and Technologies Space-Si": <<http://www.space.si/en>>.

<sup>74</sup> *Ibid.*

<sup>75</sup> Manikowski, Piotr. "Developments in Space Activities in Poland". Space Policy 29.1 (2013): 35-39.

<sup>76</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 89.

<sup>77</sup> *Ibid.*: 125.

In *Hungary*, the Hungarian Space Office (HSO) is the entity responsible for managing, co-ordinating and representing national space activities. Established in January 1992 as an independent government office under the responsibility of the Minister of Informatics and Communications, HSO was integrated into the Ministry in 2005 and then moved in August 2006 to the Ministry of Environment and Water.<sup>83</sup> Finally, in 2010, with the establishment of the Ministry for National Development, HSO became a department of this Ministry.

The Minister for National Development is officially responsible for space activities in Hungary, assisted by the Hungarian Space Board (HSB), which acts as an advisory board. The HSB consists "of representatives from the ministries involved in space activities and various experts from different space research fields". It supervises the planning of space activities and determines the cornerstones of Hungarian space activities. While the HSB is the advisory body of the Ministry in charge of space affairs, the advisory body of HSO is the Scientific Council on Space Research (SCSR). The SCSR provides the scientific background of all Hungarian space activities and consists of experts from all fields of space research<sup>84</sup>. To date, research and application activities have been carried out in about 25 scientific institutes and university departments. Their personnel in space related work number more than 250 scientists and engineers.

In *Latvia*, the space sector is officially represented by the Ministry of Education and Science, which is in charge of space policy and facilitating multidisciplinary research. Other involved ministries are:<sup>85</sup>

- The Ministry of Transport – in charge of aviation and air transport policy, Galileo-related activities;
- The Ministry of Defence Latvian territory defence mission assurance, scientific research, certain space-based products - satellite pictures as a basis for derived products (maps, analytical products, etc.)
- The Ministry of Economics - responsible for business capacity building in the space field
- The Investment and Development Agency of Latvia – gathering information, identifying and supporting competitive companies in the Latvian space sector.

<sup>83</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 107.

<sup>84</sup> *Ibid.*: 107.

<sup>85</sup> Kaspars, Karolis. "Space Activities in Latvia." Presentation. Baltic Space Roundtable. Tallinn, Estonia. 26 Jan. 2010.

The agency implements state support programs for the development of entrepreneurship that can be used by industry to develop projects in the field of space technologies.

In March 2010, the Space Working Group was established under the Ministry of Education and Science. It consists of 18 members (representatives of ministries, the private sector and scientific institutions). The objectives of the working group are to develop a National Space Strategy; to promote and implement the Cooperation Agreement between Latvia and ESA; to assure cooperation and dissemination of scientific and technical information on space science, space technology and its applications in support of communication and coordinated action between research institutes, government and industry; and to encourage the participation of research institutions and commercial companies in the activities of the European Space Agency and other R&D programmes<sup>86</sup>.

Latvian space governance has been developing since December 2009, when the Ministry of Education and Science established the National Space Technology Development Working Group with representatives from ministries, research entities and industry stakeholders. The main goals of the Working Group are:

- To promote the implementation of the agreement between Latvia and ESA
- To assure cooperation and dissemination of scientific and technical information on space science, space technology and its applications in support of communication and coordinated action between research institutes, government and municipal institutions and industry.
- To encourage participation of research institutions and commercial companies in ESA and other R&D programs<sup>87</sup>.

In 2008, a feasibility study for space cluster development was undertaken, involving 35 companies, 4 NGOs, 12 educational & research institutions and 6 public organisations. In 2009, Latvian companies and research institutions agreed to establish the Latvian Space technologies cluster, and 25 of them signed cooperation agreements for participating in cluster activities. The activities of the

<sup>86</sup> NordicBaltSat Space Directory 2011. Resource document: "Space Awareness Action Plan (SAAP)." 1 Nov. 2009. NordicBaltSat 29 Oct. 2013 <[http://www.nordicbaltssat.eu/sites/www.nordicbaltssat.eu/files/SAAP\\_09\\_01\\_2012.pdf](http://www.nordicbaltssat.eu/sites/www.nordicbaltssat.eu/files/SAAP_09_01_2012.pdf)>: 100-101.

<sup>87</sup> Kaspars, Karolis. "Space Activities in Latvia." Presentation. Baltic Space Roundtable. Tallinn, Estonia. 26 Jan. 2010.



cluster are coordinated by the Ventspils High Technology Park" (VHTP)<sup>88</sup>.

Space activities in *Lithuania* date back to the 1950s, when many Lithuanian scientists and engineers started to participate in Soviet space and military industrial programmes. This notwithstanding, space activities have received an institutional framework only in recent years. Lithuania, however, still does not have any national space agency or space activities-related institutions. In 2010 an Inter-ministerial Space Working Group (IMSWG) was established under the responsibility of the Ministry of Economy.<sup>89</sup> This Ministry is in charge of the development of Lithuanian space policy and the supervision of its implementation, while the Ministry of Education and Science is responsible for space-related R&D activities. In 2010, the two ministries established the Agency of Science, Innovation and Technology (SITA), which, inter alia, is in charge of the implementation of the national space programmes. Finally, the Ministry of Transport and Communication represents Lithuania in EU GNSS governing and implementing bodies and will be responsible for the use of the GNSS.<sup>90</sup>

In 2007, several Lithuanian R&D institutions and enterprises signed a co-operation agreement to establish the National Technology Platform of Space Technologies. The Lithuanian Space Association (LSA) was established in 2009. It is comprised of 11 universities, 11 enterprises in the field of engineering and ICT and R&D institutions, which are involved in national technology programmes, and European FP7 projects<sup>91</sup>. In November 2010, the LSA founded a non-

governmental research organisation, the Space Science and Technology Institute (SSTI), which is entrusted with space related scientific research, technology development and its transfer to business organizations. SSTI cooperates with most Lithuanian Universities and some space related business companies and thus constitutes a link between technology development and transfer for further commercial use.<sup>92</sup> Most of its members already have experience in space technology and engineering and are involved, for example, in NATO and FP5, FP6, and FP7 projects. The Institute actively cooperates with several European Universities (NL, DK, D, and CH) and organizations performing space related activities. Lithuanian students at all levels are widely involved in the scientific research work of the Institute, thus enhancing the preparation of high-level scientists and specialists in space and high-tech related fields.<sup>93</sup> SSTI is involved in a project dealing with the development and integration of small satellite components, such as a nano-satellite, intended both for scientific tasks, technologies demonstrations, educational purposes and the popularization of science. The project aims to boost the development of new high tech based research capacities and industry in the Baltic area.

In 2010, the Lithuanian Space Association (LSA) organised the 1st International Conference on "Space Economy in the Multipolar World", SEMW 2010. It brought together members of Government, industry and space policy experts to discuss policy and economic and technology trends in this field. The conference represented a milestone event for forthcoming Lithuanian space activities, and the kick-off event for the implementation of the first Lithuanian space research programme<sup>94</sup>. Given the success of the first conference, LSA organised the 2<sup>nd</sup> and 3<sup>rd</sup> SEMW Conferences in 2011 and 2012, respectively.

In the *Slovak Republic*, space activities fall under the responsibility of the Ministry of Education, Science, Research and Sport. In 2008, an expert committee was established with the aim of managing the concept and the process of Slovak cooperation with ESA.<sup>95</sup> This committee consists of representatives from:

<sup>88</sup> The VHTP was established in 2005 with the aim of creating favourable environment for high technology companies specialising in electronics, ICT, machine engineering, industrial automation and space technologies. The VHTP has several structural units: a) Business Incubator that provides infrastructure and support services for companies in their early stage of activity. This structural unit also provides services of pre-incubator for prospective entrepreneurs. b) Service Department of the Technology Park that provides infrastructure and support services for companies in their after-incubation or expansion stage, and also for research and educational centres. c) Development and Marketing Department, the main objectives of which are the development and implementation of VHTP projects, marketing and public relations, as well as the coordination of activities of the Latvian Space Technology Cluster.

Resource Document: "About Us." 2013. Ventspils High Technology Park 2 May 2013 <<http://www.vatp.lv/en/about-us>>.

<sup>89</sup> NordicBaltSat Space Directory 2011. Resource document: "Space Awareness Action Plan (SAAP)." 1 Nov. 2009. NordicBaltSat 29 Oct. 2013 <[http://www.nordicbaltSat.eu/sites/www.nordicbaltSat.eu/files/SAAP\\_09\\_01\\_2012.pdf](http://www.nordicbaltSat.eu/sites/www.nordicbaltSat.eu/files/SAAP_09_01_2012.pdf)>: 158-160.

<sup>90</sup> *Ibid.*: 159.

<sup>91</sup> "Association." 2013. Lithuanian Space Association 30 Apr. 2013 <<http://www.space-lt.eu/aprasymas.htm?lid=4>>.

<sup>92</sup> "Space Science and Technology Institute." Lithuanian Space Association 30 Apr. 2013 <<http://www.space-lt.eu/kmti/indexeng.php>>.

<sup>93</sup> *Ibid.*

<sup>94</sup> "For Public." 2013. Lithuanian Space Association 30 Apr. 2013 <<http://www.space-lt.eu/visuomenei.htm?lid=4>>.

<sup>95</sup> Cimbáková, Marta. "The Slovak Pathway towards ESA." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 March 2012.

- Different ministries in the Slovak Republic (Ministry of Education, Ministry of Transport, Post and Telecommunications, Ministry of Agriculture, Ministry of Economy, Ministry of Environment, Ministry of Foreign Affairs);
- The Slovak Academy of Sciences, which plays a leading role among the scientific institutions;
- The Government Office of the Slovak Republic;
- The Slovak Rector's Conference;
- The Slovak Industry Association and the Association of Industrial R&D organisations.

In addition to the institutional framework, an important role is played by the Slovak Organization for Space Activities (SOSA). SOSA is a non-governmental organization established in 2009, whose main purposes are the promotion and popularization of space research in the Slovak Republic, support for the accession of the Slovak Republic to ESA and ESO and the creation of a network of contacts among Slovak high schools and universities, scientific institutions and industrial companies with the interest and potential to act in the field of space research and business<sup>96</sup>. SOSA is very active in the educational field and, beyond the organisation of public talks and workshops to increase general awareness of the importance of space research and industry in Slovakia, it has identified several applicable education projects (CanSat, Rexus/Bexus, CubeSats, ESEO, ESMO, GENSO, Drop ESA /Spin/Fly your thesis) to encourage the participation of Slovakian students<sup>97</sup>.

## 2.2.3 National Policies

### National Space Strategy

Space activities in all recent and potential future ESA member states are undertaken according to different rationales and priorities. Yet, there are also broad common rationales such as the development of the national economy, industry and scientific institutions, the reinforcement of technological skills, further integration in Europe and the European market, and the will to exploit the societal benefits deriving from space applications.

Apart from the recent ESA member states, the majority of aspiring countries have not yet fully implemented a specific and robust space policy. All of them, however, have

clearly identified the range of priorities they want to focus on. Taking into consideration the size of their economies, they generally do not aim at having a huge space programme in the near term: they concentrate their limited resources on a few fields or follow a niche strategy by putting emphasis on activities with high economic efficiency. An important priority is participation in international space programmes that would bring recognition of their expertise vis-à-vis international partners.

*The Czech Republic's* space strategy is contained in the *National Space Plan* elaborated in 2010 by the different ministries involved in space affairs and with the support of ESA. It offers an analytic view of Czech space activities, provides the basis for the decision making process and defines the national objectives of Czech Space activities. Those are divided into mid-term objectives to be achieved by 2016 and a long-term vision.<sup>98</sup> The long-term vision aims at ensuring that the Czech Republic: a) has an international image of industrial and scientific excellence; b) is a high value-added economy, c) is competitive and innovative, d) is capable of absorbing and retaining the intellectual capital it creates, e) is an example of virtuous complementarity and cooperation between its industrial and academic actors, and f) is an expert user of space resources and infrastructure in operational products and services (EO, Navigation, etc).<sup>99</sup>

To ensure the accomplishment of the long-term vision the Plan states that the following mid-term objectives must be achieved by 2016: a) Czech investment in space has an appropriate return, b) the Czech Republic has the necessary competences (industrial, academic, project management) and infrastructures to sustain the long-term vision, c) Interaction between academia and industry exists and is well balanced, d) The Czech Republic has efficient and effective space coordination and recognizes space as a strategic element of national policy<sup>100</sup>.

ESA is seen as the main implementation tool to achieve the long-term vision, and for this reason space activities must first include contributions to ESA mandatory and optional programmes (especially in the fields of space exploration, space technology, navigation and Earth observation). Other main directions of Czech space activities include participation in

<sup>96</sup> "Slovak Organisation for Space Activities." 30 Apr. 2013 <<http://en.sosa.sk/>>

<sup>97</sup> *Ibid.*

<sup>98</sup> "National Space Plan. Summary." 2 June 2012. Czech Republic Ministry of Transport 29 Oct. 2013

<[http://www.czechspaceportal.cz/files/files/storage/Narodni\\_kosmicky\\_plan/national\\_space\\_plan\\_summary.pdf](http://www.czechspaceportal.cz/files/files/storage/Narodni_kosmicky_plan/national_space_plan_summary.pdf)>

<sup>99</sup> European Space Agency. *European Space Technology Master Plan 2012*. Paris: ESA, 2012: 85.

<sup>100</sup> *Ibid.*



the EUMETSAT programme; space applications development activities in several sectors (transport, industry, environment, resource management); and space related scientific research at universities and institutes of the Czech Academy of Science.

Romanian space strategy has had three constant objectives since the 1990's: 1) participation in regional and international space missions and programmes – in particular ESA; 2) The development of specific national programmes<sup>101</sup>; 3) Capacity building at national level, development of industry, development of technological niches and the sale of national specificity capabilities, and improvement of national and regional security.

These three objectives have been achieved, since Romania became the 19<sup>th</sup> ESA member state and has a presence in the international space framework; niches such as nano-satellite technologies, advanced data technologies, integrated space applications were developed; Romanian industry succeeded in participating in ESA programs as third party contractors (i.e. mechanical and electrical components and tools for Ariane); centres of competence such as the Institute of Space Science, CRUTA, ROSA RC, university, industry and SME research centres, as well as consortia of actors from institutes, academia and industry were established, and human resources building – diplomas, masters and PhD courses in space-related items in several universities – were realised.<sup>102</sup>

The Romanian space and security programme focuses on five main pillars: space exploration, space applications, space and aerospace technology infrastructure, security-related technology, security systems and infrastructure. After accession to the ESA Convention, the Programme for Research-Development and Innovation on Space Technology and Advanced Research (STAR) became the main instrument to provide national support for the implementation of activities between Romania and ESA. The programme was approved in 2011 and covers the period from 2012 to 2019.<sup>103</sup> There are 3 main specific objectives of the STAR Programme:

<sup>101</sup> The five pillars of the national programme are Science, Technology, Enterprise, capacity Building and Security. Resource Document: European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 129-130.

<sup>102</sup> Piso, Marius-Ioan. "Space Activities towards a Sustainable Development: Case Romania." Presentation. 14<sup>th</sup> EISC Conference 2012 – Thematic Workshop. Krakow, Poland. 13-15 May 2012.

<sup>103</sup> Piso, Marius-Ioan. "GNSS Concept in the Framework of the Romanian R&D Programmes 'Space and Security' and 'STAR'." Presentation. United Nations/Latvia Workshop on

- Participation in ESA's optional programmes - in the field of Science /Robotic Exploration; Earth Observation (including GMES); Telecommunication and Space Applications; Navigation (GNSS and Galileo); Human Space Flight; Launchers; Space Situational Awareness –SSA;
- Development and operation of micro-satellite missions
- Development of technologies, systems, sensors and equipment for space, aeronautics, security and related domains.

One of the main national priorities for Poland is participation in international space programmes, as it would enable Poland to develop its industry by joining international consortia and compensate for possible national funding problems. Given the difficulties in national funding, Poland concentrates its limited resources on a few fields. The three axes of the national space policy are:

- Space Science, which is the most developed field of the Polish space sector. The strategy is to concentrate research efforts on fundamental physics, astrophysics and Solar system exploration;
- Space applications. Both Galileo and GMES-Copernicus related applications are considered national priorities. Poland is involved in several ESA programmes in the field of Satellite Navigation and Earth Observation and will be involved in the development of integrated applications combining Satnav, SatCom and EO. Research activities are supported by a network of specialised institutes and SMEs;
- Space technology. The development of national technological expertise was a primary motivation for joining ESA as a member state. Poland plans to increase its involvement in space technologies by participating in the development of space manipulators and planetary vehicles. It also aims to develop critical European technologies such as processors, composite materials and launcher technologies.<sup>104</sup>

At the end of 2010, a "Programme of Action for the Development of Space Technologies and the Use of Satellite System in Poland" was published by the Ministry of Economy and finally approved by the Council of Ministers in June 2012. Poland's strategy aims to achieve four main objectives:

- Consistency with EU policy in space related fields;

the Applications of Global Navigation Satellite Systems. Riga, Latvia. 14-18 May 2012.

<sup>104</sup> *Cit.*, European Space Agency. European Space Technology Master Plan 2011. Paris: ESA, 2011: 123.

- Achieving Poland's potential in terms of its place among EU countries in the research and exploitation of space;
- Using satellite systems to benefit society and improve public services;
- Supporting Polish companies operating in the international space technology market.<sup>105</sup>

The last ESA Ministerial Council in November 2012 showed that Poland is focusing on applications and technology development. While its proportional contribution to optional programmes in the field of Earth observation, navigation, and satellite technology is well above the average of the remaining ESA member states, Poland is investing little money in ISS and space exploration and nothing in the area of launchers. Another focus seems to be on SSA, where the proportional contribution is also above the ESA average, similar to Romania.

In *Estonia*, one of the first steps in the formulation of a coherent space policy was the publication of the document "Toward an Estonian Space Policy and Strategy"<sup>106</sup>. This document lists a number of strategic objectives for the Estonian Space Policy:

- Develop the potential for economic growth from space related activities by facilitating a competitive business environment;
- Deliver public services in partnership with public institutions, private sector and academia to exploit the technologies and activities of space;
- Deliver world-class science by developing local space activities and exploiting international expertise;
- Cooperation with ESA and other national space agencies, and participation in European initiatives (Galileo, GMES).

In 2011 the government eventually approved the first national Strategy for Estonian Space Affairs 2011-2013, which further defines the national objectives in space. The main strategic objectives are the implementation of space applications and the development of Estonian high tech industry and science.<sup>107</sup> Considering the size of its economy, Estonian policy-makers will probably identify niches in which the country could develop space-related activities. For instance, because of its location, Estonia could play a crucial role in

the surveillance of Schengen borders; or develop systems to monitor ports and ships.

In *Slovenia*, a national space strategy was scheduled for 2012/2013. It can be assumed that it will not aim to have a huge space programme in the near term. The focus will be mainly on applications using space infrastructure, and on actively developing competences in niche technologies, products and services. The majority of activities will be linked to ESA and the EU space industry. Slovenia is already following a niche strategy by putting emphasis on the following market opportunities:

- Developing good relations with large space industry in order to become a privileged subcontractor;
- Finding and exploiting niche areas with sufficient S&T potential;
- Positioning itself as an important contributor of niche products and services;
- Strengthening skills on the applications side;
- Developing new technologies for user-funded applications in the field of EO, satellite navigation and telecommunication<sup>108</sup>.

For *Hungary*, participation in European and ESA programmes is one of the main priorities, since in the last few years the Hungarian government has cut off expenditure for national programmes<sup>109</sup>. Current collaboration with ESA is in the fields of Earth Observation, Science, Human Spaceflight and GSTP Programmes. National activities are focused on two main areas: the development of space-based applications to contribute to the economic development of Hungary and programmes that provide an opportunity to develop Hungarian equipment for space missions. For example, the country contributed to the instruments for the Rosetta, Venus Express, Cassini-Huygens, and BepiColombo missions.<sup>110</sup> The development of a fully Hungarian satellite was also a medium-term objective, eventually realised in 2012 when a cubesat, named Masat-1, was successfully launched as a piggy-bag payload on the maiden flight of Vega.<sup>111</sup>

*Latvia* does not currently have a space policy, but concrete actions for the development of a national space strategy are contained in the *Guidelines for Development of Science and Technologies 2009-2013*, approved by the

<sup>105</sup> *Cit.*, Manikowski, Piotr. "Developments in Space Activities in Poland". Space Policy 29.1 (2013): 35-39.

<sup>106</sup> "Towards an Estonian Space Policy & Strategy." July 2008. Enterprise Estonia 30 Apr. 2013 <<http://www.eas.ee/images/doc/ettevotjale/innovatsioon/koosmos/materials/towards-estonian-space-policy-final.pdf>>.

<sup>107</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 89

<sup>108</sup> *Ibid.*: 131-132

<sup>109</sup> *Ibid.*: 108

<sup>110</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 107-108.

<sup>111</sup> *Ibid.*: 107



Cabinet of Ministers on September 2009<sup>112</sup>. In this context, the strategic goals of Latvia are:

- To concentrate and enhance competitiveness of existing space-related research and industrial potential: a) to educate local specialists; make use of existing researchers with experience in space-related programmes, and attract high level EU professionals; b) to implement space-related industry support actions enhancing development of space technology platforms;
- To consolidate new international cooperation projects and foster fundamental end applied research and development activities with high economic efficiency;
- To enter the international space community as a recognised partner and to join ESA as a Member State;
- To become one of the leading space technology centres in the Eastern European Region<sup>113</sup>.

The formulation of new Guidelines for 2014-2018 for space and technology research is now under development.<sup>114</sup>

In *Lithuania*, the first guiding document related to the country's space activity "Development of Research, Technologies and Innovation in the Space Sector" was issued in May 2010 by a Government Resolution. The Resolution delegated to the Ministry of Economy the responsibility to approve the "National Programme on Development of Research, Technologies and Innovation in the Space Sector for 2010 – 2015" and to draft and approve the Action Plan for implementation. The main objectives are:<sup>115</sup>

- To create a favourable environment for the consolidation and development of the space sector in Lithuania;
- To initiate and develop cooperation with the ESA with the aim of joining this international organization;
- To encourage integration of Lithuanian business and science potential into ESA

activities as well as into European space programmes;

- To promote efficient use of products and services based on space technologies and on data from space in the public sector, business and society.

*The Slovak Republic* has not yet elaborated a space policy, but has identified its priorities in Telecommunications and Navigation, which are seen as the best opportunities for return on investment. Maintenance and development of knowledge and skills already gained in space weather, life sciences and astronomy/astrophysics are also relevant.<sup>116</sup>

Given the size of its economy, participation in European and ESA programmes is one of the main priorities. Slovak organisations have already been involved in ESA activities through other ESA member states' participation. The Slovak Institute of Experimental Physics, for example, has worked on Rosetta, BepiColombo, Venus Express and Double Star with the National University of Ireland. Currently, there are over 30 firms that have shown interest in many ESA Technology Domains (especially Space System Software, Spacecraft electrical Power, Automation & Robotics, and Mechanisms & Tribology)<sup>117</sup>.

#### R&D Expenditures and Investments in Space Activities

The financial framework for R&D and space activities in recent and possible future ESA member states shows wide disparities among the different countries, both in absolute and relative terms. A comparison of the Government Budget Appropriations or Outlays on Research and Development (GBAORD) – which represents the funds allocated to R&D in central government or federal budgets and therefore means budget provisions, not actual expenditure – is provided in Table 4.

<sup>112</sup> NordicBaltSat Space Directory 2011. Resource document: "Space Awareness Action Plan (SAAP)." 1 Nov. 2009. NordicBaltSat 29 Oct. 2013 <[http://www.nordicbaltSAT.eu/sites/www.nordicbaltSAT.eu/files/SAAP\\_09\\_01\\_2012.pdf](http://www.nordicbaltSAT.eu/sites/www.nordicbaltSAT.eu/files/SAAP_09_01_2012.pdf)>: 101.

<sup>113</sup> Kaspars, Karolis. "Space Activities in Latvia." Presentation. Baltic Space Roundtable. Tallinn, Estonia. 26 January 2010.

<sup>114</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 115.

<sup>115</sup> NordicBaltSat Space Directory 2011. Resource document: "Space Awareness Action Plan (SAAP)." 1 Nov. 2009. NordicBaltSat 29 Oct. 2013 <[http://www.nordicbaltSAT.eu/sites/www.nordicbaltSAT.eu/files/SAAP\\_09\\_01\\_2012.pdf](http://www.nordicbaltSAT.eu/sites/www.nordicbaltSAT.eu/files/SAAP_09_01_2012.pdf)>: 160-162.

<sup>116</sup> Cimbáková, Marta. "The Slovak Pathway towards ESA." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

<sup>117</sup> *Ibid.*

	GBOARD	% of GDP	% for space activities
<b>Czech Republic</b>	894	0,6%	1,7%
<b>Estonia</b>	102	0,8%	3,6%
<b>Hungary</b>	469	0,5%	0,5%
<b>Latvia</b>	41	0,2%	1,4%
<b>Lithuania</b>	234	0,6%	0,2%
<b>Poland</b>	1052	0,4%	1,6%
<b>Romania</b>	353	0,4%	1,0%
<b>Slovak Republic</b>	198	0,3%	0,4%
<b>Slovenia</b>	265	0,8%	0,4%

Table 4: GBOARD of recent/future ESA member states for 2010 in million EUR<sup>118</sup>

A comparison of total R&D expenditure and R&D intensity (R&D expenditure as a percentage of GDP) in recent and possible future ESA member states is shown in Table 5.

	GERD	% of GDP
<b>Czech Republic</b>	2335	1,5%
<b>Estonia</b>	232	1,6%
<b>Hungary</b>	1126	1,3%
<b>Latvia</b>	109	0,6%
<b>Lithuania</b>	219	0,75%
<b>Poland</b>	2608	0,75%
<b>Romania</b>	573	0,4%
<b>Poland</b>	2608	0,75%
<b>Slovak Republic</b>	416	0,6%
<b>Slovenia</b>	746	2,1%

Table 5: R&D expenditure in mission EUR and R&D intensity<sup>119</sup>

This means that the average R&D expenditure of these CEE countries for 2010 represented only 1,06% of their GDP (according to the figures in Table 5). With the exception of Slovenia, the countries have a very small expenditure on R&D, which is approximately half of the EU 27 average level of 2,0% and is also far short of the target of 3% set by the Lisbon Treaty.

With regard to the space sector, expenditures are very limited and in fact lower than those of other EU and ESA Member States. The following tables and figures represent the total national budget for space through na-

tional, ESA or other international programmes.

The budget for space activities in the *Czech Republic* has consistently increased in the last few years, moving from €7,4 million in 2008 to €19 million in 2012, as presented in Figure 9. It also shows that while budgets for national activities remained stable, budgets for ESA programmes increased fivefold (since accession to the Agency). The annual ESA budget of around 10 Million Euro is a reasonable commitment split into around € 5,4 million for the ESA mandatory budget and the rest for 13 optional programmes. Also the budget for other international programmes (including EUMETSAT), quadrupled passing from €0,9 million in 2008 to €4,5 million in 2012. The overall budget for 2013 is expected to rise to €23,1 million Euro.

The *Romanian* budget for space activities has consistently increased in the last few years, passing from €19 Million in 2007 to €30 million in 2011, as shown in Figure 10.<sup>120</sup>

As an ECS, Romania was under the obligation to pay a contribution of at least 1 million euros per year. Nevertheless, Romania committed to pay a contribution of 10 million euros over the five year period. Since Romania became a full ESA member in December 2011 and therefore has to pay a mandatory contribution for the general budget and the scientific programme, it is expected that its space expenditure will increase significantly over the next few years, reaching around €15-20 million per year.<sup>121</sup>

<sup>120</sup> Cfr., Piso, Marius-Ioan. "Space Activities towards a Sustainable Development: Case Romania." Presentation. 14<sup>th</sup> EISC Conference 2012 – Thematic Workshop. Krakow, Poland. 13-15 May 2012.

<sup>121</sup> Euroconsult. "Profiles of Government Space Programs. Analysis of 60 countries and Agencies", Paris, 2012.

<sup>118</sup> Eurostat. Science, Technology and Innovation in Europe. 2012 Edition. Luxembourg: Eurostat, 2012.

<sup>119</sup> *Ibid.*



Figure 9: Czech Republic, expenditures on space activities (in Million Euro)<sup>122</sup>



Figure 10: Romanian expenditure on space activities (in Million Euro)<sup>123</sup>

<sup>122</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 86.

<sup>123</sup> *Ibid.*: 130.

In *Poland*, similar to the previous examples of the other two recent member states, the budget for space activities has consistently increased in the last few years, passing from

€8, 2 million in 2008 to €39 million in 2013, (as shown in Figure 11), showing the increasing importance of the space sector in Poland.

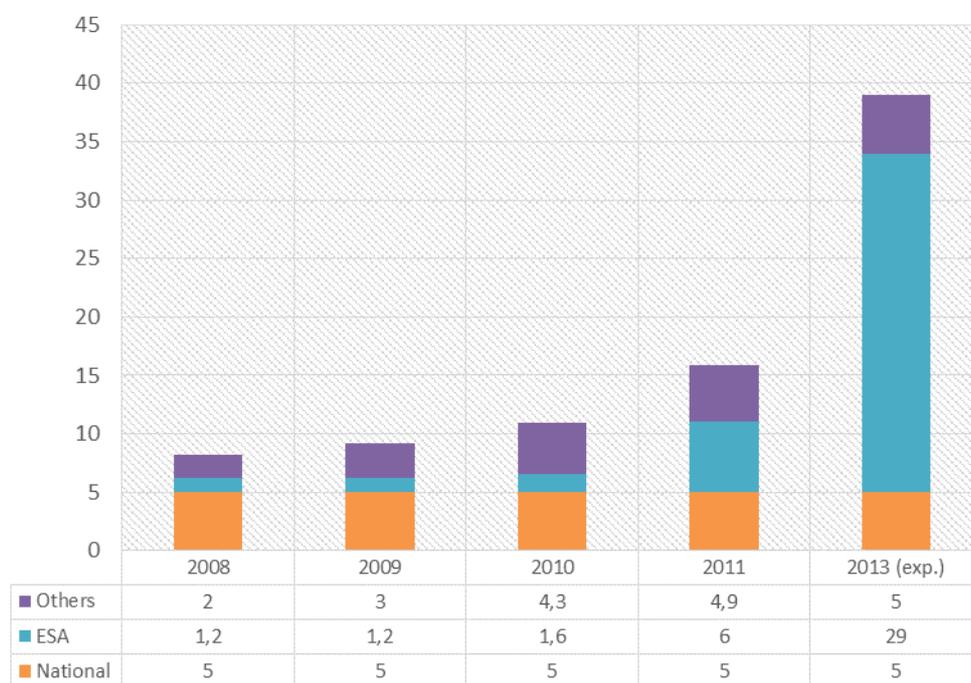


Figure 11: Polish expenditures on space activities (in Million Euro)<sup>124</sup>

The Chart shows that while the national budget did not change over the years, the budget for ESA had a very strong increase (from €1,2 million in 2008 to €29 million in 2013). It has to be underlined, however, that a significant part of national space projects is financed through Polish participation in the European FP7 programme.<sup>125</sup> Since Poland's GDP is now one of the fastest growing within the EU, and considering that accession to ESA involves participation based on national GDP, it can be expected that the accession of Poland (which took place in November 2012) will soon boost the Polish space budget, bringing its contribution to ESA mandatory activities in the range of €12 million euro per year, with potential additional contributions to optional programmes<sup>126</sup>, which could bring the future Polish ESA budget to €25-30 Million.

The *Estonian* budget for space activities has not substantially increased in the last few years, moving from 2,13 million Euro in 2008 to 2,9 million in 2012, as shown in Figure 12.

Without considering the absolute numbers, which show that the amount of investment is low, especially if compared to the previous examples of recent ESA member states, there has been a remarkable increase in the ESA budget, showing the importance that this country attributes to future membership. It is expected that both the national and the ESA budget will significantly increase in the next few years.

Figure 13 shows the budget of *Slovenia* for space activities, especially the budget dedicated to the national programme. Despite the fact that the budget for space-related activities has slightly increased, it can be expected that Slovenia will focus on specific niche areas, considering the relative small amount of money it has provided in absolute terms.

<sup>124</sup> European Space Agency. *European Space Technology Master Plan 2012*. Paris: ESA, 2012: 126.

<sup>125</sup> Euroconsult. "Profiles of Government Space Programs. Analysis of 60 countries and Agencies", Paris, 2012: 256

<sup>126</sup> *Ibid.*



Figure 12: Estonian expenditures on space activities (in Million Euro)

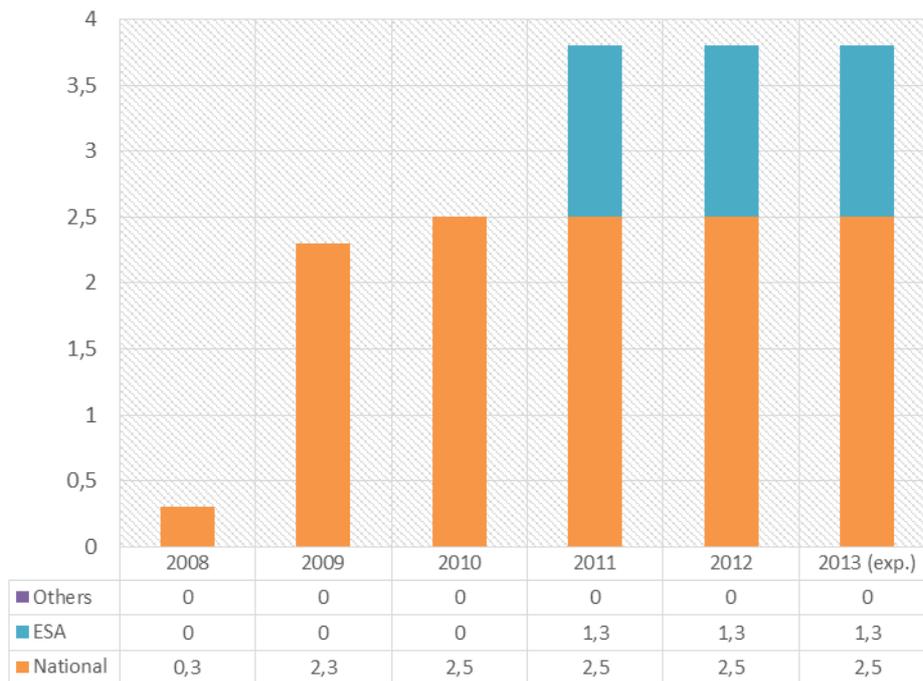


Figure 13: Slovenian expenditure on space activities (in Million Euro)<sup>128</sup>

<sup>127</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 91.

<sup>128</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 133.

Figure 14 shows the Hungarian budget for space related activities. As can be observed, while the contribution to ESA is stable (because of the commitment to the PECS pro-

gramme) and the contribution to other international organisations, such as EUMETSAT, has slightly increased, expenditure for national space activities has been discontinued.



Figure 14: Hungarian expenditure on space activities (in Million Euro)<sup>129</sup>

## 2.2.4 Space Capabilities and Expertise

The range of capabilities and expertise of recent and aspiring ESA member states is very wide, taking into consideration their past participation in the Soviet Intercosmos Programme and participation in space missions with other international partners. The following Chapter provides a brief overview of the capabilities and interests of these countries in the field of space. It does not include a detailed description of national companies and scientific institutions. Nevertheless, the following examples demonstrate that recent and aspiring ESA member states show a remarkably high level of interest in space science, while the majority of them have a longer history of expertise in this sector due to their participation in the Intercosmos programme. Furthermore, most of these countries show great interest in navigation and remote sensing applications. It is noteworthy that many of them are also involved in the production/manufacturing of components and software products related to space technology.

The *Czech Republic's* focus in the field of space activities lies in astronomy, construction of scientific instruments and micro-satellites, components (optics, electronics, micro-accelerometers, and composite parts), hardware test facilities, software for ground segment and satellite operations, remote sensing applications and navigation applications.<sup>130</sup> Most SMEs in the Czech Republic dealing with space are flexible and innovative and have a good space technology background. Nevertheless, this space background was not commercial and due to the closed totalitarian system in the past experience of a market economy is often missing. Furthermore, only minimal finances are available in the Czech Republic to support these space companies.

<sup>129</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 108.

<sup>130</sup> Mathieu, Charlotte. "Space in Central and Eastern Europe. Opportunities and Challenges for the European Space Endeavour. Addendum Exploratory Study on Estonia and Slovenia." ESPI Report 8 Oct. 2007: 37.



	Czech Republic	Romania	Poland	Estonia	Slovenia	Hungary	Latvia	Lithuania	Slovak Republic
Space science (e.g. astronomy, astrophysics, solar system exploration)	X	X	X	X		X	X		X
Earth observation (e.g. environmental monitoring, meteorology, geodesy)	X	X	X	X	X	X		X	X
Space technology	X	X	X	X	X	X	X	X	X
Ground segment engineering and utilization	X								
Telecommunication and navigation (service demonstrations)	X	X	X	X	X			X	
Life and physical sciences (e.g. space biology and medicine, material processing)				X		X	X	X	

The key sectors of *Romanian* space activities are space science (space physics and astronomy), space systems (construction of nanosatellites, microgravity experiments), security applications and space applications (telemedicine and earth observation data processing for disaster management, land use and cover agriculture, GNSS and location-based services).<sup>131</sup>

In *Poland*, space activities are mostly concentrated on space science and space science instrumentation (astronomy, planetology, interstellar physics, space weather – plasma physics), navigation applications (geodesy), remote sensing and its applications (space and ground-based instrumentation for earth observation, remote sensing applications). Both satellite navigation and Earth observation are considered as national priorities and Poland participates in Galileo and Copernicus. In terms of Galileo, the country focuses on the development of the ground segment and on the development of integrated applications (combining SatNav, SatCom and EO). With regard to Copernicus, Poland participates in a

number of EU FP7 projects (e.g. the SWEX/R project)<sup>132</sup>.

The main sectors of *Estonian* space activities focus on astrophysics and space applications for remote sensing (mainly for atmosphere, forests, agriculture and water bodies monitoring),<sup>133</sup> atmospheric research and oceanography. Estonia also has applied research in the fields of radiometry, optical (including laser) instrumentation and information technology. According to the document “Toward an Estonian Space Strategy”, Estonia should not fund launchers, nor participate in human spaceflight programmes. By optimising public resources, making full use of current (scientific, business) competence and the prospective programmes of ESA and the EU, Estonia should focus systematically on four areas of research, development and innovation: Earth Observation, Satellite Communication, Navigation & Positioning, and Space Science & Exploration.<sup>134</sup>

<sup>131</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 130.

<sup>132</sup> Euroconsult. “Profiles of Government Space Programs. Analysis of 60 countries and Agencies”, Paris, 2012: 235

<sup>133</sup> European Space Agency. European Space Technology Master Plan 2012. Paris: ESA, 2012: 89-91.

<sup>134</sup> “Towards an Estonian Space Policy & Strategy.” July 2008. Enterprise Estonia 15 May 2013

The most important space-related core competences of *Slovenian* industry are remote sensing applications, high precision manufacturing and communications. Therefore, it can be expected that the main sectors in which Slovenia will continue to invest are: Copernicus as well as satellite navigation and telecommunications related applications, technologies for micro- and nano-satellites and electro-optical data transmission and measurement systems.<sup>135</sup> The focus of the previously mentioned Space.Si consortium is mainly oriented to nano- and micro-satellite technologies that enable high precision interactive remote sensing and precise manoeuvring of satellites.

*Hungarian* space activities include: Earth observation and its applications (mainly land cover mapping, space geodesy, geophysics and meteorology), space physics (including astronomy, planetology, cosmic materials), Life sciences (biophysics, microbiology and aerospace medicine), space technology (especially concerning on-board instruments, materials sciences and telecommunications).<sup>136</sup> In the last decade, the Hungarian aerospace industry has seen remarkable growth thanks to the establishment of the Hungarian Aerospace Cluster (HAC) in 2006 and the Hungarian Aerospace Technology Platform (HATP) in 2007, which brought together over 40 high-tech companies and 2500 employees and speeded up the development of the national industry.<sup>137</sup>

*Latvia* has been strong in the areas of hardware development and material development and has longstanding experience in astronomy and space science. Several institutions and private companies are potential partners for ESA activities and the Latvian State Institute of Wood Chemistry is already working with EADS Astrium to develop internal and external cryogenic insulation materials and technologies.

*Lithuania* is mainly focused on engineering and ICT, material science technology, life science and biotechnologies, and natural re-

source and agriculture utilisation through space assets<sup>138</sup>.

Space science is the most advanced part of *Slovak* space activities, especially in the areas of space weather, life sciences, astronomy and astrophysics (solar system and solar physics).<sup>139</sup> Slovak organisations have already been involved in ESA activities through ESA member states' participation. Among the scientific stakeholders, the most important institution in terms of involvement in space research is the Slovak Academy of Science (SAS) and its Institutes of Astronomy, Geography, Experimental Physics, Experimental Endocrinology, Materials and Machine Mechanics. Several universities have participated in international projects (Mars Odyssey (NASA), XMM Newton (ESA), GMES (EU)). With regard to industrial stakeholders, Slovakia has a few experienced companies relevant to space (e.g. Siemens PSE, ZTS VVU, and Q-products), but with limited or no space contracts so far. No specific "Interest Group" dedicated to space industry currently exists, but more than 30 companies have shown interest in various technology domains of ESA (especially space system software, spacecraft electrical power engineering, automation & robotics, mechanisms & tribology)<sup>140</sup>.

### 2.2.5 Legal Framework and International Cooperation

None of the recent and future ESA member states have specific national space-related laws. Concerning the international legal framework, with the exception of the Baltic countries, all other states have ratified the major international agreements relating to activities in outer space.

Table 6 summarizes the status of the main international agreement ratifications as at 1 January 2012.<sup>141</sup>

Furthermore, most countries have recently become members of the main international institutions related to space (as shown in Table 7).

<<http://www.eas.ee/images/doc/ettevotjale/innovatsioon/kosmos/materials/towards-estonian-space-policy-final.pdf>>.

<sup>135</sup> *Cit.*, European Space Agency. European Space Technology Master Plan 2010. Paris: ESA, 2011: 121. ; European Space Agency. European Space Technology Master Plan 2011. Paris: ESA, 2011: 130.

<sup>136</sup> Mathieu, Charlotte. "Space in Central and Eastern Europe. Opportunities and Challenges for the European Space Endeavour. Addendum Exploratory Study on Estonia and Slovenia." ESPI Report 8 Oct. 2007: 53.

<sup>137</sup> "Aerospace Industry in Hungary." 2012. Hungarian Investment and Trade Agency 13 May 2013 <[http://www.haif.org/Aerospace\\_Industry\\_Hungary\\_2012.pdf](http://www.haif.org/Aerospace_Industry_Hungary_2012.pdf)>.

<sup>138</sup> Tomkus, Vidmantas. "Opportunities and Challenges for Non-member states." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

<sup>139</sup> Cimbáková, Marta. "The Slovak Pathway towards ESA." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

<sup>140</sup> *Ibid.*

<sup>141</sup> Status of International Agreements relating to activities in outer space as at 1 January 2012; United Nations Committee on Peaceful Uses of Outer Space. Resource document: "Status of International Agreements Relating to Activities in Outer Space as at 1 January 2012." 12 Mar. 2012. Committee on the Peaceful Uses of Outer Space Legal Subcommittee 29 Oct. 2013 <[http://www.oosa.unvienna.org/pdf/limited/c2/AC105\\_C2\\_2012\\_CRP03E.pdf](http://www.oosa.unvienna.org/pdf/limited/c2/AC105_C2_2012_CRP03E.pdf)>.



	OST	ARRA	LIAB	REG	MOON	NTB
Czech Republic	R	R	R	R	-	R
Romania	R	R	R	-	S	R
Poland	R	R	R	R	-	R
Estonia	R	-	-	-	-	
Slovenia	-	R	R	-	-	R
Hungary	R	R	R	R	-	R
Latvia	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-
Slovak Republic	R	R	R	R	-	R

Table 6: Ratification of International Agreements by recent/future ESA member states<sup>142</sup>

	EUTELSAT	EUMETSAT	ITU	EURISY	IAF
Czech Republic	R	R	R	Full Member	Member
Romania	R	R	R	Full Member	Member
Poland	R	R	R	Full Member	Member
Estonia	-	-	R	Full member	Member
Slovenia	R	R	R	-	Member
Hungary	R	R	R	Full Member	Member
Latvia	R	R	R	-	Member
Lithuania	R	-	R	Associate Member	-
Slovak Republic	R	R	R	-	Member

Table 7: Status of memberships in international organisations

The milestones of the cooperation with ESA and the current status of their relations with the Agency are described hereafter.

### Czech Republic

In 1996, the Czech Government signed a first level *Cooperation Agreement* with ESA<sup>143</sup>. It then joined the ESA PRODEX in June 2000 and gained *ECS Status* in 2003 (24 November)<sup>144</sup>. One year after this event (24 November 2004), the Czech Republic signed the

*PECS Charter*.<sup>145</sup> Under the PECS agreement, 22 projects were performed, with a participation breakdown presented in Figure 15.

<sup>142</sup> Acronym explanations. OST (Outer Space Treaty); ARRA (Rescue Agreement); LIAB (Liability Convention); REG (Registration Convention); MOON (Moon Agreement); NTB (Nuclear Test Ban Treaty); R (ratified); S (signed).

<sup>143</sup> "Czech Republic Accedes to the ESA Convention." 8 July 2008. European Space Agency 30 Apr. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Czech\\_Republic\\_accedes\\_to\\_the\\_ESA\\_Convention](http://www.esa.int/About_Us/Welcome_to_ESA/Czech_Republic_accedes_to_the_ESA_Convention)>.

<sup>144</sup> "Czech Republic Becomes Second ESA European Cooperating State." 30 Nov. 2004. European Space Agency 30 Apr. 2013 <[http://www.esa.int/About\\_Us/Industry/Czech\\_Republic\\_becomes\\_second\\_ESA\\_European\\_Cooperating\\_State2](http://www.esa.int/About_Us/Industry/Czech_Republic_becomes_second_ESA_European_Cooperating_State2)>.

<sup>145</sup> *Ibid.*

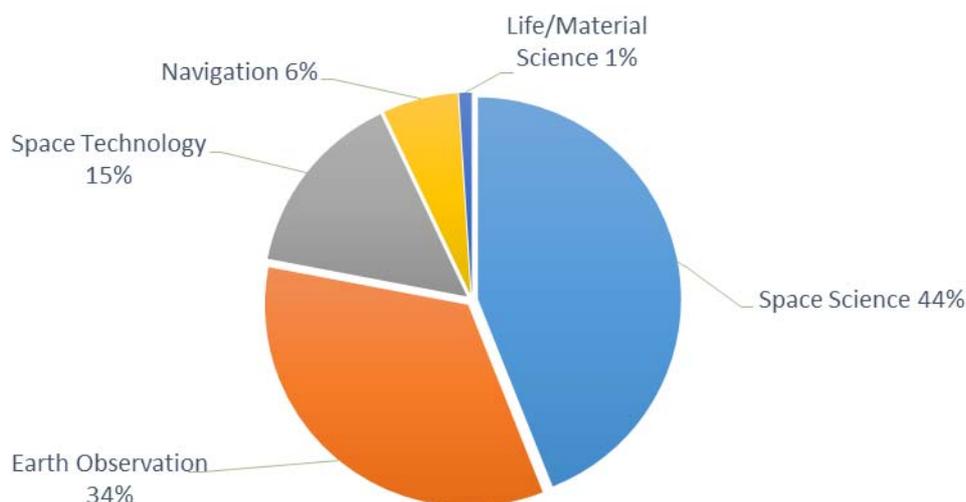


Figure 15: Breakdown of the Czech Republic's PECS activities per field<sup>146</sup>

The formal request to accede to the ESA Convention was submitted in January 2007 and the negotiations started in June of the same year. The *Accession Agreement* was signed in July 2008<sup>147</sup> and the Czech Republic formally became the 18<sup>th</sup> ESA Member in November 2008.<sup>148</sup>

#### Romania

Relations between Romania and ESA started in the early 1990s: in 1992 a first level *Cooperation Agreement* with ESA was signed.<sup>149</sup> Seven years later, in 1999, the agreement was renewed. In 2006 (17 February) Romania signed the *ECS Agreement*<sup>150</sup> and then joined the PECS Programme in 2007. The *PECS Charter* was signed on 16 February 2007.<sup>151</sup> Eight different projects have been performed under PECS

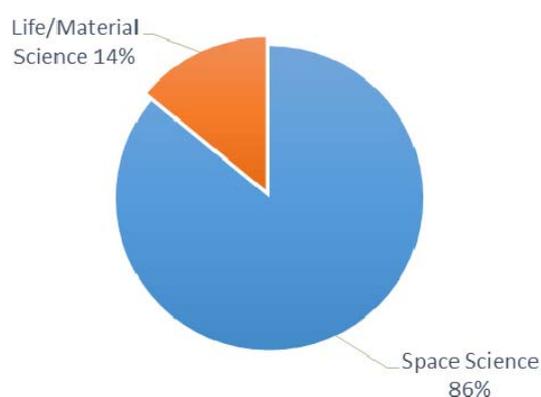


Figure 16: Breakdown of Romanian PECS activities per field<sup>152</sup>

Following a period of negotiations with ESA, on 20 January 2011 the *Accession Agreement* to the ESA Convention was signed<sup>153</sup>, and on 22 December 2011 Romania formally became the 19<sup>th</sup> member of ESA.<sup>154</sup> After accession to the ESA Convention, the STAR programme (see Paragraph 2.3.1) became the main instrument to provide national support for the implementation of the agreement between Romania and ESA regarding Romania's accession to the ESA Convention.

<sup>146</sup> Adaptation from PECS website: "Czech Republic. Plan for European Cooperating States (PECS)." 7 Dec. 2009. European Space Agency 13 May 2013 <[http://www.esa.int/About\\_Us/Plan\\_for\\_European\\_Cooperating\\_States/Czech\\_Republic2](http://www.esa.int/About_Us/Plan_for_European_Cooperating_States/Czech_Republic2)>.

<sup>147</sup> "Czech Republic Accedes to the ESA Convention." 8 July 2008. European Space Agency 30 Apr. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Czech\\_Republic\\_accedes\\_to\\_the\\_ESA\\_Convention](http://www.esa.int/About_Us/Welcome_to_ESA/Czech_Republic_accedes_to_the_ESA_Convention)>.

<sup>148</sup> "New member states." 2013. European Space Agency 30 Apr. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/New\\_Member\\_States](http://www.esa.int/About_Us/Welcome_to_ESA/New_Member_States)>.

<sup>149</sup> "Romania Accedes to ESA Convention." 20 Jan. 2011. European Space Agency 30 Apr. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Romania\\_accedes\\_to\\_ESA\\_Convention](http://www.esa.int/About_Us/Welcome_to_ESA/Romania_accedes_to_ESA_Convention)>.

<sup>150</sup> "Romania Becomes Third ESA European Cooperating State." 27 Feb. 2006. European Space Agency 30 Apr. 2013

<[http://www.esa.int/About\\_Us/Industry/Romania\\_becomes\\_third\\_ESA\\_European\\_Cooperating\\_State](http://www.esa.int/About_Us/Industry/Romania_becomes_third_ESA_European_Cooperating_State)>.

<sup>151</sup> *Ibid.*

<sup>152</sup> Adaptation from PECS website: "Romania. Plan for European Cooperating States (PECS)." 7 Dec. 2009. European Space Agency 13 May 2013 <[http://www.esa.int/About\\_Us/Plan\\_for\\_European\\_Cooperating\\_States/Romania2](http://www.esa.int/About_Us/Plan_for_European_Cooperating_States/Romania2)>.

<sup>153</sup> "Romanian Flag Raised at ESA." 24 Jan. 2012. European Space Agency 30 Apr. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Romanian\\_flag\\_raised\\_at\\_ESA](http://www.esa.int/About_Us/Welcome_to_ESA/Romanian_flag_raised_at_ESA)>.

<sup>154</sup> *Ibid.*



## Poland

Poland's cooperation with ESA dates back to the 1980s. The first formal milestone in relations between ESA and Poland was in January 1994, when the first level *Cooperation Agreement* between the Polish Government and the Agency was endorsed.<sup>155</sup> The agreement was then renewed on 24 January 2002. With this second Cooperation Agreement, the scope of cooperation was extended. Following the signature of an *ECS Agreement* on 27 April 2007<sup>156</sup>, Poland obtained ECS status. The *PECS Charter* was signed on 28 April 2008<sup>157</sup> and enabled Poland to participate in almost all ESA programmes and activities (47 projects with a total budget of 11 Million Euro).

In July of the same year, accession negotiations between the Polish government and ESA started and finished in April 2012. On 13 September 2012, the *Accession Agreement* was signed, and on 19 November 2012 Poland officially became a Member of ESA, participating at the Ministerial Council of November 2012 as the *20th ESA full Member State*.<sup>158</sup>

<sup>155</sup> "ESA/Poland Cooperation Agreement." 28 Jan. 1994. European Space Agency 30 Apr. 2013 <[http://www.esa.int/For\\_Media/Press\\_Releases/ESA\\_Poland\\_cooperation\\_agreement](http://www.esa.int/For_Media/Press_Releases/ESA_Poland_cooperation_agreement)>.

<sup>156</sup> "Poland Becomes Fourth ESA European Cooperating State." 4 May 2007. European Space Agency 30 Apr. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Poland\\_becomes\\_fourth\\_ESA\\_European\\_Cooperating\\_State](http://www.esa.int/About_Us/Welcome_to_ESA/Poland_becomes_fourth_ESA_European_Cooperating_State)>.

<sup>157</sup> "Poland and ESA Sign the Plan for European Cooperating State (PECS)." 5 May 2008. European Space Agency 30 Apr. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Poland\\_and\\_ESA\\_sign\\_the\\_Plan\\_for\\_European\\_Cooperating\\_State\\_PECS](http://www.esa.int/About_Us/Welcome_to_ESA/Poland_and_ESA_sign_the_Plan_for_European_Cooperating_State_PECS)>.

<sup>158</sup> "ESA DG in European Space Directory 2012." 25 Apr. 2012. European Space Agency 30 Apr. 2013 <[http://www.esa.int/About\\_Us/DG\\_s\\_News\\_and\\_Views/ESA\\_DG\\_in\\_European\\_Space\\_Directory\\_2012](http://www.esa.int/About_Us/DG_s_News_and_Views/ESA_DG_in_European_Space_Directory_2012)>.

## Estonia

The first contacts with ESA were established in 2005, following Estonian EU membership. On 20 June 2007, the Ministry of Economic Affairs and Communications signed a *Cooperation Framework Agreement* with the Agency.<sup>159</sup> In 2009, Estonia took a step further in its relations with ESA by obtaining *ECS Status*. The agreement was signed on 10 November 2009.<sup>160</sup> It was followed by the signature of the *PECS Charter* on 22 September 2010. ESA and Enterprise Estonia identified 12 Estonian PECS projects in the field of Space Science; Earth Observation; Human Spaceflight, Microgravity and Exploration; Satellite Communication; Space Technology; Education. The participation breakdown is illustrated in Figure 18.

## Slovenia

Slovenia's relations with ESA started quite recently. The first *Cooperation Agreement* was signed in May 2008.<sup>161</sup> On 25 January 2010, Slovenia obtained *ECS Status*,<sup>162</sup> which was followed, some months later by the endorsement of the *PECS Charter* (30 November 2010).

The Slovenian contribution to the 5 years PECS programme amounts to about €6,25 Million. Currently, there are 10 ongoing projects in the field of Space Science; Earth Observation; Human Spaceflight, Microgravity and Exploration; Telecommunication; Industrial policy; Advance Concept Study; Education. The participation breakdown is illustrated in Figure 19.

<sup>159</sup> "Estonia Signs Cooperation Agreement with ESA." 26 June 2007. European Space Agency 30 Apr. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Estonia\\_signs\\_Cooperation\\_Agreement\\_with\\_ESA](http://www.esa.int/About_Us/Welcome_to_ESA/Estonia_signs_Cooperation_Agreement_with_ESA)>.

<sup>160</sup> "Estonia Becomes Fifth ESA European Cooperating State." 12 Nov. 2009. European Space Agency 30 Apr. 2013

<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Estonia\\_becomes\\_fifth\\_ESA\\_European\\_Cooperating\\_State](http://www.esa.int/About_Us/Welcome_to_ESA/Estonia_becomes_fifth_ESA_European_Cooperating_State)>.

<sup>161</sup> "Slovenia Signs Cooperation Agreement with ESA." 9 June 2008. European Space Agency 30 Apr. 2013

<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Slovenia\\_signs\\_Cooperation\\_Agreement\\_with\\_ESA](http://www.esa.int/About_Us/Welcome_to_ESA/Slovenia_signs_Cooperation_Agreement_with_ESA)>.

<sup>162</sup> "Slovenia Becomes Sixth ESA European Cooperating State." 25 Jan. 2010. European Space Agency 30 Apr. 2010

<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Slovenia\\_becomes\\_sixth\\_ESA\\_European\\_Cooperating\\_State](http://www.esa.int/About_Us/Welcome_to_ESA/Slovenia_becomes_sixth_ESA_European_Cooperating_State)>.

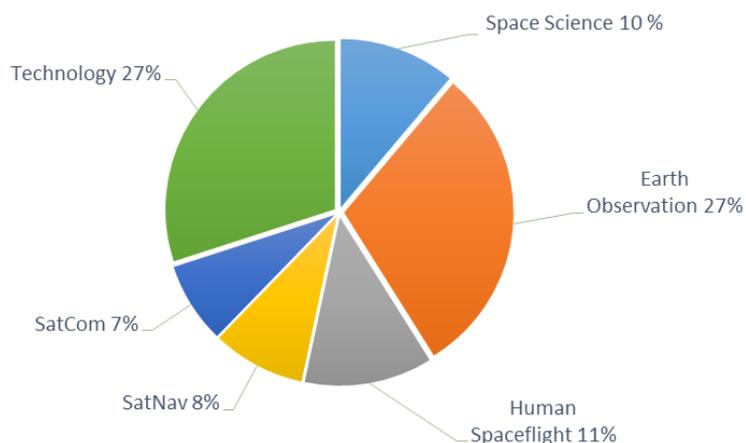


Figure 17: Breakdown of Polish PECS activities per field<sup>163</sup>

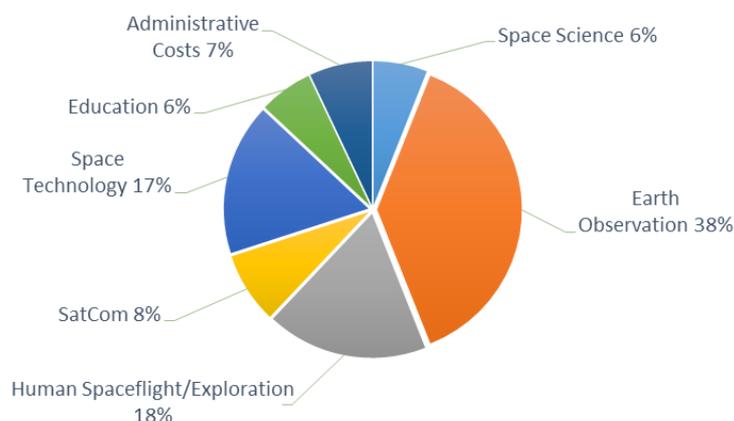


Figure 18: Breakdown of Estonian PECS activities per field<sup>164</sup>

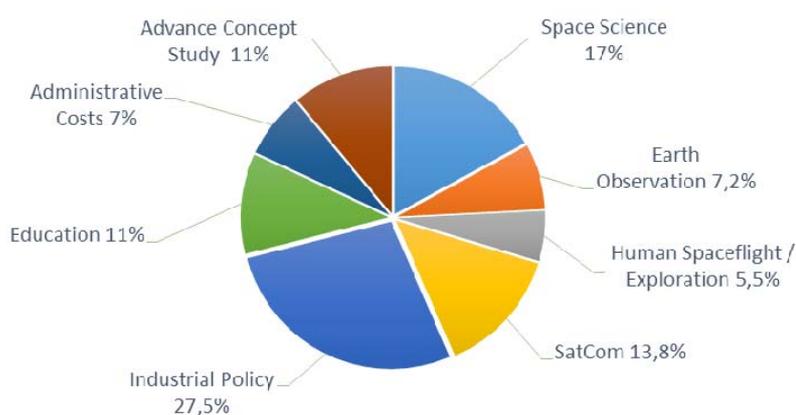


Figure 19: Breakdown of Slovenian PECS activities per field<sup>165</sup>

<sup>163</sup> Adaptation from PECS website: "Poland. Plan for European Cooperating States (PECS)." 26 Jan. 2010. European Space Agency 13 May 2013 <[http://www.esa.int/About\\_Us/Plan\\_for\\_European\\_Cooperating\\_States/Poland2](http://www.esa.int/About_Us/Plan_for_European_Cooperating_States/Poland2)>.

<sup>164</sup> Adaptation from PECS website: "Estonia. Plan for European Cooperating States." 4 Sept. 2012. European Space Agency 13 May 2013 <[http://www.esa.int/About\\_Us/Plan\\_for\\_European\\_Cooperating\\_States/Estonia](http://www.esa.int/About_Us/Plan_for_European_Cooperating_States/Estonia)>.

<sup>165</sup> Adaptation from PECS website: "Slovenia. Plan for European Cooperating States." 4 Sept. 2012. European Space Agency 13 May 2005 <[http://www.esa.int/About\\_Us/Plan\\_for\\_European\\_Cooperating\\_States/Slovenia](http://www.esa.int/About_Us/Plan_for_European_Cooperating_States/Slovenia)>.

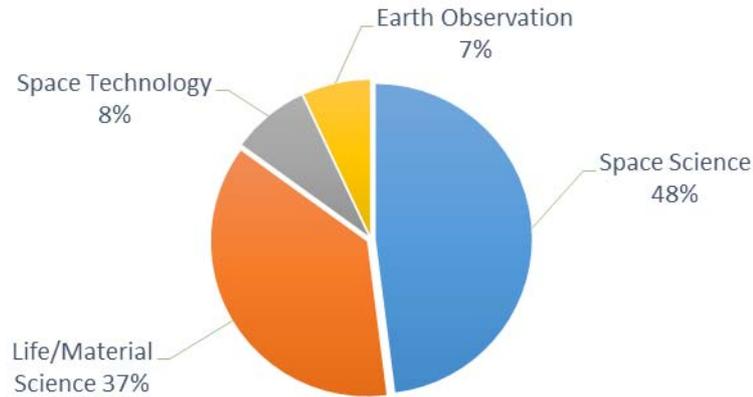


Figure 20: Breakdown of Hungarian PECS activities per field<sup>166</sup>

### Hungary

Hungarian relations with ESA started as early as 1991, when the country signed a first level *Cooperation Framework Agreement* (10 April 1991). Hungary was the first non-ESA member state (and Eastern European country) to join PRODEX<sup>167</sup>. The total contribution of Hungary to PRODEX from 1997 to 2002 was €3,45 million. On 10 April 2003, Hungary obtained *ECS Status* and some months later the country left the PRODEX programme to join PECS. The *PECS Charter* was signed in November 2003 and 37 projects in the field of Space Science, Life and Material Science, Space Technology and Earth Observation were undertaken (as shown in Figure 20).

In 2006, Hungary was granted the status of observer in the International Relations Committee. In the same year, the country informed ESA about its intention to become a Member of the Agency. Accession negotiations started the following year, but in November 2008 Hungary decided to go ahead with an extension of its participation in PECS for another 5 years.

### Latvia

The first official contacts between ESA and Latvia started in March 2004, when an ESA delegation first visited Riga to meet several space organisations working in the navigation field. In February 2005, the Latvian Minister

for Economics discussed in more detail the different types of cooperation with ESA. Eventually, Latvia became the second Baltic country to sign a *Cooperation Agreement* with ESA.

In 2010, Latvia started to prepare for the PECS programme. Therefore, in March the ESA institutional audit took place, in which 11 scientific institutions, 1 Technology Park and 13 companies participated. Following the ESA evaluation and recommendations in October 2010, several potential PECS projects were identified<sup>168</sup>:

The *ECS Agreement* was signed on 19 March 2013. As next steps, ESA and Latvia will have to complete a list of projects that will be presented for approval to the relevant ESA Committees and Programme Boards. Furthermore, Latvian organisations will be briefed and receive training by ESA representatives<sup>169</sup>. The potential timeframe for future cooperation of Latvia with ESA includes the signing of the PECS Agreement in 2013 and the implementation of PECS projects in the period 2013-2018.

### Lithuania

Lithuania was the last of the Baltic countries to sign a *Cooperation Agreement* with ESA, on 7 October 2010 in Vilnius.<sup>170</sup> The Agree-

<sup>166</sup> Adaptation from PECS website: "Hungary. Plan for European Cooperating States." 4 Sept. 2012. European Space Agency 13 May 2013 <[http://www.esa.int/About\\_Us/Plan\\_for\\_European\\_Cooperating\\_States/Hungary](http://www.esa.int/About_Us/Plan_for_European_Cooperating_States/Hungary)>.

<sup>167</sup> PRODEX (Programme de Développement d'Expériences scientifiques) is an optional programme launched in June 1986 by ESA Council. This programme aimed at providing funding for the industrial development of scientific instruments or experiments proposed by scientific institutes or universities. The Programme was opened to ESA member states but also to non-member states.

<sup>168</sup> NordicBaltSat Space Directory 2011. Resource document: "Space Awareness Action Plan (SAAP)." 1 Nov. 2009. NordicBaltSat 29 Oct. 2013 <[http://www.nordicbaltssat.eu/sites/www.nordicbaltssat.eu/files/SAAP\\_09\\_01\\_2012.pdf](http://www.nordicbaltssat.eu/sites/www.nordicbaltssat.eu/files/SAAP_09_01_2012.pdf)>: 104-105.

<sup>169</sup> "Latvia Becomes Seventh ESA European Cooperating State." 19 Mar. 2013. European Space Agency 30 Apr. 2013

<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Latvia\\_becomes\\_seventh\\_ESA\\_European\\_Cooperating\\_State](http://www.esa.int/About_Us/Welcome_to_ESA/Latvia_becomes_seventh_ESA_European_Cooperating_State)>.

<sup>170</sup> "Lithuania Signs Cooperation Agreement." 12 Oct. 2010. European Space Agency 30 Apr. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Lithuania\\_signs\\_Cooperation\\_Agreement](http://www.esa.int/About_Us/Welcome_to_ESA/Lithuania_signs_Cooperation_Agreement)>.

ment guarantees scientific, technical and organisational assistance from ESA with no financial obligations. Within the framework of this cooperation, Lithuanian scientists and industry representatives are becoming acquainted with the standardisation and certification requirements imposed by ESA on space technologies, products and services. They also receive advice and have access to other relevant and necessary information.

The potential timeframe for future cooperation of Lithuania with ESA includes the signing of the ECS Agreement and consequently the PECS Agreement in 2013-14, the subsequent implementation of the PECS projects, and finally accession to the ESA Convention by the end of the decade.

#### Slovak Republic

Contacts and discussions with ESA started in 2004 through the Slovak representative to the EU/ESA High Level Space Policy Group. Following a visit of an ESA delegation to Bratislava at the end of 2008, the Slovak Ministry of Education was appointed as the national agency to continue discussions with ESA, and a specific expert committee was created. On 28 April 2010, the Minister of Education of the Slovak Republic signed the *Cooperation Agreement* with ESA<sup>171</sup>. Areas for cooperation have been identified in space science, Earth observation and microgravity research.

Slovak organisations have already been involved in ESA activities via ESA member states' participation. The Slovak Institute of Experimental Physics, for example, has worked on Rosetta, BepiColombo, Venus Express and Double Star with the National University of Ireland. Furthermore, the Slovak Academy of Sciences is participating in the IMPRESS project.<sup>172</sup>

A joint assessment of Slovak industrial and scientific potential in space will take place during 2012-2013 and a decision with regard to ECS and PECS is expected during 2014-2015. Finally, accession to ESA Convention can be expected by the end of the decade.

The timeline presented in Figure 21 shows the different steps of European countries towards ESA accession since 1990, while Figure 22 provides an overview of their cooperation with ESA.

<sup>171</sup> "Slovak Republic Signs Cooperation Agreement." 4 May 2010. European Space Agency 30 Apr. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Slovak\\_Republic\\_signs\\_Cooperation\\_Agreement](http://www.esa.int/About_Us/Welcome_to_ESA/Slovak_Republic_signs_Cooperation_Agreement)>.

<sup>172</sup> This activity has been co-funded by the EC and ESA, with the objective to understand the critical links between the solidification processes of intermetallic alloys, the structure of these materials at micro- and nano scales, and their final mechanical, chemical and physical properties. Slovak contributions towards alloy development and microgravity experiments in space have been important.

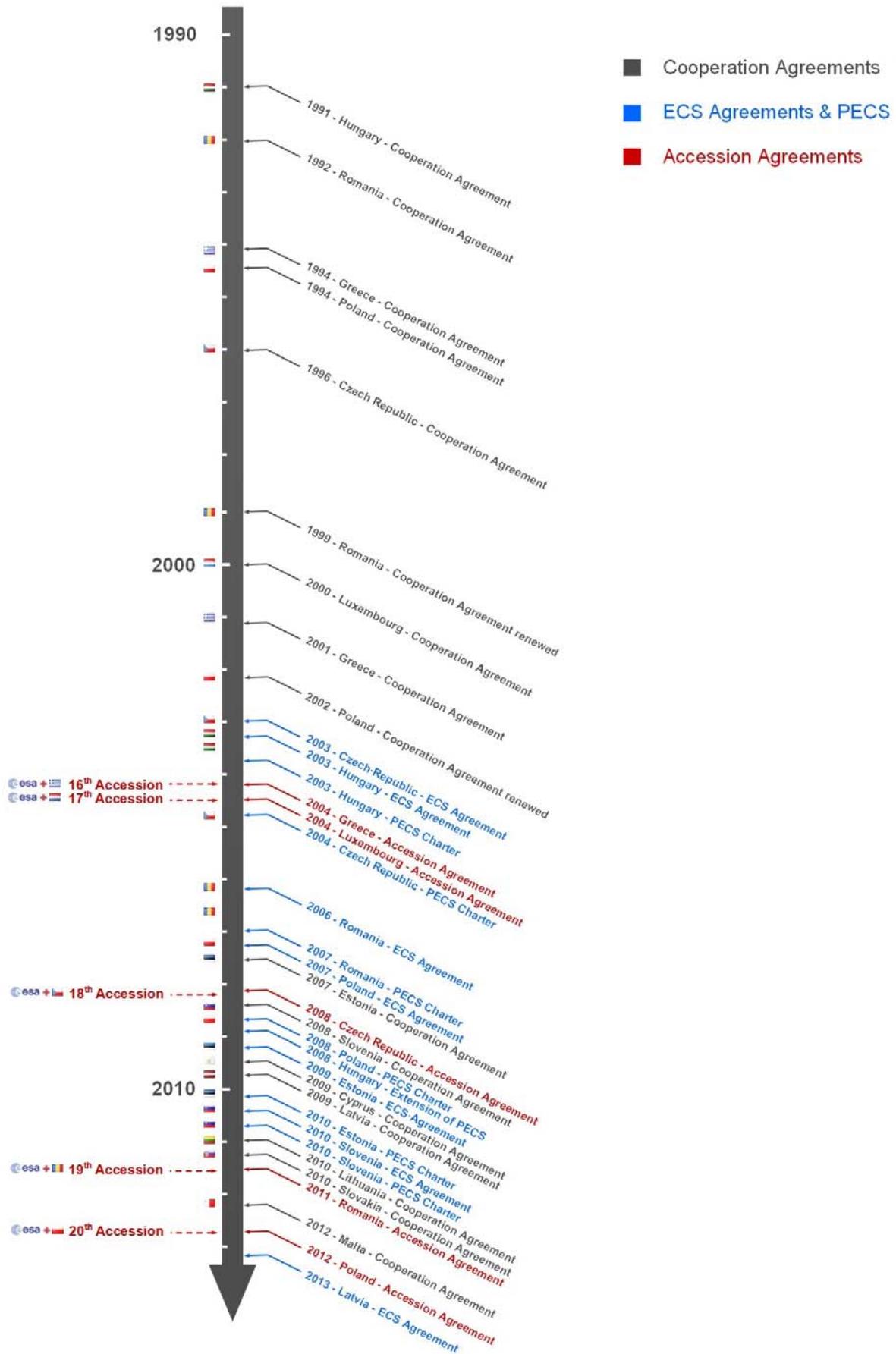


Figure 21: Timeline of countries' cooperation with ESA

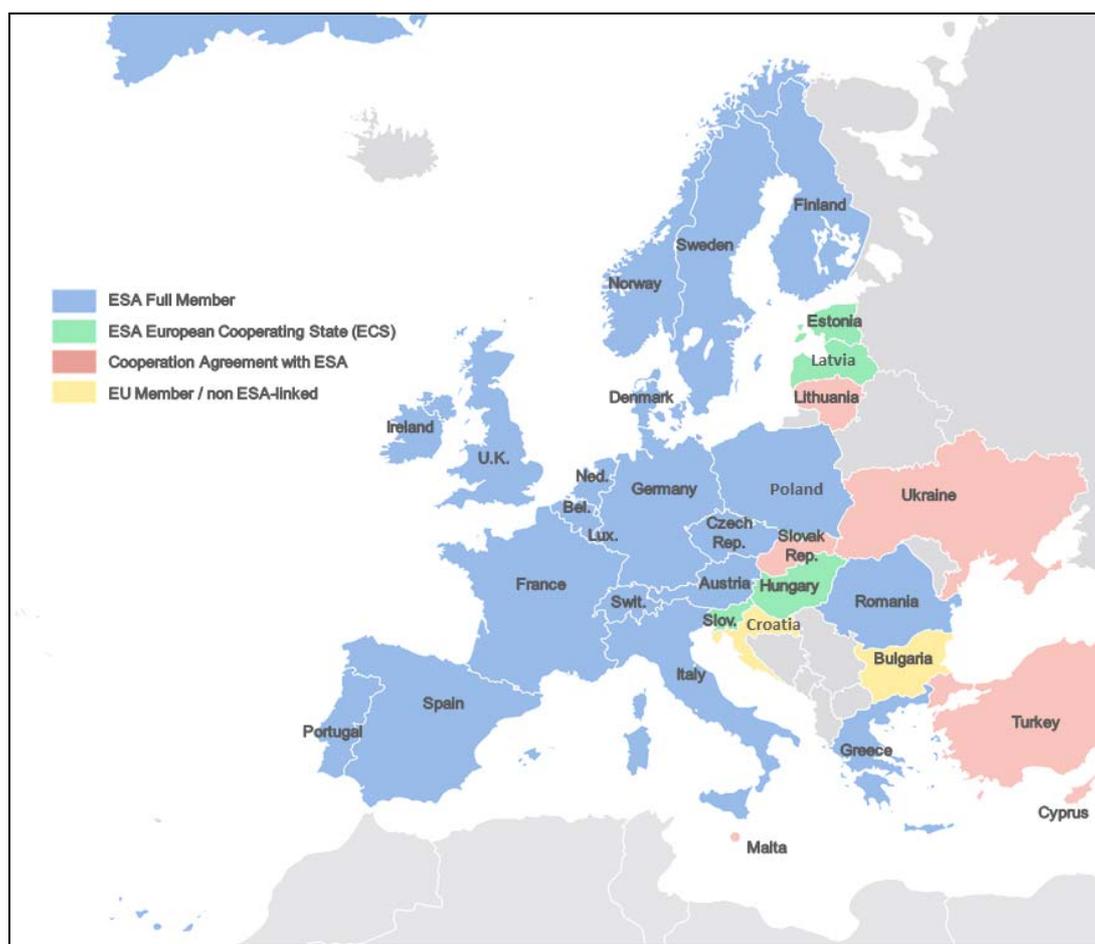


Figure 22: Overview of European countries and their relations with ESA

## 2.3 ESA Enlargement in the Light of the EU Space Mandate and Policy

When discussing the prospect of ESA enlargement, it is necessary to bear in mind and analyse the relationship that this inter-governmental agency has with the European Union, primarily because enlargement is addressed to all member states of the EU, not yet members of ESA. In fact, enlargement is directly connected to EU efforts to position itself as an effective actor in the space field. Importantly, the integration process of new ESA member states will affect the future of the European space industry, the industrial and scientific base of which will grow further; it will create new market niches, increase employment, form new companies in the sector and enable more joint projects. These are important strategic goals not only for ESA, but also for the EU, as set out by the Lisbon Treaty and its space policy provisions.

### 2.3.1 ESA and EU Relationship

The first thing to note is that ESA is not an Agency of the European Union. ESA and the EU are separate institutions: ESA is an inter-governmental organisation, while the EU is supranational. The two institutions have different ranges of competences, different member states and are governed by different rules and procedures. While the EU was founded to enhance political, economic and social cooperation among member states, which have for these reasons set up common institutions to which they delegate some of their sovereignty, "ESA was more the result of a coordinated European space effort from scientists".<sup>173</sup> The main objective, as underlined by the Convention, was to create an international organisation, pooling the resources of European countries to enable scientists to make a valuable contribution to the exploration and study of outer space.

<sup>173</sup> *Cit.*, Smith, Lesley Jane, and Kay-Uwe Hörl. "Constructing the European Space Policy: Past, Present and Future". *Commerce in Space: Infrastructures, Technologies, and Applications*. Phillip Olla. Hershey: Information Science Reference, 2008.



In addition to that, it must be noted that ESA and the EU are two institutions that seemingly have conflicting constitutional provisions and principles. The most important concerns financing and industrial policy. While ESA's *modus operandi* is based on a geographical return principle, according to which ESA awards contributing member states with industrial contracts equivalent to their financial participation, the EU is based on best-value-for-money procurement. Much analysis of the EU's competition laws versus ESA's geographical return principles has been offered through the years<sup>174</sup>. What must be underlined here is that there are some institutional and operational divergences that currently divide the two organisations.

However, in recent years the ties between the two institutions have been reinforced by a number of elements. Beyond the fact that they share a common basis of 18 members, there is the increasing role that space plays in supporting Europe's social, political and economic policies. Secondly, there is recognition that they are working towards a common objective: to strengthen European cohesion and economic growth to benefit its citizens. Thirdly, the fact that each partner needs the other to fulfil public policy objectives, provide an appropriate political profile and a more coherent framework for space activities in Europe. As underlined by Minister Giuseppe Pizza at the Fourth Space Council, "the European Union is crucial for promotion and financing of operations which will provide benefits for the citizens"<sup>175</sup>. In this regard, it should be recalled that some 20% of the funds managed by ESA now originate from the EU budget<sup>176</sup>.

The process of bringing ESA and the EU closer together has long-standing roots, with parallel EU and ESA Council Resolutions as early as the 1990s, but "officially" starting with the Green and White Paper in 2001 and 2003. It was in 2004 that their relationship was formalised on a legal basis.<sup>177</sup> A Frame-

work Agreement that was signed in October 2003 and entered into force in May 2004 provides the legal basis for EU/ESA cooperation. The agreement attempts to deal with "all" aspects relevant for cooperation between the two institutions: "its provisions address the areas and overall objectives of cooperation, the rules governing the implementation of joint programmes, the establishment of common *ad hoc* structures for harmonising the European Space Governance, as well as the exchange of personnel, public relations", etc.<sup>178</sup>. The Framework Agreement recognises that both parties have specific complementary and mutually reinforcing strengths, and commits them to work together for the implementation of space projects that are beneficial for both and to avoid duplication of efforts, in order to optimise available resources.<sup>179</sup> The framework has two main objectives:

1. To establish a common basis and appropriate practical arrangements for efficient and mutually beneficial cooperation between ESA and EU;
2. To progressively develop a European space policy to link the demand for services and applications in support of EU policies with the supply, through ESA, of the space systems and infrastructure needed to meet that demand.

The focus of the following sections will be on the first of the two goals: governance of the space sector set out in the framework. Furthermore, they provide an analysis of the European Space Policy of 2007 and recent developments, also in the light of the Lisbon Treaty and the latest EC Communications.

### 2.3.2 European Space Governance

Taking into account that aspiring ESA member states are already members of the EU and therefore full partners in the EU decision making mechanism, it is important to analyse how European space governance is currently working. Until 2004, as discussed above, the governance of the space sector was based on two pillars: a national pillar and ESA. Since the EU decided to position itself as an effective actor in European space activities, the space governance diarchy has turned into a

<sup>174</sup> Froehlich, Annette. "Space and the Complexity of European Rules and Policies: The Common Projects Galileo and GMES—Precedence for a New European Legal Approach?" *Acta Astronautica* 66.7-8 (2010): 1262-1265.

<sup>175</sup> See: "Seventh Space Council Supports Strong European Leadership in Space." 7 Dec. 2010. European Space Agency 29 Oct. 2013

<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Seventh\\_Space\\_Council\\_supports\\_strong\\_European\\_leadership\\_in\\_space](http://www.esa.int/About_Us/Welcome_to_ESA/Seventh_Space_Council_supports_strong_European_leadership_in_space)>.

<sup>176</sup> More precise, as for 2010, EU contributed to the ESA budget with 754,8 Million Euro (20,2%).

<sup>177</sup> See: "European Milestones." 24 Jan. 2012. European Space Agency 29 Oct. 2013

<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/European\\_milestones](http://www.esa.int/About_Us/Welcome_to_ESA/European_milestones)>. Cfr., Smith, Lesley Jane and Kay-Uwe Hörl. "Constructing the European Space Policy: Past, Present and Future". Commerce in Space: Infrastructures,

Technologies, and Applications. Phillip Olla. Hershey: Information Science Reference, 2008.

<sup>178</sup> *Cit., ibid.*: 13.

<sup>179</sup> ESA will continue to address a variety of space R&D areas, e.g. launcher development, space science, earth observation, satellite communication and navigation, human space flight and exploration, while the European Commission will mainly concentrate on space applications to support its various policies and lead the overall coordination of the European Space Policy. *Ibid.*

triangle (Figure 23). In this respect, it should also be noted that ESA aspiring member states are part of the two apexes of this triangle. Each player in this composition has its own competences and interests. While member states or national space agencies respectively mainly coordinate space activities at national level without a European scope and ESA is a research and development agency, the EU is a strong political player that would have the legitimacy to take political leadership. The goal of such leadership would be to ensure consistency and coordination among different activities.

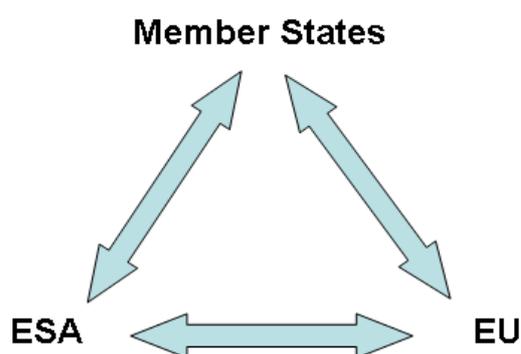


Figure 23: Triangle of the main players in Europe

A coordinated and consolidated European Space Policy also needs evolution of its governance. This also means establishing appropriate relations between the different actors and solving the asymmetry of membership between ESA and the EU. As pointed out by the ESA Director General, apart from different approaches and separate legal processes, the divergent membership of these two institutions can lead to cumbersome decision-making processes.<sup>180</sup> Moreover, Europe should avoid unsustainable duplication of activities and ensure access to publicly funded infrastructure. A proper balance of the memberships would also help the EU to develop and sustain a more effective and efficient industrial space policy.

### 2.3.2 The European Space Policy

Europe engages in space activities as space is well recognized as a tool for reaching multiple policy objectives. Indeed, activities of the EU in the space field did not start from scratch - they were built upon existing technological and industrial capabilities. Therefore, the EU joined the European space field as a new actor. The vision for a European Space Policy

<sup>180</sup> "Resolution on the European Space Policy. ESA Director General's Proposal for the European Space Policy." June 2007. European Space Agency 29 Oct. 2013 <<http://www.esa.int/esapub/br/br269/br269.pdf>>.

was initiated at the end of the 1970's in response to the needs of European States engaging in space research.<sup>181</sup> Nevertheless, over the past 35 years Europe has essentially entrusted to ESA the role of implementing European policies in the space sector, and European space programmes have been developed essentially through the Agency. In the last decade, however, the EU has become increasingly involved in space activities and the need for a comprehensive space policy has turned out to be of crucial importance. The ESP could in fact allow Europe to respond to competition from highly ambitious and capable emerging space powers, safeguard its interests and remain an indispensable international partner, by providing a more coherent and effective framework for its activities and, equally important, a stronger political profile in this field.

The joint recognition of these factors by the EU, ESA and their member countries has fuelled the process eventually leading to the ESP. The ESP is the culmination of a decade-long process, characterized by milestones such as the adoption of a series of parallel EU and ESA Council Resolutions, the EC-ESA Framework Agreement in 2004, the European Commission's Green Paper<sup>182</sup> and White Paper<sup>183</sup>, the orientations given by the Space Council, and the initiation of major flagship applications to be financed and delivered jointly by the EU and ESA. The drafting and implementation of a strong and coherent space policy is a complicated task and in the case of Europe it is even more challenging. As mentioned above, ESA is not an agency of the EU and the multitude of actors involved (ESA, EC, and member states) makes the process of crafting a coherent framework a very complex task at best<sup>184</sup>.

It has to be recalled that the membership of the EU does not equate to the membership of

<sup>181</sup> Smith, Lesley Jane, and Kay-Uwe Hörl. "Constructing the European Space Policy: Past, Present and Future. Commerce in Space: Infrastructures, Technologies, and Applications. Phillip Olla. Hershey: Information Science Reference, 2008: 12.

<sup>182</sup> Commission of the European Communities. Green Paper. European Space Policy. COM(2003) 17 final of 21 January 2003. Brussels: European Union.

<sup>183</sup> The White Paper, drafted together with ESA, includes proposals for joint ESA-EU space programmes and takes the Framework Agreement as its basis for implementation. Resource Document: Commission of the European Communities. White Paper. Space: a New European Frontier for an Expanding Union. An Action Plan for Implementing the European Space Policy. COM(2003) 673 final of 11 November 2003. Brussels: European Union.

<sup>184</sup> Smith, Lesley Jane, and Kay-Uwe Hörl. "Constructing the European Space Policy: Past, Present and Future. Commerce in Space: Infrastructures, Technologies, and Applications. Phillip Olla. Hershey: Information Science Reference, 2008: 12.



ESA and vice-versa, as well as the fact that ESA members used to pursue their own individual national space objectives while participating in the Agency's programmes in parallel.<sup>185</sup> Through this path, multiple bilateral and multilateral agreements as well as ad hoc European Programmes have supported European Space activities. Despite its flexibility, this system lacks the stability, certainty and coherence needed for a strong European Space Policy (ESP). A coherent ESP would require that Europe realigns its relevant institutions and centralises its political and technical expertise.

Recognising the need for a stronger political profile in the space sector, the EU and ESA finally decided to adopt "the path of rapprochement and to combine their political, social, and technological expertise"<sup>186</sup>, in order to develop a comprehensive European Space Policy. In May 2007, twenty-nine European countries at the Fourth Space Council expressed their support for the implementation of a European Space Policy, unifying the approaches of ESA and the EU with those of their respective member states<sup>187</sup>. Prepared jointly by the European Commission and ESA's Director General and then adopted through a Resolution of the Space Council in May 2007, the European Space Policy sets out a basic vision and strategy for the space sector and addresses issues such as security and defence, access to space and exploration. This was the first time that a common political framework for space activities was created in Europe. However, the significance of the European Space Policy lies in the fact that "it is the first wholly joint document addressing all dimensions of space activities, compiled and adopted after extensive consultations with member countries of the EU and ESA, as well as industry and other key stakeholders, and given an endorsement by those member countries."<sup>188</sup> Through this resolution, the EU, ESA and their member states have committed to increasing coordination of their activities and programmes and their respective roles relating to space. In greater detail, the resolution, after appreciating the crucial role that ESA has played in providing an efficient structure for European cooperation on joint space projects, contributes to the increasing role of Europe through

the successful development of the European space sector and to the strong position of the European space industry on world markets, and reaffirms the roles and responsibilities of the European Union, ESA and member states, as identified in the Orientations of the second meeting of the "Space Council".

On the basis of such roles and in order to take advantage of ESA experience and its institutional setting, calls on the European Commission to draw on the management and technical expertise of ESA for managing the European Community-funded R&D space infrastructure programmes with ESA coordinating the relevant agencies and entities in Europe.

This ESA role should also include<sup>189</sup>:

- Supporting the European Commission as the technical expert in the elaboration of European Community initiatives involving space-related activities and relevant work programmes, and in the selection and monitoring of relevant work contractors,
- Management by ESA of European Community space-related activities in accordance with the rules of the European Community.

In addition to this, the Resolution invites member states - under the coordination of ESA - and in the case of significant European Community activities, in close cooperation with the European Commission<sup>190</sup>:

- To provide the best expertise for European space programmes (such as GMES-Space Component, exploration programmes and future launcher programmes),
- To increase synergy between national, ESA and EC contributions to these programmes leading progressively to an integrated programmatic approach while respecting national sovereignty.

According to the resolution, closer ties and an increase in cooperation between ESA, the EU and the member states will bring substantial benefits to Europe by guaranteeing Europe's full and unrestricted access to services provided by space systems in support of its policies. Furthermore, it must be noted that the Resolution of the Space Council of May 2007 invited the European Commission and the ESA Executive to establish a process of regular monitoring and priority setting through an implementation plan for the ESP. Accordingly,

<sup>185</sup> *Ibid.*: 13.

<sup>186</sup> *Ibid.*: 13.

<sup>187</sup> Council of the European Union. Outcome of Proceedings of the Council (Competitiveness) on 21-22 May 2007. Resolution on the European Space Policy. 10037/07 of 25 May 2007. Brussels: European Union.

<sup>188</sup> *Cit.*, "European Space Policy". 13 Aug. 2013. European Commission 10 Dec. 2013

<[http://ec.europa.eu/enterprise/policies/space/policy/index\\_en.htm](http://ec.europa.eu/enterprise/policies/space/policy/index_en.htm)>

<sup>189</sup> Council of the European Union. Outcome of Proceedings of the Council (Competitiveness) on 21-22 May 2007. Resolution on the European Space Policy. 10037/07 of 25 May 2007. Brussels: European Union.

<sup>190</sup> *Ibid.*

consultations between the EU, ESA and member countries started immediately to define modalities and priorities of implementation. As far as the Industrial Policy is concerned, the Resolution recognises that ESA has a flexible and effective industrial policy based on cost-efficiency, competitiveness, fair distribution of activities and competitive bidding, which secures adequate industrial capacities, global competitiveness and a high degree of inner-European competition for efficient European cooperation on joint space projects, thus providing the basis for the successful development of space in Europe. It also invites the European Commission to develop adequate instruments and funding schemes for Community actions in the space domain, taking into account the specificities of the space sector, the need to strengthen its industry's competitiveness and the necessity of a balanced industrial structure.

### 2.3.3 Recent Developments under the Lisbon Treaty

The entry into force of the Lisbon Treaty<sup>191</sup> has reinforced the case for space in Europe by creating legal bases for the action of the EU in this field, which were not previously covered, and by putting "space" at the highest level in the political agenda. The Treaty contains essentially 3 Articles that explicitly mention space: Article 4.3, Article 13, and Article 189, whose text is set out hereafter.<sup>192</sup>

- » Art. 4.3  
In the areas of research, technological development and space, the Union shall have competence to carry out activities, in particular to define and implement programmes; however, the exercise of that competence shall not result in member states being prevented from exercising theirs.
- » Art 13  
In formulating and implementing the Union's agriculture, fisheries, transport, internal market, research and technological development and space policies, the Union and the member states shall, since animals are sentient beings, pay full regard to the welfare requirements of ani-

mals, while respecting the legislative or administrative provisions and customs of the member states relating in particular to religious rites, cultural traditions and regional heritage.

- » Art. 189, found under Title XIV of the Treaty headed "Research and technological development and Space"
  1. To promote scientific and technical progress, industrial competitiveness and the implementation of its policies, the Union shall draw up a European space policy. To this end, it may promote joint initiatives, support research and technological development and coordinate the efforts needed for the exploration and exploitation of space.
  2. To contribute to attaining the objectives referred to in paragraph 1, the European Parliament and the Council, acting in accordance with the ordinary legislative procedure, shall establish the necessary measures, which may take the form of a European space programme, excluding any harmonisation of the laws and regulations of the member states.
  3. The Union shall establish any appropriate relations with the European Space Agency.
  4. This Article shall be without prejudice to the other provisions of this Title.

With the aim of resolving some of the previous uncertainties, the provisions of the Lisbon Treaty specify the EU's space competence, which operates together with that of the EU member states (thus also with those not yet members of ESA). In this context, the provisions of Article 4.3 and Article 13 confirm the shared competences and support competences of the EU in different fields in which space-based applications can serve as a tool "to help address the major challenges of the Union and which is at the service of citizens"<sup>193</sup>. Beyond the traditional EU fields (i.e. agriculture, fisheries, transport, etc), space can be an instrument at the service of the common foreign and security policy. Article 189 deals instead with the specific competence of the EU in the space domain, which entails mainly actions of support to R&D, coordination and promotion of joint space initiatives<sup>194</sup>.

However, the Treaty does not provide guidance on the definition of appropriate instruments and mechanisms (for example the funding resources) for the future actions of the EU concerning space, and does not specify what the "necessary measures" cited in the second paragraph could exactly be, what instruments will be developed and what in-

<sup>191</sup> The Treaty of Lisbon was signed on 13 December 2007 by the Heads of States and Government and entered into force on 1 December 2009, amending the Treaty on European Union (TEU), and the Treaty establishing the European Community (TEC), which is renamed the Treaty on the Functioning of the European Union (TFEU).

<sup>192</sup> Council of the European Union. Consolidated Version of the Treaty on the Functioning of the European Union. 6655/1/08 REV 1 of 30 April 2008. Brussels: European Union. Document available at: <<http://www.consilium.europa.eu/uedocs/cmsUpload/st06655-re01.en08.pdf>>.

<sup>193</sup> European Space Agency. European Space Technology Master Plan 2010. Paris: ESA, 2011: 57.

<sup>194</sup> ESA Council, "Information Document - Space in the 'Lisbon Treaty'". ESA/C(2008)19, March 2008.



dustrial policy will be followed.<sup>195</sup> Article 189.3 states that the EU should establish appropriate relations with ESA, but does not provide elements to qualify what “appropriate relations” with ESA entail. However, it can be argued that the membership asymmetry between ESA and the EU is one of the fundamental issues in the establishment of appropriate relations between the two institutions.

Thanks to the provisions of the Treaty, not only ESA but also the EU has the competence to draw up “a European Space Policy and to implement such a policy. As was noted in an Information Document by ESA<sup>196</sup> “the utilisation of the indefinite article “a” in both TFEU and ESA Convention” could imply the coexistence of more than one policy (an ESA policy and a separate EU policy with its member states, thus also including the non-members of ESA). In practice, however, this did not occur because the EC and ESA jointly elaborated the ESP in 2007. Nevertheless, important considerations relate to current work under the EU – ESA cooperation agreement, such as the creation of a common basis and appropriate arrangements for efficient and mutually beneficial cooperation in the field of space. On the one hand, with the EU there exists a political giant that has great legitimacy and indeed the possibility to enforce a space policy from a political and regulatory point of view, but does not have the technical capacity. On the other hand, ESA, as an independent intergovernmental organisation, has the technical competences and instruments to realise complex space projects. Having this in mind, the goal now should be to combine these strengths in order to optimally utilise the available resources and to promote economic growth. In general, there should be a balance of relative strength in the triangle between the EU, ESA and their respective member states.

If it is true that these recent developments have reinforced ESA-EU governance, they have also deepened the framework of competences between the EU, ESA and their members (in particular those not yet member of ESA). This issue is indeed quite relevant for those countries: given the membership asymmetry between ESA and the EU, these countries have become involved in carrying out EU tasks but are in fact still excluded from the execution of ESA competences. These different roles and competences ESA and the EU respectively have can be summarised in a comparison of the ESP, the Lisbon Treaty and the resolutions of the Space Council as follows:

<sup>195</sup> *Ibid.*:5

<sup>196</sup> *Ibid.*:5

a) ESA’s role includes:

- To support the EC as technical expert in the elaboration of European space-related activities and in the selection and monitoring of work contractors;
- To manage European Community space-related activities in accordance with the rules of the European Community;
- To lead the process of harmonising technology development programmes, since the EC recognises that the ESA system provides transparency on research across Europe and increases coordination;
- To develop and implement space technologies, in particular access to space, science and exploration, and to support technical specifications of the space segment.

b) EU’s role includes:

- To carry out activities, in particular to define and implement programmes, in the different fields in which space-based applications can serve as a tool for addressing the EU’s general policies;
- To promote joint initiatives, support Research and Technology Development (RTD) and coordinate the efforts for the exploration and exploitation of space;
- To ensure the availability and continuity of service supporting EU policies by funding relevant up-stream research activities;
- To create an optimum regulatory environment and facilitate innovation;
- To promote coordination of the European position in international cooperation;
- To develop and implement the European Space Policy.

Through this framework it becomes clear that the EU has increasing influence on the already complex framework between ESA and its members and aspiring members respectively. Presumably, this influence will also shape the environment ESA members and aspiring member states will have to work within. As a result, the enlargement process could also be affected. To better assess this point, it could be useful to look at the communications recently issued by the EC with the intention of further developing and implementing the ESP.

One of the most relevant documents is the EC Communication entitled “Toward a space strategy for the European Union that benefits its citizens”, released on 4 April 2011<sup>197</sup>. The

<sup>197</sup> European Commission. Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions. Towards a Space Strategy for the European Union that Benefits its Citizens. COM(2011) 152

Communication sets the basis for an EU space strategy. Despite the fact that it is a non-binding document, the Communication is a strong political statement that begins to address the real scope of EU space competence, as affirmed by the Lisbon Treaty. It lays down, in fact, a whole set of policy rationales, priority actions as well as a governance and financial framework that prepare the basis for the EU actions under its space competence<sup>198</sup>. After identifying the political imperatives for EU involvement in space<sup>199</sup>, the document defines the EU space competences and the role of the EU in the European space-related decision making process. It advances the EU position towards a coordinated European Space Strategy and explicitly asks ESA and EU to establish a coordinated industrial policy and a coordinated governance scheme. In that respect, the Communication emphasises, in particular, “a reassessment of ESA-EU relations, with the view to a gradual adaptation of ESA in accordance with the increasing role of the EU” in the space domain<sup>200</sup>. To sum up, the Communication collects the results of the discussions that have taken place in recent years in the context of space, and contains a list of priority measures and instruments. It is not a strategy in itself; rather it is another step in the direction of defining the role of space in Europe as well as the role of the EU in the space field. Therefore, the Communication leaves open the questions of follow through and necessary further steps. As the Communication and various other documents make clear, the EC sees space not as a goal in itself but rather as a tool to achieve economic, social and strategic goals through the support of other policy areas.

This emphasis becomes even more visible in the Communication issued by the Commission to the Council and the European Parliament on 14 November 2012.<sup>201</sup> The docu-

ment, entitled “*Establishing appropriate relations between the EU and the European Space Agency*” explicitly suggests that, given the mismatch of financial rules, membership asymmetry, and security and defence-related asymmetry, “ESA could make the necessary structural adaptations... and make the necessary changes allowing unrestricted access to ESA's relevant statutory bodies...”<sup>202</sup> The document clearly affirms also that the “EU can provide political dimension (including at the international level) and legitimacy, as well as links with other policy areas. “The need for greater operational efficiency, symmetry in defence and security matters, political coordination and accountability can only be resolved, in the long term, through the rapprochement of ESA towards the European Union”.<sup>203</sup>

In that respect, it becomes clear that the EU intends to gradually “assimilate” ESA into EU structures, as a kind of space agency of the EU. To date, ESA-EU relations are far from being determined but it goes without saying that an eventual transformation of ESA into an EU agency would also seriously affect the possibilities of European Cooperating States and aspiring countries to gain advantages from ESA membership. In concrete, the implied possibility to abide by the EU rules, and in particular to the procurement principle of best-value-for-money (with the obvious abandonment of the geo-return principle), could raise fears and tangible problems for the aspiring members. The main ones would logically be that bigger industries, typically the ones of the historical members of the Agency will gain many advantages compared to the smaller industries of aspiring members. Without the geo-return principle, contributions to the ESA space programme could be easily perceived in the aspiring countries as “lost money”, and their accession might be eventually postponed or even abandoned.

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final of 4 April 2011. Brussels: European Union. Document available at the European Commission website:

<[http://ec.europa.eu/enterprise/policies/space/files/policy/comm\\_pdf\\_com\\_2011\\_0152\\_f\\_communication\\_en.pdf](http://ec.europa.eu/enterprise/policies/space/files/policy/comm_pdf_com_2011_0152_f_communication_en.pdf)>

<sup>198</sup> Sánchez Aranzamendi, Matxalen. “European Commission Communication “Towards a Space Strategy for the European Union that Benefits its Citizens” – Towards a Lisbon Generation Competence?” ESPI Perspectives 46. May 2011: 1.

<sup>199</sup> The EC document states that “space policy is an instrument serving the Union's internal and external policies and responds to three types of need: social, economic, and strategic”.

<sup>200</sup> *Cit.*, Sánchez Aranzamendi, Matxalen. “European Commission Communication “Towards a Space Strategy for the European Union that Benefits its Citizens” – Towards a Lisbon Generation Competence?” ESPI Perspectives 46. May 2011: 5.

<sup>201</sup> European Commission. Communication from the Commission to the Council and the European Parliament. Establishing Appropriate Relations between the EU and

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the European Space Agency. COM(2012) 671 final of 14 November 2012. Brussels: European Union. Document available at: <<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0671:FIN:EN:PDF>>.

<sup>202</sup> *Ibid.*

<sup>203</sup> More specifically, concerning the EU role, the document states that the EU could: 1) work through the Council of the EU, using as appropriate the open method of coordination to ensure coherence within the EU and consistency of EU member states' positions in ESA with EU policies; 2) have systematic recourse to ESA for the design and development of EU space infrastructures, whereas exploitation activities will be carried out by other entities, such as the GSA.;3) ensure a homogeneous approach in line with the EU Financial Regulation for delegating responsibilities over EU space programmes to ESA as a way to prepare ESA to working within the EU environment. Resource Document: *Ibid.*



This eventuality is still far from taking place; however, given the increasing involvement and influence exercised by the EU over ESA activities, the question to be discussed is also whether the EU could have other motivations in promoting ESA enlargement.

### 2.3.5 A Role for the EU in Promoting ESA Enlargement?

The following section discusses and analyses the reasons the EU may have for supporting the ESA enlargement process.

The fact that all EU member states are fully part of the decision-making process of the ESP and European Space Programmes, but not fully engaged in the decision making processes of ESA introduces an imbalance which can impair both space as a European policy instrument and the funding for European 'flagship' projects. It is clear that outside ESA, many countries find difficulties in participating fully in such programmes and in gaining the industrial and scientific benefits of these programmes. The case of GMES for instance, has shown that non-ESA member states have been quite hesitant in funding a programme in which they are not fully engaged also on the ESA side. It would appear that only through an enlarged ESA, could the EU provide a more coherent and "legitimate" framework of space activities in Europe and fully implement pan-European Space Programmes.

The structural impediment is important because the European flagship programmes are designed so that the EU can pursue its objective of strengthening European cohesion and economic growth to benefit its citizens. Space is playing an increasing role in supporting Europe's social, political and economic policies. Therefore, the enlargement of ESA, acting as a powerful stimulus for increasing the space programmes of the different EU countries, will help the EU in enhancing the level of employment, the budget for R&D (with the goal of 3% of EU GDP defined by Europe 2020), strengthening the European industrial and scientific base and enlarging the market. In the space field these objectives cannot be efficiently achieved without a high degree of convergence between EU, ESA and the respective member states.

A competitive European space industry is of strategic importance for the ESP, which means strong and competitive organisations along the different value chains. With regard to some Eastern European countries not yet members of ESA who do not have a strong space industry compared to other EU members, the EU can fall back on the role ESA

plays in facilitating performance and capability audits during the accession processes of new member states. In that respect, the EU would benefit from ESA enlargement, relying on the management and technical expertise of the Agency. Those countries could benefit from technology development programmes that provide transparency in research and from technology developments that might offer niche opportunities. Furthermore, the ESA "juste retour" principle and the possibility of optional programmes is an advantage especially for smaller countries.

Much has been said about ESA as THE space agency of Europe, and although this might be achieved in a number of ways, it is hardly achievable if a large number of European states do not participate, particularly if they share one characteristic, namely, that they are economies in transition and relatively new members of the EU and the European fabric being created by the EU.

Clearly, the initiative for accession to the ESA Convention must primarily come from the states themselves, however, the EU possesses a number of general tools, which might be deployed to aid the process. These are analysed below.

#### EU Funding Mechanisms

An important opportunity for potential ESA candidate countries is presented by EU funding. There is a variety of significant sources of funding which are or can be channelled for the benefit of new member states, most of the time following a bottom-up process. At European level, the effort concentrates on the so-called European Cohesion Policy. The main objective of this policy, as set out in Article 174 of the Treaty of Lisbon, consists in reducing disparities between the levels of development of the various regions and the strengthening of economic, social (and territorial) cohesion in order to promote overall harmonious development of the EU<sup>204</sup>. EU Cohesion Policy works through the European Regional Development Fund (ERDF), the European Social Fund (ESF, known as Structural Funds), as well as the Cohesion Fund:<sup>205</sup>

- The ERDF supports regions having the lowest GDP per head;

<sup>204</sup> Council of the European Union. Consolidated Version of the Treaty on the Functioning of the European Union. 6655/1/08 REV 1 of 30 April 2008. Brussels: European Union. Document available at: <<http://www.consilium.europa.eu/uedocs/cmsUpload/st06655-re01.en08.pdf>>.

<sup>205</sup> Maquet, Gilles. "Discussing Accompanying Processes." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

- The Cohesion Fund co-finances projects in transport and the environment in MS whose GNP is less than 90% of the EU average;
- The ESF is the financial instrument for supporting employment as well as promoting economic and social cohesion in the member states of the EU.

It would appear possible for the EU to use these instruments, for instance, by allocating a dedicated budget for the development of space-based applications in CEE countries in order to pave the way for ESA Membership. For example, as part of its task to promote regional development in order to reduce the gap between the different levels of Europe's regions<sup>206</sup>, the ERDF can provide funding with regard to the three objectives: "Convergence", "Regional competitiveness and employment" and "European territorial cooperation". These objectives cover important fields such as research and technological development, innovation and entrepreneurship, creating sustainable jobs, or stimulating economic growth. As already mentioned, space can be an important tool to enable these key objectives and an important driver of economic growth and of high-tech research. The ESF could be another financial instrument that could be deployed in a space context. Its particular goal is the creation of new and qualitatively better jobs in the EU by co-funding regional, national and local projects<sup>207</sup>. Space leads to innovation and research and therefore could be key for the creation of new or better jobs. Furthermore, Europe is facing a reduction in the interest of young people in science, engineering and technology. Space can inspire students in these critical fields in order to secure a sufficient quantity and quality of human capital in related areas.

### Framework Programmes

EU Framework Programmes, and in particular Horizon 2020 (H2020), present another significant opportunity for new and aspiring ESA member states and their space industry. H2020 is the eighth Framework Programme for Research, Development and Innovation in Europe, aimed at securing Europe's global

<sup>206</sup> European Parliament and the Council. The European Regional Development Fund. Regulation (EC) No 1080/2006 of 5 July 2006. Brussels: European Union. Document available at: <[http://europa.eu/legislation\\_summaries/agriculture/general\\_framework/g24234\\_en.htm](http://europa.eu/legislation_summaries/agriculture/general_framework/g24234_en.htm)>.

<sup>207</sup> "European Social Fund." 12 Mar. 2013. Directorate-General Employment, Social Affairs & Inclusion of the European Commission 29 Oct. 2013 <<http://ec.europa.eu/esf/home.jsp?langId=en>>.

competitiveness".<sup>208</sup> It covers the period 2014 - 2020 with an €80 billion budget, combining all research and innovation funding currently provided through the Framework Programme for Research and Technical Development, the innovation related activities of the Competitiveness and Innovation Framework Programme and the European Institute of Innovation and Technology.<sup>209</sup> H2020 has three main objectives<sup>210</sup>:

- Strengthen the EU's position in science with a dedicated budget of € 24.598 million. This will provide a boost to top-level research in Europe, including an increase in funding of 77% for the very successful European Research Council.
- Strengthen industrial leadership in innovation (€ 17.938 million). This includes major investment in key technologies, greater access to capital and support for SMEs.
- Providing € 31.748 million to help address major concerns shared by all Europeans such as climate change, developing sustainable transport and mobility, making renewable energy more affordable, ensuring food safety and security, and coping with the challenge of an ageing population.

As shown, there are thus three main areas of focus within H2020: science, industry and society. Space, identified a strategic and critical asset for the EU and its Member States, is included in the *competitive industry* objective of H2020. Galileo and Copernicus-GMES, the two European flagship programmes in space, are both financed within this framework.<sup>211</sup>

<sup>208</sup> "The EU Framework Programme for Research and Innovation." 20 Sept. 2013. Directorate-General Enterprise and Industry of the European Commission 29 Oct. 2013 <[http://ec.europa.eu/research/horizon2020/index\\_en.cfm?pg=h2020](http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=h2020)>.

<sup>209</sup> Compared to FP7, H2020 provides a major simplification through a single set of rule.

<sup>210</sup> Cit., Directorate-General Enterprise and Industry of the European Commission. See: "The EU Framework Programme for Research and Innovation." 20 Sept. 2013. Directorate-General Enterprise and Industry of the European Commission 29 Oct. 2013 <[http://ec.europa.eu/research/horizon2020/index\\_en.cfm?pg=h2020](http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=h2020)>.

<sup>211</sup> EUR 6300 million was allocated in the new multiannual financial framework of the EU for the European satellite navigation programmes (EGNOS and Galileo). See: "Council Regulation laying down the multiannual financial framework for the years 2014-2020." 25 Nov. 2013. Council of the European Union 09 Dec. 2013 <<http://register.consilium.europa.eu/doc/srv?l=EN&t=PDF&gc=true&sc=false&f=ST%2011791%202013%20REV%207>>.

<sup>212</sup> Beyond Galileo, the European Council has secured funding for the GMES-Copernicus programme through H2020. Within the new multiannual framework, €3786 million was allocated, covering Copernicus services, *in situ*



The participation of potential ESA candidate states in the calls for proposals and tenders within this Framework Programme will offer new opportunities not only for business and space research but also for increasing employment and contributing to the socio-economic development of a country. It also represents a potential instrument to prepare for ESA membership and to strengthen the industrial base. Clearly aspiring states should make a strenuous effort to attract significant H2020 funding, and national space policies should be correspondingly geared. But also the Commission, in charge of this programme, should make dedicated efforts to define projects within H2020 which are particularly suitable for industry and institutions in aspiring ESA member states.

#### Workshops on Space Technology

The Directorate-General for Enterprise and Industry has been organising a series of workshops on Space Research and Technology Development (RTD) related to H2020. The first workshop, dedicated to Space technology, was held in Brussels in January 2013, while the second, on Space Science and Exploration, was held in Madrid in February 2013<sup>213</sup>. These workshops constitute an additional stage to the consultation process that started with the "Hearing on Space Research in FP8",<sup>214</sup> which was held on 8 December 2010, and that has continued with the recent recommendations issued by the FP7 Space Advisory Group. The purpose of these workshops is to directly consult the space research community, so as to gather their input on the Commission's proposal for space research under Horizon 2020 and the corresponding implementation strategy.<sup>215</sup> Through these workshops, aspiring ESA member states are offered the possibility of

contributing in identifying areas of potential interest in the next framework programme and becoming more acquainted with other's countries perspectives and with EU procedures related to the FP8.

#### Education and Research Activities

Another field where the EU could play a fundamental role in facilitating the process aspiring ESA member states are going through is education. Not by chance, education is at the same time one of the major elements in both Europe 2020 and the European Space Policy and one objective included in the ESA Convention as part of mandatory activities. Beyond various activities and initiatives included in the framework programmes (e.g. the research activities within the Space Foundations<sup>216</sup>), there are other initiatives worth mentioning.

The question should also be how EU education activities could be aligned with ESA education activities and how a special focus could be put on youth in aspiring countries? The EU could for instance fund traineeships for graduates in the space field that would be executed by and within ESA. These traineeships could be offered to young people of aspiring countries, inspiring and motivating students to pursue careers in a technical field (i.e. science, engineering, technology, mathematics) and thus also facilitating ESA enlargement. In this context, it would be also conceivable that the EU starts nano-satellite projects, focused on aspiring countries. By starting such projects, the EU would support those countries in developing their space industry and promoting space to the public. In January 2013, for example, the EU launched the FP7 project NANOSAT that aims to contribute to a roadmap for space and innovation in Europe.<sup>217</sup> With a total budget of about 500.000 Euro, the two-year project brings together five partners from Estonia, Germany, Denmark, and Sweden.

and space components. See: "Securing Operational EU Funding for GMES Copernicus". 19 Feb. 2013. Directorate-General Enterprise and Industry of the European Commission 29 Oct. 2013  
<[http://www.esa.int/Our\\_Activities/Observing\\_the\\_Earth/Copernicus/Securing\\_operational\\_EU\\_funding\\_for\\_GMES\\_Copernicus](http://www.esa.int/Our_Activities/Observing_the_Earth/Copernicus/Securing_operational_EU_funding_for_GMES_Copernicus)>.

<sup>213</sup> "EU Space Research and Technology Development." 23 Oct. 2013. Directorate-General Enterprise and Industry of the European Commission 29 Oct. 2013  
<[http://ec.europa.eu/enterprise/policies/space/research/index\\_en.htm](http://ec.europa.eu/enterprise/policies/space/research/index_en.htm)>.

<sup>214</sup> More information and written contribution on the "Hearing on Space Research in FP8" can be found at European Commission - Enterprise and Industry webpage:  
<[http://ec.europa.eu/enterprise/policies/space/research/fp8/index\\_en.htm](http://ec.europa.eu/enterprise/policies/space/research/fp8/index_en.htm)>

<sup>215</sup> "EU Space Research and Technology Development." 23 Oct. 2013. Directorate-General Enterprise and Industry of the European Commission 29 Oct. 2013  
<[http://ec.europa.eu/enterprise/policies/space/research/index\\_en.htm](http://ec.europa.eu/enterprise/policies/space/research/index_en.htm)>.

<sup>216</sup> Within the FP7 particular emphasis has been addressed on strengthening space foundations, in order to support research for long term needs such as space transportation, bio-medicine, life and physical sciences in space. Among its tasks, the EC Enterprise and Industry's space R&D unit is responsible for supporting R&D for space foundations - science, exploration, transportation and technology - which is complementary to the initiatives and programmes of ESA or other European, national or regional bodies. Through these foundations, opportunities are offered to ESA aspiring member states for strengthening space-related research activities. See: "EU Space Research and Technology Development." 23 Oct. 2013. Directorate-General Enterprise and Industry of the European Commission 29 Oct. 2013  
<[http://ec.europa.eu/enterprise/policies/space/research/index\\_en.htm](http://ec.europa.eu/enterprise/policies/space/research/index_en.htm)>.

<sup>217</sup> "About FP7 NANOSAT." European Union 29 Oct. 2013  
<<http://www.fp7-nanosat.eu/index.html>>.

Furthermore, it appears possible that the EU could develop crowd-sourcing platforms or associated prizes for the best ideas on space. This seems to be a powerful tool to stimulate young people and to engage a broad segment of a population. Such platforms could be designed especially for youth in aspiring countries under the guidance of experts from European institutions in order to ensure that the corresponding projects fit in the overall space portfolio. The objectives and structures would have to be defined for each project and could be in response to specific needs of participating countries.

The EU has also started regional initiatives to promote education and training as a way of connecting neighbouring countries such as, for example, the "Eastern Partnership" or the "Western Balkans Platform on Education and Training".<sup>218</sup> Such initiatives could be extended by building a platform for promoting and educating on space, especially for EU member states that are not yet members of ESA. This is similar to the idea of interest groups that is discussed in Chapter 3 of the report.

In order to increase awareness of how space and its applications provide benefits to European citizens and to underline the critical role of the EU in space and space-based technologies, the EC has launched a European Space Expo.<sup>219</sup> The exhibition takes place in different hosting locations, included CEE capitals such as Warsaw and Bratislava. In fact, the public is hungry for space-based information but also sceptical about the benefits of space related activities and therefore communications plays an important role. In this context, the European Space Expo represents an interesting initiative for generating public awareness for space activities in countries where the enhancement of expenditures on space is needed in order to get prepared for ESA membership.

### Technology Platforms

Another opportunity that may help aspiring countries in their process of joining ESA is presented by Technology Platforms (TP), launched in 2004 by the EC as part of a larger initiative, which was described in the "Guidelines for future European Union Policy

to support research".<sup>220</sup> TPs aim to respond to the need to bring together enterprises, research institutions and the financial world in order to define a common research agenda that should mobilise public and private resources and bring tangible results in research and innovative technologies. The development and implementation of European TPs is essentially a "bottom-up process". It is in fact taken by stakeholders of a certain area, who agree on a common vision. Even though the key role in initiating and leading the TPs is played by stakeholders, in particular by industry, the EC provides support, for example through active participation as an observer in many platforms and by offering a guiding role, when appropriate.

With the aim of avoiding dilution of the TP concept and duplication among platforms, the EC services evaluate emerging initiatives, according to a set of pre-established criteria, and give recommendations for their development. The Commission services follow developments within technology platforms and, where appropriate, use their input in the course of developing European research policy. However, only few TPs are of direct relevance to the space sector. The most important for space deal with hydrogen and fuel cells, photovoltaic, advanced materials, robotics, micro- and nano-technologies, embedded systems, and aeronautics.<sup>221</sup>

A Space Technology Platform, led by ESA in collaboration with member states, was established in 2005 under the frame of the ETP and with the encouragement of the EC/ESA Joint Secretariat. The European Space Technology Platform (ESTP) aims at creating a non-dependent technology portfolio facilitating European strategic independence for access to and exploration in space.<sup>222</sup> Furthermore, the platform should support the development of next-generation technologies that leverage ambitions in space-related sectors such as, for example, Galileo, Copernicus, security, and space exploration. The objectives of the ESTP are to:

- Open the coordination process to all EU member states;

<sup>218</sup> "International Co-Operation in Education and Training." 9 July 2013. Directorate-General Education & Training of the European Commission 29 Oct. 2013

<[http://ec.europa.eu/education/external-relation-programmes/overview\\_en.htm](http://ec.europa.eu/education/external-relation-programmes/overview_en.htm)>.

<sup>219</sup> "European Space Expo." 17 Oct. 2013. Directorate-General Enterprise and Industry of the European Commission 29 Oct. 2013

<[http://ec.europa.eu/enterprise/policies/space/expo/index\\_en.htm](http://ec.europa.eu/enterprise/policies/space/expo/index_en.htm)>.

<sup>220</sup> Commission of the European Communities. Communication from the Commission. Science and Technology, the Key to Europe's Future – Guidelines for Future European Union Policy to Support Research. COM(2004) 353 final of 16 June 2004. Brussels: European Union. <[ftp://ftp.cordis.europa.eu/pub/era/docs/com2004\\_353\\_en.pdf](ftp://ftp.cordis.europa.eu/pub/era/docs/com2004_353_en.pdf)>.

<sup>221</sup> See ESTP website:

<<http://estp.esa.int/exp/E10430.php>>. See also: <[http://cordis.europa.eu/technology-platforms/energy\\_en.html](http://cordis.europa.eu/technology-platforms/energy_en.html)>.

<sup>222</sup> "ESTP – the Platform for Space Technologies." 2006. European Space Technology Platform 29 Oct. 2013 <<http://estp.esa.int/exp/E10719.php>>.



- Provide a long-term vision for space technology R&D;
- Establish a coherent framework for the development of space technology in Europe;
- Promote actions to reduce European non-dependence;
- Enhance and cross-fertilise technology;
- Develop synergies between the ESTP and other related non-space TPs;
- Promote joint upstream research on technologies of dual-use;
- Drive technology R&D strategy in response to EU needs;
- Facilitate international cooperation on technology issues.

At the same time, the ESTP aims at facilitating interactions between the European Harmonisation Process and related non-space-technology platforms and initiatives. It is for that reason that the ESTP builds on the success of a pre-existing co-ordination and harmonisation effort, the European Space Technology Master Plan ESTMP, sustained by ESA and its member states, national agencies, space industry and research organisations. The ESTP complements this effort in several strategic areas. The ESTP will support the enlargement of the Union (and of ESA) by helping the integration of new EU Members States in the space sector along agreed roadmaps, and will facilitate interactions between the space sector and non-space technology initiatives. "Since its pilot launch in 2000, approximately 40 technologies have been harmonised, with the participation of all ESA member states, Eurospace, industry, more than 700 professionals from more than 170 European space companies and research organisations."<sup>223</sup>

Some recent ESA members, such as Poland and Romania, have already launched a number of TPs in non-space-related areas. The ESTP could be an important activity to boost the integration process in ESA of EU Members States not yet members of the Agency. Eastern European Countries such as Slovenia, Estonia, Latvia, and Lithuania could build together a TP to mobilise a critical mass of their public and private resources and bring tangible results in research and innovative technologies. These efforts could make their industry grow and get prepared for ESA and absorb the geographical return. The EC could support this specific effort, which, in a sense, might be understood as a sub-technology platform of the ESTP.

<sup>223</sup> Cit., "ESTP – Background." 2006. European Space Technology Platform 29 Oct. 2013 <<http://estp.esa.int/exp/E10465.php>>.

Especially for smaller companies such as technology spin-offs and start-ups, these platforms offer research and market orientation opportunities for the future.<sup>224</sup> In concrete terms, companies and business associations in the different countries might get together, following the ITF (International Transport Forum) model or the Space IGT (Space Innovation and Growth Team), to create an association, with the aim of:

- Identifying the shared technology and industrial needs of member companies
- Confronting respective needs with the circulation of business plans
- Seeking out innovative solutions
- Accessing the technology development funds
- Launching collaborative joint industry projects
- Delivering technology implementation
- Creating a suitable match making function

Such a facilitator would link companies to government, agencies and other space companies seeking suppliers, partners and collaborators.

### Business Angels

Finally, a helpful instrument for enlarging the industrial base of ESA aspiring member states would be represented by EC involvement in the networking of the so-called "Business Angels"<sup>225</sup> to the benefit of space activities in these countries. In general, business angels are individual investors who provide both capital and managerial experience for start-up companies. More and more angel investors organise themselves into angel groups or networks with the goal of sharing research and bundling their investment capital. EBAN (The European Trade Association for Business Angels, Seed Funds, and other Early Stage Market Players) is a European business angel network that was established under EC auspices in 1999<sup>226</sup>.

In this context, what might be relevant for market entrants from aspiring ESA member states is not so much the capital but more the access to the expertise of executives with a long history of involvement in the space business. Hence the profile of business angels

<sup>224</sup> Giannopapa, Christina, Peter Hulsroj, Arne Lahcen, and Nunzia Paradiso. "Space and the Processes of Innovation." ESPI Report 43 July 2012: 58.

<sup>225</sup> "Business Angels." 5 Feb. 2013. Directorate-General Enterprise and Industry of the European Commission 29 Oct. 2013

<<http://ec.europa.eu/enterprise/policies/finance/risk-capital/business-angels/>>.

<sup>226</sup> "EBAN, The European Trade Association for Business Angels, Seed Funds, and other Early Stage Market Players". 2013. EBAN 30 Oct. 2013 <<http://www.eban.org/>>.

in this case would be different from that of normal business angels and access to senior expertise would be the defining feature. In Chapter 3, the concept of Business Angels and how it could be used as a useful instrument for aspiring countries will be described in more detail.



### 3. Instruments for Aspiring Countries

Countries on the road to full ESA membership have to face various challenges. Experience shows that despite the deliberate pace and the various supportive measures new member states have had a hard time adapting to the ESA environment and its exigent requirements. Compared to other entrants the Czech Republic might have had an easier time, but Romania is facing real structural issues and Poland has to manage a steep increase in involvement, because of the size of its economy, and the relative modest investments through the PECS scheme.

The following section analyses and discusses potential additional instruments that can be supportive for aspiring countries, including measures these states can take to help their industry and scientific organisations survive in the competitive environment in ESA. Given the current quite supportive frame for rapprochement to ESA, which was described in previous chapters, there are questions as to how the existing tools can be deployed by national stakeholders in the best possible way and questions on whether such stakeholders on their own can define further accompanying measures that would further ease the way for aspiring countries. Instruments aspiring countries could use may be grouped into two main categories: those aimed at strengthen-

ing national industry and preparing it for the competitive environment in ESA, which can be referred to as industry-oriented, and institution-oriented tools, intended to increase awareness among the public and decision-makers in order to strengthen the space education system and to foster cooperative and efficient relations between government, universities and industries.

A mutually beneficial interplay among these three pillars (government, industry and academia, as shown in Figure 24) appears to be fundamental for the proper development of space activities in every country, and particularly for ESA aspiring member states. Each of these institutions can positively contribute to the growth of space activities only by coordinating its actions with the others in order to optimize the utilisation of resources and capabilities and create the conditions for competitive advantage in the space sector. Unfortunately, the academic community is often excluded from the dialogue between industry and national agencies. Nevertheless, a close relationship between universities and research institutions respectively and industry is important as the latter can access innovative ideas and technologies arising from aca-

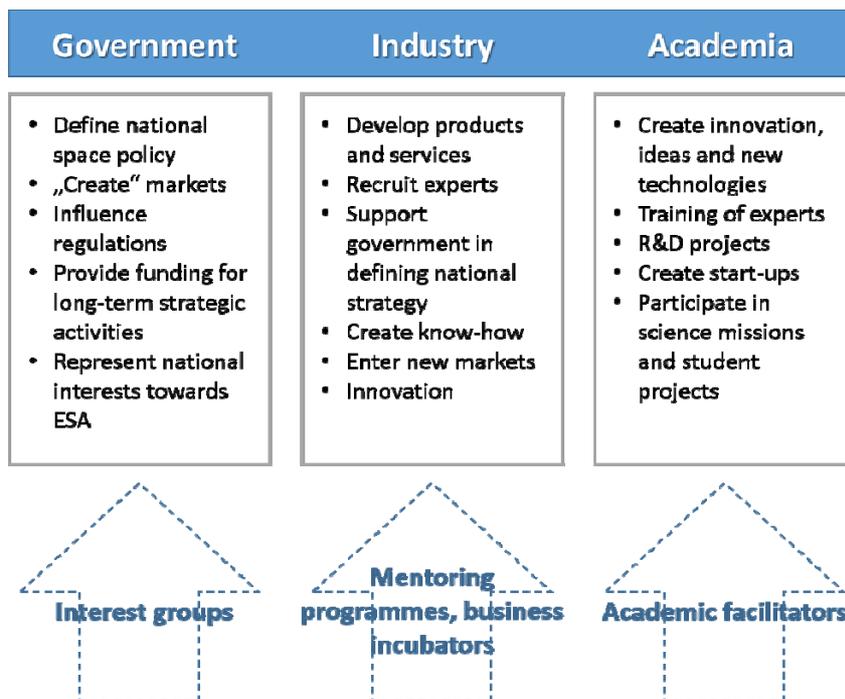


Figure 24: Three fundamental pillars for the development of space activities

demia that can enhance their international competitiveness. This is especially the case in the space sector. Therefore, efforts have to be made to strengthen the expertise of universities and expand their portfolio in order to guarantee the training of experts. The role of government is essential to define a long term and effective space policy, a task that cannot be accomplished without efficient coordination with national industry and academia. Another important aspect is to keep the ship steady. Policy-makers need to ensure a predictable and stable environment of funding for long-term strategic activities in the space sector.

Potential supportive instruments for aspiring countries can be identified for each of the three fundamental pillars. Questions that should be addressed in this context include whether there is a basis for creating "ESA interest groups" for aspiring countries and their industries or whether an optional programme for ECS countries only could be set up.

### 3.1 Mentoring Programmes

Countries interested in strengthening their cooperation with ESA have to face several challenges. One of the biggest challenges in this respect is to make industry and scientific institutions fit for winning work through competitions with well-established organisations from member states as well as to be able to capture a 'juste retour' for their investment. In order to overcome problems, candidate countries have to expand and reinforce the national industrial base, by both facilitating the establishment of new companies in the space sector and strengthening the expertise of already existing organisations.

In the seeding and start-up of new companies the already well-established networks of 'Business Angels' could play a supporting role. Business Angels can be defined as private individuals who invest in business start-ups, usually in exchange for becoming shareholders of the companies. In addition to funds, angel investors often share their personal business management expertise and network of contacts with the entrepreneur and thus are offering more than just money. One major difference to other financing sources is that business angels typically invest their own funds, while venture capitalists, for example, invest the financial capital of third-party investors. In addition, their investment is typically focused on the start-

up phase, thus helping to fill the "equity gap" between the seed and early growth.<sup>227</sup>

Business angels are usually pooled in groups or networks to share research and bundle investment capital as well as to provide training to entrepreneurs and their members. One example of such a network is the European Trade Association for Business Angels, Seed Funds, and other Early Stage Market Players (EBAN). It is a non-profit association, established in 1999 by a group of pioneer angel networks and the Association of Development Agencies (EURADA), with the support of the European Commission<sup>228</sup>. EBAN is representative of more than 250 business angel networks in Europe, which means that the association federates around 20.000 angels. That partnership between such business angel networks and the space sector is nothing new is shown by the collaboration between EBAN and ESA, represented by its Technology Transfer Programme Office (TTPO), which started a three-year strategic partnership in January 2010. This partnership aims at informing and raising awareness among European business angels and early stage investors about innovation funded by the European space programme. The collaboration should support ESA's approach to these investors and stimulate exchange between business angel networks and selected business incubators that focus on transferring space technology and applications to other markets<sup>229</sup>.

ESA, TTPO and EBAN are regarded as ideal partners: ESA provides a steady flow of promising high-tech companies and the start-ups get the chance to convince early stage investors. In concrete terms, the utility of the partnership starts immediately after the incubation phase. ESA Business Incubation Centres (BIC) help start-up companies take their business idea off the ground and form a start-up business, and the business angel takes the firm from being an incubation graduate to being a viable business earning money through seed funding.

The question is whether the concept of business angels and their collaboration with the European space sector could also be useful for non ESA member states, particularly since the involvement of such investors in the start-up of new companies in aspiring states

<sup>227</sup> De Caro, Chiara. "Business Angels." Presentation. Workshop on ESA Enlargement. ESPI, Vienna, Austria. 23 Mar. 2012.

<sup>228</sup> "EBAN, The European Trade Association for Business Angels, Seed Funds, and other Early Stage Market Players". 2013. EBAN 30 Oct. 2013 <<http://www.eban.org/>>.

<sup>229</sup> "Space for Business. Technology Transfer Programme Newsletter." Issue 1 – 2011. European Space Agency. 29 Oct. 2013 <<http://esamultimedia.esa.int/docs/TTP/space-to-business-2011-01.pdf>>.



would primarily bring capital and less expertise in the space field. Nevertheless, capital start-up companies could benefit from the network and the extensive knowledge of market trends of business angels. Moreover, the industry in these countries might also benefit from the partnership between EBAN and ESA and learn from the experience in financing the development of space technologies and applications. In this way, industry would also get closer to the ESA culture and by virtue of EBAN mediation, states might get indirect access to the ESA Technology Transfer Programme. It has to be stated, however, that since the average amount of investment by a business angel in Europe is between 25.000 and 250.000 Euro<sup>230</sup>, depending on the business type and the region, the company established with the support of the investor would be most probably a niche-market oriented enterprise (e.g. space-based applications or system components) with the potential to gradually grow. However, the mere enlargement of space market and industry capabilities in candidate countries would most likely increase the level of competition inside the country and thus could be a powerful stimulus for making the national space market fit for future ESA membership.

For business angels, investing in space - especially in the manufacturing segment - might be at least challenging, given the peculiar characteristics of this sector (high concentration, entry barriers and low average profitability). Their focus however will presumably be in the service segment, which offers more opportunities: it appears to be highly profitable; investments usually lead to profits in a shorter period of time than the manufacturing sector, and barriers to entry are less strong.

### 3.1.1 Business Facilitators

Companies in ECS countries might often not need access to new capital, as the traditional concept of business angels would bring. As underlined, these 'angels' are predominantly involved in start-up companies. Aspiring ESA member states, however, also have already established companies with existing manufacturing and high-tech core business in non-space related sectors that would be open for business in space. In that case, the market entrants, unlike start-ups, have already well-established capital sourcing systems and would not need access to new capital. Entering the space business would hence often not lead to equity dilution. What market entrants

<sup>230</sup> De Caro, Chiara. "Business Angels." Presentation. Workshop on ESA Enlargement. ESPI, Vienna, Austria. 23 Mar. 2012.

would be looking for is primarily space market experience, expertise and a useful network they can build on<sup>231</sup>. In that respect, mentoring programmes offered by 'business facilitators' could be an invaluable tool. Examples of mentoring programmes exist mainly in the academic field, as described in the following chapters. Nevertheless, there are also cases of industry facilitators, which can be either individuals or organisations, outside the space sector, for example in the fields of energy, aerospace and defence.

Facilitators can be defined as individuals or organizations that enable groups and organizations to work more effectively to collaborate and achieve synergy.<sup>232</sup> Business facilitators mainly provide capacity building, entrepreneurship, innovation, skills building, cross-border trade, investment and business linkages. Business facilitators would link companies to each other, to government, agencies and other space companies seeking suppliers, partners and collaborators. In this context, space industry or space institution retirees could fulfil the role of such facilitators, for example. There is, in fact, a number of retired people from ESA and the space industry that have expressed an interest in continuing to be involved with space on a 'hobby' or part time basis. They possess wide experience and expertise in space technologies and science. Of course, the modalities of their involvement and the concrete activities they could perform may vary. In addition to participation in promotion activities directed to very diverse audiences (e.g. schools, universities, governmental and public departments, and scientific institutions) these space experts could support companies from aspiring countries that are trying to break into the ESA space business<sup>233</sup>. Many of them would presumably not want to assist companies that would be in direct competition with the companies they were working for, but might be interested in market entrants. They might act as a kind of mentor, they might serve on the board of such market entrants, and they might give access to their network, without interfering with the interests of the company they served in the past and without creating a direct competitor. Candidate countries could use this business facilitator tool to bring

<sup>231</sup> European Space Policy Institute. Executive Brief: Business Facilitators and Happiness in ESA. Vienna: ESPI, 2012.

<sup>232</sup> An individual who assists in the management of an exchange of ideas, information, and opinions. A facilitator is expected to offer guidance along the way to making decisions rather than provide expertise on a particular subject relevant to the decisions. Business dictionary

<sup>233</sup> Duchossois, Guy. "Initiative on Space Promotion and Education (ISPE)." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

space business expertise to non-space companies wanting to expand into the space business when their home countries become full members of ESA<sup>234</sup>.

However, it has to be seen how the participation of retired space experts in the promotion of space activities could be organised. The creation of an association or an umbrella organisation that would act as a clearing house for retired senior executives ready to become involved and to support space market entrants having set their sights on ESA business could be a feasible solution. Moreover, business associations in EU member states not yet members of ESA might join together in order to create a suitable match-making function.

An interesting impulse in this direction is already offered by the Initiative on Space Promotion and Education (ISPE), a grouping of retired ESA staff that was launched in 2009. At the moment this initiative is in a work-in-progress phase. Members of the association generally have a wide spectrum of expertise and longstanding experience in many space thematic domains (such as Earth observation, Space science, Launchers, Telecommunication, or Human Spaceflight). In particular they have expert knowledge in the management of medium to large space projects (including space and ground components). As project managers, they have a strong and acknowledged competence in team management, ESA procurement and contract management procedures (e.g. ESA ITT releases and evaluation procedures, negotiations with and selection of industrial consortia, the role of prime and sub-contractors, and ESA contract management procedures) as well as ESA project and budget control and reporting. Furthermore, these retired space experts have been involved in all major parts of a space project such as the interactions with user communities, discussions/negotiations with ESA delegates at various levels, the monitoring of the development, the launch and possibly the exploitation and promotion of results and lessons learned. Some ISPE members even have strong expertise in international cooperation (PECS for ESA new member states, negotiation of cooperation agreements with foreign space countries and projects, data transmission to foreign receiving stations, etc.) or consulting activities for the European Commission (EC) and therefore a good understanding of EC procedures and mechanisms.

<sup>234</sup> European Space Policy Institute. Executive Brief: Business Facilitators and Happiness in ESA. Vienna: ESPI, 2012.

These examples show that initiatives such as the ISPE could support the ESA enlargement process in various ways. Business facilitators, taking over the role of mentors, might play a useful role for industries, institutions and agencies in aspiring countries through their deep and proven knowledge of internal ESA structures and procedures as well as of the decision-making mechanisms at all levels. The level of contributions may vary from general presentations and bilateral meetings with industry representatives at workshops and conferences to mentoring and training activities for companies. Therefore, these activities could be organised accordingly, either on a free basis for limited efforts or on a fee basis for bigger efforts and detailed training activities.

### 3.1.2 Business to Business Relations

Another important question that arises in this context is whether and why space industries from ESA member states should be interested in the ESA enlargement process. Possible reasons involve both industrial and political dimensions. From an industrial point of view, the Eastern European region is a fertile area for the development of new satellite based services of direct benefit for socio-economic development for example, and new member states might open opportunities for growth. Countries in this region are open to new ideas and innovation, with many opportunities to apply cutting-edge technologies. Therefore, companies from the already well-established space nations can find new market possibilities, for example to deliver space-based systems in the area of Earth observation, telecommunication, and integrated applications. Furthermore, they may find opportunities to participate in national security and defence programmes<sup>235</sup>. On the other side, these aspiring countries may also offer development and production capabilities at lower costs as well as specific expertise in certain domains (e.g. for developing missing critical technologies). And lower production costs can help to increase the European space sector's competitiveness in certain domains.

It is clear that for well-established space companies of ESA member states this is a long-term investment and requires a lot of effort and therefore each firm has its own strategy and vision. In most cases, their first priority is to select targeted countries and to set up a dedicated light organisation<sup>236</sup>. Furthermore, the companies could trigger work-

<sup>235</sup> Maquet, Gilles. "Discussing Accompanying Processes." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

<sup>236</sup> *Ibid.*



shops in these countries in order to discuss procurement policy and identify areas for cooperation as well as to have a good mapping of potential suppliers. However, to get involved in these candidate countries and the enlargement process a strong commitment within the companies is needed, as the potential business volume might be small compared to other countries (also to states outside Europe) who might be more relevant for strategic alliances for ESA programmes.

Several companies of ESA member states have set up a dedicated organization in ESA future and recent member states. Telespazio, one of the world's leading players in satellite services, for instance, is present in Hungary with Telespazio Hungary and in Romania with Rartel S.A.<sup>237</sup> In Poland, the biggest European space industry company, Astrium, and the major Polish research institute, the Space Research Centre of the Polish Academy of Science, created the joint venture Astri Polska, for running R&D activities and elaborating advanced technologies for space missions and ground systems. The AVIO group has also established a subsidiary in Poland. Avio Polska comprises Avio with 59%, WZL4 (Military Aircraft Works No.4) with 40% and WAT (Polish Military Technical Academy) with 1%. EADS Astrium has another subsidiary in the Czech Republic as well, Astrium Czech Republic s.r.o., which was founded in September 2010 with the aim of providing a focus for representation of one of ESA's major prime contractors in the political heart of a new ESA member state and supporting Czech national institutions in the scientific and industrial sectors to quickly grow into the role of experienced partners for the principal European space players in ESA projects<sup>238</sup>. Another example is Siemens, which also has subsidiaries in Romania, Slovakia, the Czech Republic and Hungary.

From a political point of view, it has to be firstly underlined that European industry will not necessarily see the enlargement of the Agency with an increase in the level of intra-European competition. The new members will in fact specialise not in the whole range of space activities, but presumably in subsystems, aiming at becoming a subcontractor of bigger industries. The development and pro-

duction capabilities will come at lower cost for the already ESA member state's industry. It is therefore in the interest of European industry to indicate to the 'enlargement countries' where to invest for the development of their industry, in order to better harmonise the overall European industrial base. In addition, enlarging the market with new industries could produce a potential interest to develop missing critical technologies and to reach the final aim of European Technology non-Dependency (ETnD). This is a very important objective for overall European industry, considering that in an industry survey by ESA, industry identified more than 100 items under access restriction. 85% of these items had issues, which have a strong or very strong impact on their procurement. Also considering that export controls might be more severe in the future, it is essential for European industry to achieve an ETnD. Other political reasons are the fact that most of space activities are already performed at EU level in terms of budget and programmes. New and aspiring ESA member states are now fully part of the decision-making process of the European Space Policy, and of the budget of Galileo and Copernicus. ESA, as well as European space industry, have then to actively ensure that these countries can benefit from space activities. In other words, it might be convenient for European industry to "give them the *appetite* for space"<sup>239</sup> in order to get their political support (for instance concerning the budget of Galileo and Copernicus).

### 3.1.3 Academic Facilitators

Universities and scientific institutions constitute another important pillar for candidate countries. Having a consolidated academic system in the space area and qualified young aerospace scientists, engineers and technicians should be an important goal for countries embarking on the path of ESA membership. In this context, it could be useful to discuss the previously mentioned tool of facilitators or mentors also in the education sector. Experienced professionals or, again, retired space experts may offer knowledge, insight and resources to the mentee with the aim of assisting students and their transition from study to graduate work. The involvement of such academic facilitators in aspiring ESA member states would be different - and complementary - to the Corporate Education Programme and the National Trainee Scheme provided by ESA.

<sup>237</sup> RARTEL S.A. is a Romanian-Italian joint venture and provides turn key solutions in satellite technologies, using state-of-the-art equipment with highest technological standards. RARTEL has been present in the Romanian market since 1998. RARTEL has the ability to provide fixed and mobile data, voice and video transmission services, In Orbit Control of the satellites and satellite imagery, all of the highest quality.

<sup>238</sup> "About Astrium Czech." 2013. Astrium Czech Republic S.R.O. 29 Oct. 2013 <<http://event.astrium.eads.net/en-astrium-czech/about-astrium-czech-sro/>>.

<sup>239</sup> Maquet, Gilles. "Discussing Accompanying Processes." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

In areas outside the space sector, mentoring programmes are already an important and well-established element in universities. As mentioned above, space experts have long-standing experience in many space thematic domains that can contribute to the further intensification and better organisation of the space education system. In concrete, their expertise could be beneficial for the establishment of specialised courses and PhD programmes as well as for strengthening exchange programmes with students and professors from universities of ESA member states or other aspiring countries. Furthermore, it might increase awareness of the opportunities offered by ESA and, finally, support the creation of spin-offs. Inside the university environment, Professor-Consultants<sup>240</sup> could play a crucial role in creating relationships with national industry. It is important, in fact, that industry and university create a mutually beneficial relationship, by cooperating in recruiting engineers and technicians, creating innovation, develop new technologies, products, etc. As underlined in a recent ESPI study, “the professor-consultant’s role as a part-time industry player improves the quality of the university itself and student experiences therein, bringing practical knowledge and contemporary business culture and practice into the academic community. From an industry perspective, knowledge flowing back into academia from professor experience in the private sector will translate into producing better employees in the future; theoretically, the professor-consultant will prepare students to work in a way relevant and actually tailored to the industry.”<sup>241</sup>

Professor consultants usually have their main jobs in industry, extramural research institutions, business or governmental agencies, and hold only a part-time position as professors at universities. Therefore, they bring practical knowledge and business culture to the academic world that improves the quality of a university and university-industry relationships in general. Furthermore, it helps shape student competency in accordance to industry’s needs so that they are better prepared with regard to labour market requirements and able to find a direct path to employment.<sup>242</sup> Professor consultants could work in all the three main types of academic consulting: *opportunity driven*, *commercialisation-driven* and *research driven*. In the first type of consulting, professor consultants,

while establishing relations between academia and industry, would mobilise expertise that is usually confined within academia itself. Commercialisation-driven consulting, which aims at helping academics to commercialise their own technologies, would bring benefits also to industries. Companies might benefit as commercialisation might allow them to accelerate development along an already chosen path and spin-in technology. Finally, research-driven consulting enables companies to extend in-house research capacity and create emerging technologies.<sup>243</sup>

### 3.1.4 Institution-Oriented Mentoring Programmes

As shown in Chapter 2, the organisation of space activities in ESA aspiring member states, as well as their respective space policies and strategies, is currently in a process of transformation and consolidation. Defining and implementing a coherent and effective space policy is an essential task for potential future ESA member states, which may however lack the necessary space expertise. Mentoring programmes could be a valuable tool not only for industry and academia, but also for supporting the institutions in charge of space activities of ESA aspiring countries. Through their deep and proven knowledge of ESA (and European national space agencies) structures, decision making mechanisms and procedures at all levels, the mentors could work together with the institutions of the countries to define a clear long-term vision for space activities in the country and a concrete space policy. They could also give advice on how to better structure the institutional framework for space activities and on how to develop and implement a coherent space programme.

This task, of course, cannot be carried out only by external advisory bodies, since they might lack the necessary knowledge of the political and socio-economic environment they have to work in. Indeed, the task would be better achieved through efficient cooperation between those facilitators and the national institutions.

## 3.2 Business Incubators

One specific tool ESA is using to promote technology transfer is that of incubators. In addition to being a business stimulus, incubators could be considered as a facilitator of awareness raising on “space benefits” in the society and politics of aspiring ESA member

<sup>240</sup> For more information, see: Giannopapa, Christina, Peter Hulsroj, Arne Lahcen, and Nunzia Paradiso. “Space and the Processes of Innovation.” ESPI Report 43 July 2012: 46-49.

<sup>241</sup> *Ibid.*

<sup>242</sup> *Ibid.*

<sup>243</sup> *Ibid.*



states, thus contributing to the achievement of broader public support for space activities.

It is well known that significant parts of space technology are being transferred to life-improving and prosperity-enhancing terrestrial applications: healthcare products, improved waste management, water recovery etc. Manufacturers use space technologies to create and improve new and existing products that then provide industry and users with a wider choice of reliable goods. This technology transfer reinforces European industry by opening business opportunities for providers of space technology, broadening their business area and thus improving their know-how and competitiveness. It further encourages the wider use and awareness of space technology and systems. Technology transfer has less obvious benefits as well. It maximises the return on investment in ESA's space research by its member states and minimises the duplication of research between the space and non-space sector, while providing cross-disciplinary opportunities for researchers to collaborate with other organisations. It provides economic potential and motivation for both technology producers and technology receivers where the social impact is high and the potential market is large. Though some spin-offs and projects do not directly bring about concrete social and health benefits, they may still result in safety benefits in specialized sectors; space technologies are used by the motor racing, sailing and skiing communities.

ESA's Technology Transfer and Promotion Office, now called the Technology Transfer Programme Office (TTPO), was established in 1990 to facilitate technology transfer from space technologies to terrestrial applications and the commercialisation of such applications. The TTPO offers space-developed technologies to non-space companies, expanding business for space industry and creating new business and jobs for non-space companies. This is supported through a network of technology brokers who assess market needs in areas where there is a potential for exploitation of space technologies.

The ESA Business Incubation Centres (ESA BICs) and the associated network, European Space Incubators NETWORK (ESINET) were set up in order to bridge the gap between ideas and actual business. Currently, there are six such centres throughout Europe, designed to get space to non-space projects off the ground and help them develop into viable space businesses. They support entrepreneurs with operational services and know-how in a technical environment, including office space and shared facilities, assistant and business development support, access to

finance, strategic partnership and networking, as well as engineering support and expertise from ESA experts and ESA resources.

In concrete terms, ESA BICs provide selected start-up companies with operational services and know-how in a state-of-the-art technical environment. Aspiring countries could build on this concept of business incubators by establishing incubator programmes to support the industrial involvement in space. Of course, this would require a significant amount of investment but might be a potential tool to prepare local industry for full membership in ESA and strengthen its competitiveness.

The way potential incubator programmes could work in ESA aspiring member states is, in a sense, the inverse: if space incubators are usually intended to transfer and commercialise space technologies in non-space contexts, the lack of a consolidated base of space technologies in the enlargement countries would not make it a viable way. Indeed, the procedure one can envisage involves the creation of incubator programmes to bring existing "terrestrial" technologies expertise into the space sector. The creation of such national incubator programmes could be ideal / profitable for non-space companies wanting to expand into the space business as well as for start-ups. Technology transfers would in this way help reinforce national industry by opening space business opportunities for non-space industries, broadening their business area and thus improve their know-how and competitiveness. Start-ups as well are intended to benefit from these programmes. In this case, it is worth noting that start-ups could be set up to not only generate space technology, but, at the same time, to utilise the knowledge in non-space contexts, thus bringing a number of safety benefits in specialized sectors.

Potential future ESA member states, by creating such national business incubators, could strengthen the competitiveness of their industry. Encouraging the beneficial as well as commercial use of technologies that in turn leads to innovative products and the generation of new jobs within Europe would strengthen industry.

In order to achieve these objectives, a certain degree of cooperation with the current ESA framework would appear advisable. The eventual involvement of the ESA Technology Transfer Programme Office does not imply that it is responsible for the creation of a dedicated space incubator programme in the ECS and the provision of a direct access to the TTP for the ECS; the TTP Office would rather bring its expertise and provide its as-

sistance to the interested country in establishing its own national programme, while facilitating the linkage and collaboration with the European Space Incubators Network (ESINET).

While only ESA member States and PECS countries have access to this programme, EU member states not yet members of ESA could have access through the three-year strategic partnership between ESA and EBAN (as described in Chapter 2.3). From this partnership, start-up companies could benefit from extensive knowledge on space related market trends and experience in financing space technologies. They could be able to identify new business opportunities and, as a consequence strengthen their industry. It would also contribute to the enhancement of the know-how and competitiveness of providers of space technology and systems. Ultimately, ESA aspiring member states should, under their own steam, seriously consider the case for a space incubator programme as another initiative of primary importance for paving the way - among other benefits - to future ESA membership.

### 3.3 Interest Groups

Another useful instrument for candidate countries could be the establishment of interest groups, which could be set up by industry, scientific institutions or by governments, both at national and regional level. An important example of such an interest group is the NordicBaltSat (NBS) initiative<sup>244</sup>, which was launched by countries in the Baltic area with the major aim of strengthening the relationship between ESA member and non-member states as emerging space countries. A further goal of the initiative was to better organise the coordination of dialogue across national space programmes and utilise the potential of consortium partners (especially in Estonia, Latvia, Lithuania and Poland) for a sustainable contribution to on-going and planned European space programmes<sup>245</sup>. The NBS initiative has shown that the creation of interest groups that have a geographical focus could be a powerful tool for countries to screen the space potential in this area, to build capacity, and to establish or intensify cooperation between the states in a region and ESA. The NBS initiative could be generalised and countries could develop an open environment for ideas and information exchange in the whole value chain, for example

<sup>244</sup> For more information on the NordicBaltSat initiative: <<http://www.nordicbaltsat.eu/>>.

<sup>245</sup> "Overview." 2013. NordicBaltSat. 29 Oct. 2013 <<http://www.nordicbaltsat.eu/node/2>>.

institutions, operators, service providers (both terrestrial and space-related), as well as users and manufacturers. Furthermore, such interest groups can build the bridge necessary for successful integration into the space industry in Europe by not only strengthening the relationship between the participating states but also with ESA member states. It would foster the dialogue and debate on space science and research with public institutions and the public audience.

#### 3.3.1 Industry-Oriented Interest Groups

The establishment of such an interest group could be set up by for industry, both at national and regional level. At national level an important example is the Czech Space Alliance, an SME association of 16 companies established in 2006 with the aim of helping its members win ESA industrial contracts in the Czech Republic. CSA has already proved to be beneficial for Czech industries. During the PECS programme (2005 - 2008) CSA members won 9 out of 12 industrial contracts, and after the accession to ESA they won 16 out of 23 industry contracts in the Czech Industry Incentive scheme, and 10 out of 10 contracts in ESA's international tender.

While at national level some countries have already started such initiatives (e.g.. Estonia set up a national ESA industrial interest group for Remote Sensing and ICT<sup>246</sup>), at regional level there are only informal initiatives (i.e. the Baltic Space roundtable<sup>247</sup>). Such groups could show the space potential of a dedicated region and create joint technology programmes, thus also providing opportunities for future cooperation and adhesion to ESA. Although countries might be interested in establishing groups, the question arises as to who takes the lead and will manage a resulting group. The risk of a country or a powerful industry monopolising the group could make this idea less appealing for some countries. Nevertheless, as shown by the example of the NordicBaltSat initiative, the establishment of a grouping would make it possible to achieve effective coordination of resources across national space programs in aspiring ESA member states.

#### 3.3.2 Institution-Oriented Interest Groups

The European Inter-parliamentary Space Conference (EISC) is another form of interest group that could be of benefit to aspiring countries. EISC was established in 1999 as a

<sup>246</sup> Võõras, Madis. "Challenges and Opportunities for Estonia." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

<sup>247</sup> *Ibid.*



permanent forum aimed at fostering cooperation between national parliaments in Europe on space policy issues. Even though this group is a promising opportunity, from the Eastern European region only the Czech Republic, Romania, Poland and Estonia have joined the forum.

A grouping of parliaments, similar to EISC or as a sub-group of EISC, specifically dedicated to aspiring ESA member states would be another interesting tool. National parliaments can play an important role in increasing wider public awareness and in formulating the directions governments should to follow<sup>248</sup>. It might facilitate the exchange of information on space activities and policies among countries and strengthen existing cooperative efforts. The establishment of a forum to analyse the major issues at stake would allow aspiring countries to discuss common challenges they are facing on the way to ESA membership and find new common tools to overcome these difficulties. The establishment of such groupings does not necessarily have to be limited to parliaments. Other institutional bodies, such as ministries, could use this tool and create this type of interest group. A European Government Space Conference could be envisaged.

The establishment of such fora for analysing the major issues at stake in the European space sector would allow aspiring ESA member states to discuss:

- How to face common challenges in joining ESA, also by finding new common tools for overcoming such difficulties;
- How to best exploit the opportunities offered by space;
- How to build effective space policies
- How to better organise business in the space sector;
- How to better promote education;
- How to deal with ESA and its member states, etc.

### *3.4 Specific Optional Programme for Aspiring Countries*

Over the years, ESA has enriched its path of cooperation in order to support countries in their process of accession to the Agency. Nevertheless, other potential new initiatives in supporting enlargement might also be considered. For instance, setting up optional

programmes for ECS countries only, where industry would be subject to regional competition, could be considered.

One question is why set up a programme additional to the already existing quite supportive framework? For ECS an ad-hoc programme already exists: PECS. There would, however, be several differences from PECS. First, a dedicated optional programme for ECS countries would not only aim at reinforcing their space industry capabilities, but also aim at preparing them for the ESA competitive environment. PECS provides only a limited amount of regional competition. The establishment of an optional programme specifically dedicated to aspiring ESA member states could be attractive because industry would have better chances to win the invitations to tender, given the non-participation of ESA member states. At the same time, tenders would still be subjected to competition, since the tender would be open to the industries of different countries. In this way, through a limited regional competition, future ESA members could start to get prepared for the high competition they will have to experience once their country joins the Agency.

In addition, this initiative would give ECS/Cooperation Agreement states another helpful opportunity that PECS alone cannot provide: the possibility of setting up regional consortia with other ECS industries and scientific institutions to ultimately respond to and participate in ESA Invitations To Tenders (ITTs). In establishing regional consortia, aspiring ESA member states could gain experience of the procurement policy and regulations, they would get used to dealing and cooperating with the industries of other countries, and to establishing agreements between primes and subcontractors. Other important benefits include the fact that participating states and industries would become more familiar with ESA standards and procedures (for example how to deal with the ITT package, how to satisfy ESA evaluation criteria, etc.<sup>249</sup>) and would then be more efficiently prepared for full membership. And since an optional programme would be involved, to some extent countries would get used to dealing with the intricacies of the geographical return system of ESA

Finally, an optional programme for aspiring ESA member states might be an additional intermediate step to bridge the gap between PECS and Associate Member status or ESA membership. As discussed above, when a country joins the Agency it has to significantly increase its investment for space ac-

<sup>248</sup> Ergma, Ene. "The Involvement of Parliaments." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

<sup>249</sup> ESA Tender Evaluation Board (TEB). See The PECS Process.

tivities. The provisions of Article XIII of ESA Convention require that member states provide for compulsory participation based on national GDP to cover ESA general expenses and the mandatory scientific programme. It goes without saying that boosting the space budget from the 1 Million Euro PECS contribution to the much bigger investment required by ESA membership or associate membership, can be highly challenging. In that respect, a special optional programme for ECS could be an optimal solution to gradually increase a country's involvement in ESA costs and programmes.

However, the question of how to organise the financial contribution and the procurement policy for such an optional programme must be addressed. There are several possibilities within the existing framework<sup>250</sup>:

- The first possibility is that the method of procurement follows the normal procedure (for placing contracts) of open competitive tenders, but in a restricted economic operators' market, namely that of aspiring ESA member states. As for the "classic" optional programmes, these special programmes could be open to all ESA aspiring member states (both ECS and Framework Agreement countries) that then would decide whether they will participate and with what level of involvement. States could contribute to these programmes on a scale based on their budgetary situation. These optional programmes could cover areas such as Earth observation, telecommunications, satellite navigation, space transportation or space system components.
- An alternative method would be to set up a system where a potential ESA member candidate country participates in a previously-selected ITT, without having participated in its funding. If the country's economic operators taking part in the tendering process award a contract, the country would then have to allocate the funding before the signature of the contract. Obviously this would significantly increase competition since the industry of aspiring countries would have to win contracts in competition with industry from all ESA member states.
- A third method which would be to 'pay as you go', similar to the ARTES Programmes. An optional programme could be set up for aspiring countries, and only when results of the competition are known would the country of origin be

asked for funding. By this the return coefficient would always be 1, and there would be no challenge in terms of the geographical return system.

Existing ESA member states may, of course, see problems with such approaches. New legal structures would have to be created, and industry from non-member states could be seen as being favoured. However, such objections ignore that the ECS/PECS system already embodies exactly the same features. By extending the system as mooted an additional layer would be created and activities would be increased, but ultimately this would serve economic efficiency when the aspiring states ultimately become member states. From the perspective of existing ESA member states this would be an 'investment' in a better, less complicated future.

### *3.5 Space-Based Applications for Economic Growth*

It is important to make space more and more relevant for citizens and their daily life. Focusing on space-based services would not only help aspiring ESA member states in promoting space activities and strengthening awareness of space applications, but also in finding niche markets for and increasing the competitiveness of their industry. Space-based services definitely have the potential of creating new business opportunities, especially for Small and Medium Enterprises (SMEs). The development of services and applications is therefore an important challenge and key to strategic and economic development across Europe.

The downstream market has great potential and represents the majority of the market value of the three main satellite activities that are relevant for the development of space-based applications (satellite communications, navigation and Earth observation). Also, development costs and risks for space-based services are lower than for space systems, as the development approach is demand driven and the service market tends to be of considerable size. To sum up, space-based services can support national policies. In addition, the service segment appears to be highly profitable and investment has usually led to profits in a shorter period than the manufacturing sector. Satellite application revenue is growing steadily, compared to other market segments<sup>251</sup>, and, as shown in

<sup>250</sup> See also, for instance, Article 13d of ESA Procurement Regulations. Reference Document: European Space Agency. Procurement Regulations. Paris: ESA, 2008.

<sup>251</sup> Hayward, Keith. "The Structure and Dynamics of the European Space Industry Base." ESPI Perspectives 55. Dec. 2011.

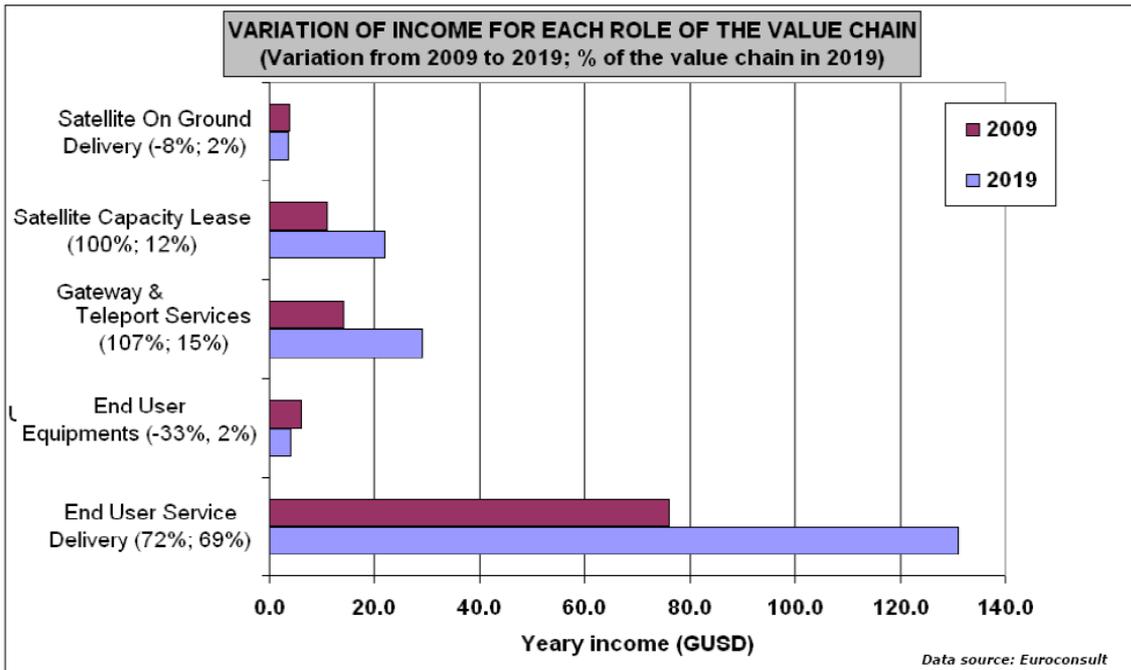


Figure 25: Revenues shifting in the value chain<sup>252</sup>

Figure 25, rapidly shifting downstream in the value chain. Also the barriers to entry are less strong and therefore, for ESA aspiring member states, the application market is the one that offers more opportunities (for start-ups, new clusters, etc).

However, investment in space-based applications is still a long-term investment. One of the main problems in this respect is that the ESA geographical return system does not capture the downstream value added services market, thus making it almost impossible for this segment to assist in satisfying industrial return norms. Nevertheless, the value chain of satellite applications has proven to be highly beneficial.

Through the Integrated Applications Promotion (IAP) programme, ESA supports the development of new applications by using and integrating different space assets. The programme was established by the Ministerial Council in 2008 and is trying to promote a new user driven approach, contrary to traditional technology push programmes, in order to meet the needs and requirements of various users. The programme addresses the utilisation of space capabilities to create value along the entire satellite applications value chain. IAP is already active in diverse application fields ranging from energy grid management to aircraft safety (e.g. Bird Strike early warning and risk reduction), facilitating

novel and innovative solutions and services that previously were unimaginable. Integrated applications are thus already benefiting European industrial competitiveness, while serving the needs of European societies and global communities.

The list of projects and thematic areas is constantly expanding. Recent activities of the programme show the importance of innovative third party partnerships in order to finance space-based solutions as this kind of funding is becoming more and more attractive due to the current economic situation and the interesting way of sharing costs and risks. This is particularly important to overcome the so-called 'valley of death' - the transition from demonstration projects to operational services where many services die when the public funding ends. The IAP programme has already initiated partnerships with institutions such as the European Maritime Safety Agency (EMSA) and the European Investment Bank (EIB), aimed at supporting the development of new applications, services and user-driven missions.

Only a few years after the launch of the programme, IAP has already achieved a significant level of maturity with a considerable number of feasibility studies and demonstration projects as well as some already operational services. However, sustainable services need a critical mass of users and/or structured user communities. Yet the majority of citizens are not aware of what space can do for their daily life. In order to multiply the outreach to users and have a better overview

<sup>252</sup> Ginati, Amnon. "Integrated Applications Promotion (IAP). ESA Creating Value, Along the Value Chain." Presentation. Space for Civil Protection Workshop. ESPI, Vienna, Austria. 5-6 May 2011.

of markets outside of the traditional scope space activities, the ESA IAP programme is building a network of so called "Ambassador Platforms". These platforms are hosted by external organisations that have the necessary expertise and networks to interface between ESA and users of potential services. Furthermore, Ambassador Platforms have the mandate to act as "honest brokers" between ESA, potential users, service providers and other stakeholders who are interested in participating in the IAP programme and thereby pave the way for partnerships. IAP Ambassador Platforms have a thematic and/or geographic framework. The latter is the case for the Ambassador Platform for the Central and Eastern European region which was established to support the IAP programme by raising awareness and stimulating projects in the region of Central and Eastern Europe. This platform is hosted by ESPI in Vienna.

Thus, the development of IAP applications is a considerable opportunity for increasing the market pull of existing space infrastructures. The market proximity and flexibility of the

programme appears to be a good opportunity for the industry in new ESA member states to win projects, to develop operational services and to gain experience in the competitive ESA environment. Aspiring countries can only benefit from the IAP programme through the PECS programme. Nevertheless, there are other possibilities to get involved in the programme such as, for example, end-users of future services can always participate in the programme regardless of where they come from. User communities like public institutions can participate in ESA IAP projects as potential end-users and therefore have the possibility of gaining experience which they can pass to their industry or to integrate local industry without receiving funding from ESA. Another possibility to participate in the programme is to become involved in activities through other ESA member states' participation. This would help in developing a space industry and in promoting the benefits of space related activities to the public.



## 4. The Path Ahead: Conclusions and Recommendations

Since its establishment, ESA has been a pole of attraction for all European countries wishing to conduct space activities in a cooperative and profitable manner. Thanks to its geographical return principle, which provides ESA member states with industrial contracts corresponding to the amount of their financial contribution, membership has been proven to offer many opportunities for European countries.

It was clear from the beginning that the different European countries were not at the same level in terms of industrial capabilities in space. While some of them (e.g. Germany, France, the United Kingdom) were characterised by economies of scale and advanced space capabilities, others were just new entrants on the supply side of the space market.

To this end, from the beginning the ESA Convention was not only designed to accommodate the accession of new European member states, it was also designed to enrich the Agency with new cooperative supportive mechanisms for new entrants. The historical evolution of the cooperative patterns corroborates this assumption. In the history of the Agency, cooperation schemes have in fact been gradually modified and enriched with new steps and supporting measures aimed at better harmonizing the integration process. In short, the ESA cooperation scheme has undergone a process of permanent restructuring, aimed at better supporting the accession of new member states. The 6-9 years transitional measures, the creation of ECS status in 1999, the subsequent creation of the PECS programme and the launch of a National Trainee Scheme, have all responded to this logic. Despite the introduction of all these supportive measures that were discussed in detail in Chapter 2 of this report, new entrants still have a hard time adapting to the ESA environment and its exigent requirements, due to the size of their economy, the state of their space industry and the past low level of investment in the space sector. It is anticipated that future members may find similar difficulties.

In this light, it is clear that, alongside ESA, aspiring countries on their own have to define instruments and implement strategies to get their industries prepared for winning work in

ESA. In spite of the geo-return principle, the experience of many new member states demonstrates that the ESA environment is very competitive, its requirements exigent, its standards high and its "culture" tremendously complex.

With the entrance of the EU in the already complex framework of ESA relations with its members and aspiring members, a variable has been introduced that will tremendously influence the future environment ESA members and aspiring member states will have to work within. As a result, the enlargement process could also be affected. To date, ESA-EU relations are far from being determined but it is clear that an eventual transformation of ESA would also seriously affect the possibilities of European Cooperating States and aspiring countries to gain advantages from ESA membership. As underlined in ESPI Report 46, it goes without saying that "the transformation of ESA into an EU agency, would imply abiding to EU rules and, in particular, to the principle of 'best value for money' which very often provides many advantages for bigger industries and few for smaller ones."<sup>253</sup>

Taking into consideration the analysis provided in chapter 2.2, several challenges will be faced in the coming years by both ESA recent and aspiring member states. In the latter case, some countries still lack the necessary expertise, not only in terms of technical and industrial capabilities but also on the policy side, which may in turn postpone their access and constitute an impediment.

Taking all this into consideration, this report has discussed the possibility of strengthening the current framework and introducing new tools to respond to the specific needs of different countries and subsequently enable them to achieve happiness within the ESA family. Firstly, the role of business angels has been addressed with the aim of enlarging the national industrial base through support for start-ups and spin-offs. Mentoring programmes for industry, academia and institutions have been proposed with the objective of strengthening industries, scientific institutions and the capability of public stakeholders

<sup>253</sup> Paradiso, Nunzia. "The EU Dual Approach to both Security and Space." ESPI Report 45. Aug. 2013.

respectively. The creation of Space Business Incubators in aspiring ESA member states, has been discussed as a business stimulant and instrument of awareness raising for obtaining public and political support for space activities. Particular emphasis has been placed on the possibility of establishing Interest groups for industry and scientific institutions (following the NordicBaltSat example) or public institutions (following the example of EISC). Finally, new possible instruments for ESA have also been identified. In particular, the idea of a specific optional programme for ECS countries was highlighted, where industry would be subject to limited competition. The possible pitfalls and limitations of all these measures have been underlined as well.

Based on all aspects discussed in the present report, various recommendations have been identified for the main actors involved in the enlargement process: the aspiring member states, ESA and the EU.

#### Recommendations for Aspiring ESA Member States

Based on the experience of recent ESA member states, the analysis of the current status of the aspiring ESA Members in chapter 2.2 above, and on the conclusions of the ESPI workshop on "ESA Enlargement", several recommendations and actions for consideration by ESA enlargement countries are offered below. These are general or selected-target actions that focus on three different levels: national, ESA and international.

1. At national level, the first recommendation concerns the appropriate *organisation and coordination of space activities*. It is essential for most of the examined countries – especially those that just recently established cooperative links with ESA – to create a more specific framework for space activities in their country. The creation of a space agency is not in all cases a necessity, but a defined framework for the coordination of space activities is indispensable.
2. Concerning national *space policies*, a primary step is the elaboration of a national space plan that will be the basis for the decision making process and for defining the national objectives of space activities. A clear long-term vision as well as mid-term objectives to ensure the accomplishment of the former needs to be identified. In drawing up a national plan, space priorities have to be defined from both the government side and the side of industrial/scientific institutions in order to build sustainable cooperation based on strong fundamentals.
3. An efficient and mutually beneficial interplay (within and) among the *three pillars* (institutions, academia, industries) has proved to be fundamental to optimizing the use of resources and integrating complementary capabilities and ideas. Internal coordination (i.e. among the different research institutions or different ministries involved in space activities, which usually have different visions and purposes) is a precondition for relating with other national stakeholders and for the establishment of a "one voice" system towards ESA and other possible international partners.
4. Progressive *budgetary consolidation* appears to be compulsory for all aspiring countries. As the analysis has shown, with very few exceptions, R&D expenditures of ESA enlargement states are still low in absolute terms and their R&D intensity represents only half of the EU average level of 2% and 1/3 of the target level set in Horizon 2020. Despite the increase of recent years, the budget for space activities in ECS are still too modest, while Framework Agreement countries do not secure the necessary dedicated budget. In order to avoid a too steep increase in financial involvement when passing from the ECS status to full membership, budgets should be gradually enhanced. This will also bring policymakers into the arena in order to ensure a predictable and stable environment of funding for long-term strategic activities.
5. The government itself, while focusing on budgetary consolidation, should elaborate arguments for the investment in space activities and for ESA participation, and present the benefits of this investment to the wider public - especially in terms of economic growth and services offered. *Raising public awareness* (the creation of a case for space) and subsequent political support are preconditions for investing in space. A main objective in this respect is to develop an active and coherent public information strategy, complemented by promotion activities at national and regional scale.
6. Considering the size of the economies of current aspiring ESA member states and the limited financial resources, it is recommended that they follow a *niche strategy* by putting an emphasis on select



market opportunities.<sup>254</sup> In particular, small countries must carefully consider their broad scientific priorities and focus on the most promising fields. In this respect, it is important to bear in mind that being involved in the supply of space services offers much more growth potential than on the manufacturing side. In this context, the ESA IAP programme has proven to be a useful starting vehicle in this domain.

7. Given the shortage of young aerospace scientists, engineers and technicians in many aspiring member states, the space-related academic system should be strengthened and *educational activities* intensified and better integrated with the needs of the national industry and research institutions. The establishment of mentoring programmes or an institution of dedicated professionals such as professor-consultants could be of great help in realising these objectives.<sup>255</sup> At the same time it is essential to motivate students to study and work in the fields of space engineering, technology and science, also through their active participation and experiences in real space projects with industry and research institutions.
8. Enterprises and research institutions should encourage and support the establishment of *Clusters and Technology Platforms*. Especially for smaller countries with very few big companies, the creation of groups of interconnected companies and associated institutions (e.g. faculties, research centres, SMEs) in the space field offer, beyond research and market-oriented opportunities, the possibility of overcoming the lack of financial resources and mobilizing a critical mass of national public and private resources in order to bring tangible results in research and innovative technologies. As shown, other benefits of these networks include access to specialized human resources, suppliers and knowledge. In addition, information flow between the public administration and scientific/industrial institutions of the national space sector would be facilitated.
9. In relations with ESA, on the one side it is necessary to promote and learn about the ESA complex (technical, administrative and financial rules and procedures, activities and programmes, courses, traineeships, etc) and on the other side to make ESA learn about the country (priorities,

financial situation, capabilities and expertise).

10. At international level, enabling keys are identified as developing *cooperation with international partners*, both industry (i.e. establish prime-subcontractor relations with other industries, or encourage foreign companies to invest in the space sector in ESA enlargement states) and public institutions (in sharing experience and looking for common means to meet common needs), not only in regard to ESA activities. Regional and sub-regional cooperation among CEEs should be fostered also through the development of *Interest Groups*. Such groupings could be institution-oriented (like EISC) or industry-oriented, modelled for instance on the successful experience of NordicBaltSat.
11. Active participation in the elaboration and implementation of the ESP, in particular with the aim of fully utilising the opportunities offered by the EU flagship programmes, Copernicus and Galileo, could be a priority. Having a common policy towards the EU to facilitate the management of cohesion funds for space applications as a very efficient mean for convergence could also be considered.
12. The creation of a dedicated *space incubator programme* in ECS countries through active involvement and coordination between the institutions in charge of space activities in ESA aspiring countries and their respective industries should be considered as another initiative of primary importance. It is worth mentioning that the establishment of these incubator programmes within ESA enlargement countries would work the other way round: non-space technologies would be transferred into the space industry. In this way technology transfers would help reinforce national industry by opening space business opportunities for non-space industries, broadening their business area and thus improving their know-how and competitiveness. This objective could be better achieved by facilitating linkage and collaboration between the newly established Space incubators and the European Space Incubators Network (ESINET).
13. Lastly, the possibility of offering *mentoring programmes* for industry should be seriously explored. In some cases, ECS already have a solid industrial base in non-space related sectors that might be willing to expand into the space business. Providing space market experience, useful networks and expertise is therefore a primary requirement that could be met

<sup>254</sup> Beyond reinforcing the industry, by creating a critical mass or by following a niche strategy, it is necessary to be aware of ESA standards and understand "ESA culture".

by the institutions responsible for space activities in the ESA aspiring countries setting up such mentoring programmes. They could be cost-effective solutions that would be of great help for ECS. In the execution of such programmes collaboration with already established firms and international initiatives (e.g. the Initiative on Space Promotion and Education – ISPE) should be pursued. Through this eventual international collaboration, mentoring programmes could be offered not only to industry, but also to support the institutions of ESA aspiring members in defining and implementing a coherent and effective space policy.

### Recommendations for ESA

The aim of easing the process of rapprochement to ESA is hard to achieve if the actions of aspiring members are not complemented by the equally important support of the Agency. Although ESA is already providing a range of supportive measures, the establishment of new tools should be considered.

1. ESA might consider reviving the *Associate Membership* as a further intermediate step in order to alleviate the significant budgetary step-increase when passing from the ECS status to full membership. In this regard, it has to be remembered that the PECS programme has been introduced because the Associate Membership status was seen as a too broad involvement compared to the bare cooperation agreement. However, the same could be said when passing from the ECS status to a full membership. The much bigger involvement required by full ESA membership could therefore be mitigated if Associate Membership would again be possible and would constitute a further supporting measure in the path of rapprochement to ESA.
2. Some of the current mechanisms for cooperation and assistance for aspiring ESA members could be strengthened. Within the new *National Trainee Scheme*, for instance, opportunities are exclusively related to scientific and technical subjects. However, space policy issues are of essential importance to ESA candidate countries, and the Agency should consider offering policy related trainee programmes as well.
3. The ESA *education programme* could be leveraged more extensively in ECS countries and at the same time cross-fertilised with EU education programmes. Taking into consideration that the programme aims to ensure the availability of a suitably

qualified workforce for ESA and the European space sector in the future, it seems clear that this purpose is fundamental for aspiring ESA member states. In addition, looking to the current results of the programme, it is worth noting that the ESA education programme has already produced remarkable results, which were highly beneficial for ECS. Specific education programmes could have great potential for countries on the road to full ESA membership. Harmonisation with the education programmes provided within the EU frame should be encouraged. Finally, the possibility of leveraging this programme in countries with only a Cooperation Agreement could be also considered.

4. ESA could also define new accompanying measures that would ease the way even further for aspiring countries. The establishment of specific *optional programmes* for ECS countries where industry would be subject to limited competition should be considered. Such an initiative would help the industry in aspiring countries to get better prepared for the competitive environment in ESA and to establish partnerships between companies and institutions from these countries.
5. Finally, the possibility of offering *mentoring programmes* to ECS should be seriously explored by ESA as well. The provisions of such mentoring programme could be incorporated into the PECS scheme or, alternatively when signing the ECS agreement.

### Recommendations for the EU

Given the various benefits the EU would gain from ESA enlargement, the EU, alongside ESA and its aspiring member states, could play a more active role in bringing forward the expansion process.

1. Specific mechanisms for supporting the enlargement process could be established, in close coordination with ESA. Within the *cohesion policy instruments*, for example, a dedicated budget for the development of space-based applications could be secured (and managed through an ESA-EU coordination group). The ERDF and the ESF are financial instruments of the EU that could be deployed in a space context. The particular goal of ESF, for example, is the creation of new and qualitatively better jobs in the EU by co-funding regional, national and local projects. Space leads to innovation and research and therefore could be key for the creation of new or better jobs.



2. In addition, more *specific education programmes* – possibly linked to those of the ESA – could be offered to ECS.
3. The EU could fund *traineeships for graduates* in the space field that would be executed by and within ESA. Such traineeships could be offered particularly to young people of aspiring countries.
4. It is conceivable that the EU could start *nano-satellite projects focused on aspiring countries*. By starting such projects, the EU would support those countries in developing their space industry and promoting space to the public. Moreover, it would further facilitate the accession process of those countries to ESA.
5. The EU could develop *crowd-sourcing platforms* or associated prizes for the best ideas on space. This could be a powerful tool to stimulate young people and to engage a broad segment of a population. Such platforms could be designed especially for youth in aspiring countries under the guidance of experts from European institutions.
6. The EU could *extend its regional initiatives* in promoting education and training as a way to connect neighbour countries, by building such a platform in the field of space for EU member states that are not yet members of ESA.
7. *Awareness-raising initiatives* (such as the European Space Expo) could be strengthened in ESA aspiring countries.

# List of Acronyms

Acronym	Explanation
<b>A</b>	
AFC	Administrative and Finance Committee
APCEE	Ambassador Platform for Central and Eastern European Region
ARTES	Advanced Research in Telecommunications Systems
<b>B</b>	
BA	Business Angel
<b>C</b>	
CEE	Central and Eastern Europe
Copernicus-GMES	Copernicus-Global Monitoring for Environment and Security
COSPAR	Committee on Space Research
CSA	Czech Space Alliance
CSO	Czech Space Office
<b>E</b>	
EADS	European Aeronautic Defence and Space Company
EAS	Enterprise Estonia
EBAN	European Business Angels Network
EC	European Commission
ECS	European Cooperating State
EDA	European Defence Agency
EISC	European Inter-parliamentary Space Conference
EMITS	Electronic mail Invitation to Tender System
EO	Earth Observation
ERDF	European Regional Development Fund
ESA	European Space Agency
ESA DG	European Space Agency Director General
ESA BICs	ESA Business Incubations Centres
ESAC	European Space Astronomy Centre
ESEO	European Student Earth Orbiter
ESERO	European Space Education Resource Office
ESF	European Social Fund
ESINET	European Space Incubators Network
ESMO	European Student Moon Orbiter
ESO	European Southern Observatory
ESP	European Space Policy



<b>Acronym</b>	<b>Explanation</b>
ESPI	European Space Policy Institute
ESRIN	European Space Research Institute
ESTEC	European Space Research and Technology Centre
ESTPs	European Space Technology Platforms
ESTMP	European Space Technology Master Plan
ETnD	European Technology non-Dependence
EU	European Union
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
<b>F</b>	
FDI	Foreign Direct Investment
FFG	Austrian Research Promotion Agency
FP7	Seventh Framework Programme
<b>G</b>	
GBAORD	Government Budget Appropriations or Outlays on Research and Development
GDP	Gross Domestic Production
GENSO	Global Educational Network for Satellite Operations
GEO	Group of Earth Observation
GMES	Former acronym for: Global Monitoring for Environment and Security
GNSS	Global Navigation Satellite System
GSA	European GNSS Agency
GSTP	General Support Technology Programme
<b>H</b>	
H2020	Horizon 2020
HLSPG	High Level Space Policy Group
HSB	Hungarian Space Board
HSO	Hungarian Space Office
<b>I</b>	
IAF	International Astronautical Federation
IAP	Integrated Applications Promotion
ICT	Information and Communication Technology
IMSWG	Inter-Ministerial Space Working Group (Lithuania)
ISPE	Initiative on Space Promotion and Education
ISS	International Space Station
ISU	International Space University
ITT	Invitation To Tender (ESA)
ITU	International Telecommunication Union
<b>L</b>	
LSA	Lithuanian Space Association

<b>Acronym</b>	<b>Explanation</b>
<b>N</b>	
NASA	National Aeronautics and Space Administration
NBS	NordicBaltSat
NMS	New Member State
NTS	National Trainee Scheme
<b>P</b>	
PECS	Plan for European Cooperating State
POLSA	Polish Space Agency
PRODEX	Programme de Développement d'Expériences scientifiques
PSO	Polish Space Office
<b>R</b>	
REXUS/BEXUS	Rocket & Balloon Experiments for University Students
R&D	Research and Development
ROSA	Romanian Space Agency
RRC	ROSA Research Centre
RTD	Research Technology and Development
<b>S</b>	
SAC	Space Affairs Council
SAS	Slovak Academy of Science
SITA	Science, Innovation and Technology Agency (Lithuania)
SME	Small to Medium Enterprise
SOSA	Slovak Organization for Space Activities
Space-SI	Slovenian Centre of Excellence for Space Science and Technologies
SRC	Space Research Centre (Poland)
SSA	Space Situational Awareness
SSTI	Space Science and Technology Institute (Lithuania)
STAR	Space Technology and Advanced Research Programme (Romania)
<b>T</b>	
TFEU	Treaty on the Functioning of the European Union
TP	Technology Platforms
TTPO	Technology Transfer and Promotion Office
<b>U</b>	
UN	United Nations
UN COPUOS	United Nations Committee on Peaceful Use of Outer Space
UNESCO	United Nations Educational, Scientific and Cultural Organisation
<b>V</b>	
VHTP	Ventspils High Technology Park (Latvia)



# Annex

## A.1 ESPI Workshop “ESA Enlargement”

### A.1.1 Background and Rationale

With the accessions in the last few years of the Czech Republic, Romania and Poland (November 2012)<sup>256</sup>, the scene has been set for the gradual enlargement of ESA by all the Member States of the EU not yet members of ESA, bringing the total membership to 30 in the medium term (EU28 plus Norway and Switzerland). In light of this recent and upcoming ESA expansion, it is important to investigate whether or not aspiring member states have the necessary tools to integrate their industries and scientific institutions into ESA’s highly competitive environment.

Experience shows, in fact, that despite the deliberate pace and the various supportive measures offered by ESA, new member states have had a hard time adapting to the Agency’s environment and its exigent requirements. Compared to other entrants, the Czech Republic has had an easier time, but Romania is facing real structural issues and Poland will have to manage a steep increase in involvement, because of the size of its economy and the relatively modest investments through the PECS scheme.

Given the existing quite supportive frame for rapprochement to ESA there are questions as to how the current tools can be deployed by national stakeholders in the best possible way and questions as to whether such stakeholders on their own can define further accompanying measures that would ease the way even further for aspiring countries. Questions that need to be addressed in this context include:

- The role of sub-regional cooperation. Is there a basis for creating an ‘ESA interest group’ for Baltic countries, for instance?
- For ECS there is already a coordination mechanism through the PECS Committee. Should there be a Cooperation

Agreement Committee as well, for EU countries that have not yet reached ECS status?

- Should industry in aspiring countries set up national or regional ESA industrial interest groups? Should scientific institutions?
- Should parliaments from these countries have a grouping similar to EISC, but for ESA non-member states only?
- Can the ESA education programme be leveraged also in countries with only a Cooperation Agreement; can it be leveraged more extensively in ECS countries; and can it be cross-fertilised with EU education programmes?
- Is there a case for a space incubator programme in ECS countries (i.e. beyond PECS) and perhaps even for Cooperation Agreement countries?
- Would it be possible to set up an optional programme for ECS countries only, where industry would be subject to regional competition only? Could this also embrace Cooperation Agreement countries?
- Should a mentor programme be established where seasoned executives (and others perhaps) would make themselves available to small and even large firms relevant for space in these countries?
- How would it be possible to overcome the problem of the ESA geographical return system not capturing the downstream value added services market, making it impossible for this segment to assist in meeting industrial return norms?

In order to discuss such issues, ESPI organised a workshop entitled “ESA Enlargement – What interested countries can do to prepare themselves for ultimate accession”, which took place on 23 March 2012 at its premises in Vienna. The objective of the workshop was to set up a discussion platform to elaborate on the process to facilitate the participation of new member states in ESA. Furthermore, it aimed to address the difficult transition from non-member state to member state, including measures aspiring states can take to help industry and scientific organizations survive in the competitive environment of ESA. The event saw the participation of a number of personalities from ESA as well as

<sup>256</sup> At the time the workshop took place, Poland was not yet a Member of ESA.

from recent and aspiring member states, underlining the relevance of the issue for the future of Europe in space. The International Cooperation Program, PECS program, the Education Office, and representatives of the Integrated Applications Promotion programme represented ESA. Additionally, representatives from the business sector and the space industry as well as delegates from the following countries attended the workshop: Austria, Czech Republic, Romania, Poland, Estonia, Slovenia, Latvia, Lithuania, and Slovakia.

ESPI Director Peter Hulsroj, together with the Head of the Aeronautics and Space Agency of the Austrian Research Promotion Agency (FFG), Harald Posch, welcomed the participants to the workshop. The keynote address was given by Ms. Ene Ergma, President of the Parliament in Estonia and Chairperson of the Estonian Space Committee, who talked about the involvement of parliaments. Afterwards, speakers from ESA addressed the strategic elements of ESA expansion and the development of space-based sustainable services. The morning session of the event was concluded with a discussion on accompanying processes, where four speakers presented the role of space industry as well as the idea of mentoring programmes and the concept of business angels. The afternoon session focused on the opportunities and challenges for non-member states. High-ranking space representatives from 8 different CEE countries (member as well as non-member states of ESA) provided their knowledge and experiences on the adaptation and past accession processes respectively. In the course of the following roundtable discussion they reviewed their national status and strategies. The programme of the event is at Annex A.

### A.1.2 Summary of Keynote Speeches

The workshop comprised three main sessions covering the topics:

- Boundary conditions, which aimed at discussing possibilities and measures for aspiring ESA member states offered by the Agency
- The accompanying process
- Opportunities and challenges for non-member states

In his opening remarks, *Harald Posch* provided an overview of the national strategy and space activities in Austria as well as advice for new CEE countries. He stressed the need to clarify the reason for becoming involved in space (generating benefits for society, economic benefits, science issues offered to the scientific community – knowledge based economy, space as an area of inspira-

tion) and the importance of learning about ESA and setting priorities. He also emphasised the importance of supporting and making investments in technology, in getting organized and speaking with one voice. For ESA aspiring countries it is particularly important to establish and maintain a national space programme, by preparing the country's institutions and by finding and securing national funding. The national strategy states a country's direction and should be revised and adapted several times.

The keynote address, given by *Ene Ergma*, gave an overview of the role of parliaments in supporting national space activities. After outlining the relevance of this sector for pursuing military activities, research, and economic benefits, Ms Ergma emphasised the existence of a new fourth dimension: education. This important dimension is a tremendous input for students, as space may in fact become a stimulus to motivate students to study scientific disciplines, a bridge on the young people's path to natural and exact science and technology. Furthermore, Ms. Ergma emphasized the importance of parliaments in supporting and benefiting from the development of space activities. It is essential that parliaments are ready to support new technological trends, to inform the broader public of the societal benefits of space-based services, to keep up awareness, and to uphold sustainability of development. In this context, the European Inter-parliamentary Space Conference (EISC) should play an active role in encouraging parliaments and governments of countries that have not yet started to deal with space issues. It should invite representatives of the parliamentary committees of all EU member states dealing with education, research and innovation to its annual conferences.

#### A.1.2.1 Session I: Boundary Conditions

In the first session of the workshop, speakers from ESA addressed the strategic elements of ESA expansion and the development of sustainable space-based services.

The session was opened by *Anabelle Fonseca*, representing the ESA International Relations Department, who illustrated the ESA system leading to accession. After presenting the recent steps taken by ESA toward EU member states not part of the Agency, (in particular their nomination as observers in October 2011 and the National Trainee Scheme), she defined the boundary conditions and procedures leading to ESA accession, explaining that a formal request must first be sent by a country to start the co-operation. Ms. Fonseca explained that ESA has recently



started negotiations with Bulgaria. Finally, she illustrated the current status of ESA co-operation with CEE countries and explained the final aim of becoming a "happy" Member of ESA.

The PECS Office Manager, *Bernard Zufferey*, addressed in a more specific way the issues related to the Plan for European Cooperating States. He firstly presented the historical background, from PRODEX as a first temporary cooperating tool with ESA to a two-day workshop in Budapest in 1999 organised by ESA and HSO that aimed at analysing existing relations between ESA and its partners in CEE. The main conclusion of this event was that the step between present co-operation agreement and full membership was far too big for CEE countries, which finally led to the establishment of the PECS programme. Subsequently, he focused on the two key objectives of PECS: to associate ECS participants with ESA programmes and activities, and to prepare them in the most efficient manner for possible future accession. The areas covered by the Plan were illustrated subsequently. Given the difficulties encountered by many countries with the PECS procedures, particular emphasis was given on the new PECS Call for Proposal and Invitation to Tender procedure. Calls for proposals are made according to the standard ESA procedures, including the use of EMITS, in order to make the ECS more familiar with the Agency. Furthermore, the importance of having a national space programme and a kind of framework space policy was emphasised during the presentation.

*Pierluigi Mancini*, Head of the Awareness and Feasibility Studies Division in the Directorate of Telecommunication and Integrated Applications of ESA, talked about the development of sustainable space-based services as an opportunity for aspiring countries. The focus was placed on the Integrated Application Promotion (IAP) programme (ARTES 20) and the opportunities for economic growth offered by space applications and services. He started the presentation by showing how applications, as the bridge between the world of End Users and the world of Technology, represent the ultimate good for which end users are "willing to pay the bill". The IAP programme supports the development of new applications by utilising and integrating different space assets, resulting in improved or new services for citizens on a regional, European and global scale. The programme does not push any particular technology, but responds to user needs. Following its user-driven nature, the main focus of the IAP programme is to set up relationships with user communities in order to collect their requirements for new (or improved) services and to

federate their demand so as to obtain the critical mass to enable sustainable services.

IAP services address a broad range of application domains and Mr. Mancini stressed the fact that the prerequisite to achieving a successful IAP programme is a successful awareness programme, which can be realised also thanks to the established network of so called IAP Ambassador Platforms. The concept of Ambassador Platforms was introduced to bridge the gap to areas outside the traditional scope of space activities. Therefore, these platforms are hosted by external organisations that have the necessary expertise and network to interface between ESA and stakeholders of potential services. An IAP Ambassador Platform has a regional or thematic focus (or a combination of both) and the mandate to inform users of the opportunities available within the IAP programme, to collect their needs, and to encourage the involvement of all relevant service stakeholders.

The development of a space capacity is essential for the development of space-based applications, which he defined as "access to a coherent set of know-how, industrial capacity and infrastructure, and the maintenance and continuous improvement of this competitive technical infrastructure". The specificities of European capacity are that it has a high level of integration and is becoming a symbol of European identity; it is based on civilian public efforts more than military; and it is still very vulnerable, given its dependency on the commercial environment and the lack of technological independence in certain critical areas. The achievement of this European capacity is a precondition for the design, development and operation of space-based applications. The presentation highlighted that the development of IAP applications presents a considerable opportunity for increasing the market pull of existing space infrastructures.

The Head of the Education and Knowledge Management Office of ESA, *Hugo Maree*, gave a presentation on the ESA corporate education programme, which highlighted the role education plays in supporting ESA enlargement. He emphasised that even if ESA is not an educational institution, education is also included in the Agency Convention as part of ESA mandatory activities. It is an important element of the European Space Policy and of Space Council Resolutions as well as a major objective of the Europe 2020 strategy. Education can use space as a theme to enhance the literacy of young people in science and technology, and to motivate young Europeans to pursue a space related career. Given the strong lack of interest by

young people, it is essential to focus also on teachers. Therefore, a major objective of the Education programme is to offer tailored support for teachers to meet the very diverse needs of 20 member states. Beyond the different languages there is, in fact, a variety of educational systems and a very large audience. This support is implemented exclusively through institutional partnerships (co-funding), mainly with Ministries of Education.

Other important objectives of the education programme are to provide university students with practical experience in real space-related projects through hands-on opportunities; to support the academic development and career prospects of postgraduate students in member states; and to inform and inspire teachers and students through a variety of initiatives. There are a number of activities that have the aim of ensuring the availability of a qualified workforce for ESA and the European space sector in the future, by providing university students with their "first" practical experience in real space projects. These projects deal, for example, with micro and hyper gravity activities ("Fly Your Thesis", "Drop Your Thesis" and "Spin Your Thesis"), microsattelites (ESEO), nano-sattelites (CanSats), rocket and balloon experiments (REXUS and BEXUS). Among the hands-on opportunities a major role is played

by CubeSats, which is an ESA educational space project in collaboration with European universities. It provides university-level students with the unique opportunity to gain significant practical experience in the full lifecycle of a real space project. As also mentioned in Chapter 2 of the present report, thanks to the CubeSats project Romania, Hungary and Poland succeeded in launching their first satellite on the VEGA maiden flight on 13 February 2012. Furthermore, many universities across Europe have been able to build real satellites.

Finally, Mr. Maree presented the current results of the ESA Education programme. Since 2000, about 3900 students from all ESA Members and Cooperating States have been involved. Development, testing and operation of flight and ground hardware and software have been realised. An important mentoring opportunity has been given by ESA/industry experienced staff, which also provided familiarisation with the space projects standards of the Agency. Finally, many Masters and PhD theses were produced in the course of these projects and for many students their participation was the first step towards a successful career. To conclude, in 2011 alone, a total of 485 students from European countries took part in ESA's tertiary education projects (as shown in Figure 26).

<b>Tertiary education projects (all)</b>			
<b>Total students per country (running projects only)</b>			
<b>Country</b>	<b>2008-2010</b>	<b>2011</b>	<b>Total</b>
<b>Austria</b>	9	4	13
<b>Belgium</b>	17	4	21
<b>Canada</b>	24	1	25
<b>Switzerland</b>	1	9	10
<b>Czech Republic</b>	6	0	6
<b>Germany</b>	58	47	105
<b>Denmark</b>	25	0	25
<b>Spain</b>	53	75	128
<b>Estonia</b>	2	7	9
<b>France</b>	54	83	137
<b>Finland</b>	10	0	10
<b>Greece</b>	0	1	1
<b>Hungary</b>	90	9	99
<b>Italy</b>	158	88	246
<b>Ireland</b>	5	0	5
<b>Norway</b>	15	0	15
<b>Netherlands</b>	2	4	6
<b>Portugal</b>	22	3	25
<b>Poland</b>	201	40	241
<b>Romania</b>	5	27	32
<b>Sweden</b>	37	46	83
<b>Slovenia</b>	10	14	24
<b>United Kingdom</b>	96	23	119
	<b>900</b>	<b>485</b>	<b>1385</b>

Figure 26: Participation of European students in ESA's tertiary education projects<sup>257</sup>

<sup>257</sup> Marée, Hugo. "ESA Corporate Education Programme." Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.



The first session of the ESPI workshop was concluded with a presentation by *Fernando Maura*, Head of the ESAC Human Resources Service. The presentation provided an overview of the new national trainee scheme, presented by ESA DG in May 2011. Mr. Maura firstly explained the mechanisms, purposes and benefits this initiative may deliver. The national trainee scheme is funded by national entities and provides an opportunity for engineering and science graduates from non-ESA member states to receive on-the-job training in space technologies for 12 months. In concrete, the main objectives are: to help meet national space industry needs of skilled staff, to support effective cooperation with ESA by creating links, and to increase ESA awareness. He subsequently stressed the fact that, despite the numerous benefits and although 30 training opportunities were available in 2012, non-ESA EU Members had not yet signed any agreement. For this reason, two discussion points were raised: what can be done to speed up the process, and what can ESA do to help in this respect?

#### A.1.2.2 Session 2: Discussing Accompanying Processes

In the second session of the ESPI workshop on "ESA Enlargement", accompanying processes for supporting aspiring member states were discussed. Industry and investment representatives expressed their views on the enlargement process in the coming years and what initiatives could be taken in order to facilitate and support the rapprochement cycle and to achieve "happiness within the ESA family".

The session was opened by *Guy Duchossois*, former ESA Earth Observation Satellites Mission Manager, who explained the Initiative on Space Promotion and Education (ISPE) of 3AeF, an association of approximately 200 retired ESA staff members that aims at conducting space promotion activities. He explained that there is, in fact, a large number of ESA retired staff or space industry retirees that possess wide experience and expertise in space technologies and sciences. Many of them are often asked to participate, or have expressed their interest in participating in the promotion of space on a "hobby" or part time basis. The modalities of their involvement and the concrete activities they can perform vary and are directed to very diverse audiences (primary and secondary school, universities, non-space associations, governmental and public departments, scientific institutions, etc).

Following some background information, Mr. Duchossois showed the evolution of the ac-

tivities undertaken by 3AeF, as well as the early results and the potential of ISPE. In 2009, 3AeF decided to explore how to better structure the participation of retired ESA staff volunteers to contribute to space promotion activities. Informal contacts were first established with specific relevant organizations including ISU (International Space University), UNESCO, Eurisy, and IAF as well as with ESA internal departments (dealing with promotion, education, and communication) at Headquarters, ESTEC and ESRIN. Positive replies were received but more detailed information on the type of support/expertise that could be made available was needed. Therefore, in 2010 a questionnaire was sent to all retired ESA staff in France with the objective of identifying interested volunteers in different thematic domains (EO, space science, launchers, space station, etc.) and the possible types of contribution (general and/or specialized presentations, tutoring, support for the production of education material) as well as to get information on possible constraints (geographical, travel, calendar, languages, time availability, etc.). Several positive replies were received coming essentially from French, Belgian and Italian retirees. Furthermore, four domains emerged: Earth observation, space science, space station and microgravity, as well as spacecraft engineering and ground segment. Only a few replies were related to telecommunications, navigation and launchers.

Official contacts were established in early 2011 with interested partners (ISU, IAF, UNESCO) and ESA internal education departments. In May 2011 ISPE also met with the communication and education departments of ESA to discuss concrete activities and possible schemes/conditions for supporting activities. Concrete support was provided to ESA for the drafting of education material in December 2011. In the same year, a partnership was launched with the IAF Secretariat for their project "e-mentoring SpaceMatch", where six ISPE members interacted with students and young professionals from Australia, Asia, South Africa and Europe mostly for career guidance and for university projects.

In 2012, 3AeF offered support to the ISU in the context of their contract with the EC for the evaluation of the space potential of Baltic countries that had recently joined the EU.

On 16 February 2012 a successful meeting with ESA management (DG and Head of Cabinet) was held in Paris to identify concrete activities (e.g. support for large ESA events) and modalities for ISPE involvement. In general, any support is on a free-of-charge basis except if travel/accommodation is involved which in this case will be reimbursed accord-

ing to ESA rules. For the future, there are already plans to expand the French ISPE initiative to other associations of ESA retired staff, for example, in Germany, Netherlands, Italy, and the UK (in total there are around 600 persons of whom possibly 10% would be interested in contributing, which would lead to a “reservoir” of some 50-60 experts).

*Gilles Maquet*, former Astrium Senior Vice President, drew attention to the role of European space industry in accompanying the ESA enlargement process. In particular, he investigated the reasons why the space industry could be willing to contribute to the enlargement process, how the space industry would act to accompany these processes and what the main problems are. Concerning the first point, he identified political and industrial reasons (for further details see the Section on “benefits and costs of ESA membership” of the present report). There can be quite different methods of industry’s engagement in ESA enlargement, given the fact that each company has its own strategy and the content and implementation of such strategy is “confidential industry”. In general, a first priority is always to select the targeted countries and to set up a dedicated light organisation.

In order to support the enlargement of ESA, industry could trigger dedicated workshops to discuss procurement policy and to identify areas for cooperation with other industries and institutions. In this context, it is essential to have a good mapping of potential suppliers and a personalised selection of preferred companies. Equally important are the development of a local footprint through joint ventures, to be partner in a local industrial base, to associate local partners in EU projects (Horizon 2020, Cohesion Funds), and to keep close contacts with ESA experts in order to monitor the geo-return constraints. Finally, industry should try to have a focal point to make things easier for local players.

Several problems may however rise. From an internal point of view, it has to be considered that creating a long-term partnership requires more time than usual. There are concerns from engineers (risk adverse) to move from one existing supplier to a new one, since they tend to stay in the current supply chain. The same difficulty is encountered when a transfer of some in-house capability to a new industrial partner is requested. Therefore, a strong commitment within the company is needed (e.g. clear definition of concrete projects & work packages that can be done in collaboration with local partners). Concerning external problems, it has to be mentioned that new member states’ potential business volume is recognised as small

(budget estimation for all new member states for 2020 is about 170 Million Euros), and other countries might be more relevant for strategic alliances for ESA programs. The market attractiveness of these states has to be compared with other export possibilities outside Europe. In addition, local industries are not yet “ready for space” and supervision is necessary.

In his conclusions, Mr. Maquet provided four strong recommendations<sup>258</sup>:

1. Space priorities should be clearly defined from on government side (and the same on the industrial side) to build sustainable cooperation on strong fundamentals;
2. To be involved in the supply of Space services offers much more growth potential than on the manufacturing side as it is the EU priority and where the money is. Thanks to its application programmes, ESA is an ideal vehicle to start in this domain;
3. It is important to have a common policy towards the EU to facilitate the use of Cohesion Funds for space applications as a very efficient means for convergence;
4. For aspiring countries it is important to be patient and maintain motivation, as space solutions are part of their future.

*Chiara de Caro*, General Manager of EBAN, gave a presentation on Business Angels and the contribution they could potentially offer in sustaining ESA enlargement. Business Angels are defined as individual investors, directly investing their own money predominantly in seed or start-up companies, with a medium to long-term timeframe. They are ready to provide, on top of their individual investment, follow up strategic support to entrepreneurs from investment to exit. Business Angels are usually grouped in networks, “private or semi-public bodies, whose aim is to match entrepreneurs looking for equity with business angels”<sup>259</sup>. Within Europe, the most important organization is EBAN, the European Trade Association for Business Angels, which reaches out to 300 groups, 20.000 angels and 40.000 entrepreneurs. The added value of EBAN is that it increases supply and demand for angel investments.

Several events and congresses have already been organised by Business Angels in the CEE region. In addition, in 2010 EBAN started to collaborate with ESA’s Technology Transfer Programme Office (TTPO) through a three-

<sup>258</sup> Maquet, Gilles. “Discussing Accompanying Processes.” Presentation. ESA Enlargement Workshop. ESPI, Vienna, Austria. 23 Mar. 2012.

<sup>259</sup> De Caro, Chiara. “Business Angels.” Presentation. Workshop on ESA Enlargement. ESPI, Vienna, Austria. 23 Mar. 2012.



year strategic partnership. The objective of this partnership is to support ESA's approach to European early stage investors as a provider of quality and exclusive deal flow in the space technology sector and collaboration between incubators and Business Angel networks. Ms. De Caro concluded that Business Angels and EBAN could therefore be an excellent instrument for helping CEE countries in enlarging and advancing their industrial capabilities.

At the end of the second session of the ESPI workshop, *Bernd Litzka*, Programme Manager at the Austrian Wirtschaftsservice, presented the Austrian network of Business Angels, called i2. The network was created in 1997 and is in close contact with other Business Angel networks and also a member of EBAN. In fact, i2 is a matching service where Business Angels can find promising start-up companies that are looking for capital as well as experience. Mr. Litzka also provided an overview of how angels work and their motivations. Furthermore, he underlined that the concept of Business Angels could present a good opportunity for aspiring countries on their way to ESA rapprochement.

### A.1.2.3 Session 3: Opportunities and Challenges for Non-Member States

The third session of the ESPI workshop was dedicated to the opportunities and challenges encountered by recent and future member states on their road to ESA membership. Highly ranked space representatives from eight different states (Czech Republic, Romania, Poland, Slovenia, Estonia, Latvia, Lithuania, and Slovak Republic) accepted the invitation to talk about the experiences of their countries.

The Czech Republic perspective was addressed by *Karel Dobes*, Government Commissioner of the Czech Ministry of Transport. Mr Dobes firstly described the space sector in the Czech Republic before accession to ESA as well as the milestones of the process leading it to be the first CEE country to join ESA. In illustrating the Czech organisation of space activities, he described the difficulties encountered and the differences among the Czech institutions in the perception of space. In particular, a major problem was to find a common strategy and inputs to the competitiveness of Czech space activities within the ministries. There was no common understanding of space among different ministries as, for example, the Ministry of Transport and the Ministry of Trade wanted space to be a more business and political-related issue, while the Ministry of Education pursued a more science-oriented approach. Concerning

future development, in 2013 the official Czech National Space Agency was to be established, replacing the Ministry of Transport in the coordination of Czech space activities.

It is important to clearly define who should be responsible for space in the national context as well as to have one point of contact and one point of decision making. Mr Dobes finally raised the question of the importance of space and the need to have full political support (from government, Parliament and industry) and to encourage public awareness for the development of space activities.

*Marius-Ioan Piso*, President and CEO of the Romanian Space Agency, presented the framework of Romanian space activities (in particular of ROSA) and the process leading to full ESA membership. He identified three important priorities for the national space policy: industry should establish correlations with national governmental RTD programmes; longer term programmes have to be launched with the aim of capacity building at national level; and a toolbox for governments should be developed.

In his presentation Mr. Piso mentioned that space investments in the former socialist countries are much lower than the EU average and that the industry should act as the major actor for space sector development in the new ESA member states. In his concluding remarks, Mr. Piso also underlined that the discussion on legal accession procedures was not easy and that it is difficult to convince the government to invest more in ESA as well as to engage with industry.

*Anna Nalecz-Kobierzycka*, Chief Expert in the Innovation and Industry Department of the Polish Ministry of Economy, illustrated the opportunities and challenges for non-member states from the Polish perspective. The presentation focused on the lessons learned by Poland with the PECS programme. She underlined that new PECS procedures are quite complicated but useful for aspiring ESA Members, since they are closer to the actual ESA rules and are a good way "to force" national entities to use EMITS. In this light, more preparatory workshops with ESA experts are necessary, and more promotion activities at national scale needed. The establishment of a national "advisory service" (dealing with non-ESA related issues, national law, etc) should be also considered.

Ms. Nalecz-Kobierzycka identified three levels of operation for better utilising the "potential of space": national, ESA and international. At national level, scientific and industrial platform/chamber associations could be very helpful as the information flow between the public administration and national space sec-

tor would be facilitated. Raising awareness and promotion of space activity (creating a case for space) are necessary as well. Finally, education and promotion of students' activities and projects have to be pursued. At ESA level, it is necessary on the one side to promote and learn about the ESA complex of rules and procedures (from the technical, administrative and financial points of view, activities and programmes, courses, traineeships, etc) and on the other side to make ESA learn about the country (priorities, financial situation, capabilities and expertise). Finally, at international level key goals are to develop cooperation with international partners, share the experience and look for common means to meet common needs (not only for ESA activities). At the end of her presentation, Ms. Nalecz-Kobierzycka underlined that information is key for success and is needed at all levels.

*Madis Võõras*, Head of Space Office in Enterprise Estonia, highlighted space governance and policy in Estonia and its relationship with ESA. He, provided an overview on the timeline of cooperation between Estonia and ESA, starting with the first consultations in 2006 and the signature of the cooperation framework agreement with ESA in June 2007 to the signature of the PECS Charter in November 2010. Mr. Võõras also explained the plans for further accession to the Agency that will start with negotiations at the beginning of 2014 and should be completed with accession to the convention after the end of the ECS Agreement, at the end of 2015.

The idea of creating sub-regional cooperation through an ESA interest group for Baltic countries was then addressed, underlining its potential benefits but also pitfalls concerning the management of such an undertaking. Other potential instruments for easing the enlargement process of ESA, such as the idea of a space incubator programme or the extension of the ESA Education programme for countries with a Cooperation Agreement, were also welcomed in the Estonian perspective. In this light, Mr. Võõras underlined that for an ECS it is necessary to have a clear understanding of what would be the rules (especially on the financial side) to get and use ESA educational resources, to participate in IAP tenders, and to participate in the ESA Technology Transfer programme. It is important to find the best way to learn the ESA language as the system is complex and has its own culture.

*Kaspars Karolis*, Senior Official in the Ministry of Education and Science of Latvia, presented the organisation of space activities in Latvia (see Chapter 2.2) and the country's long-term strategy and timeframe for cooperation

with ESA. An ESA technical audit in 2010 accredited the country as having an industry with technical capabilities relevant to space and identified at least seven potential PECS projects. The Latvian space strategy builds on four main pillars: creating an institutional framework and ensuring coordination in space, improving the specialist level in space, ensuring the participation of researchers in international space projects, and ensuring the participation of industries in international space projects. Mr. Karolis pointed out that Latvia intends to become a full ESA member state in 2018.

In this context, Mr. Karolis also gave an overview of the main obstacles and difficulties Latvia is facing in getting closer to the Agency. In particular, he emphasised low public awareness, low business and research activity, insufficient R&D and the lack of access and experience in international supply chains of the space industry. He subsequently addressed the issue of sub-regional space cooperation by showing the successful example of NorBalticSat and presenting the future joint initiatives. These include a Common GMES service platform, the joint satellite project Cube 50, training initiatives, and cooperation among space-related enterprises on the basis of projects.

*Vidmantas Tomkus*, Director of the Lithuania Space Association, focused his presentation on the opportunities and challenges related to both up- and down-stream services. Among the challenges for downstream services he emphasised that small countries with well-developed transport and telecommunication infrastructure do not see evident advantages from using satellite communications and EO data instead of aerial monitoring, wireless ground sensors, and terrestrial networks for data transmission respectively. In addition, the relatively high price of high resolution radar images limits the commercialisation of EO services. Satellite services are complementary to services provided by ground sensor networks and aerial observations. With regard to challenges in the upstream sector, it is important for aspiring countries to correspond to the technology areas defined as needed for the ESA / EDA non-dependence strategy.

Mr. Tomkus stressed that the interest in participating in ESA and EU space activities has to be value driven and not by the requirement to finance global European space policies. He affirmed that it would be beneficial for countries with a Cooperation Agreement to have access to the ESA education and space incubator programmes. The ESA education programme could be cross fertilized with EU education programmes as there is



already experience in co-operation and sharing resources between EC and ESA in Galileo/GMES programmes. Furthermore, regional industrial clusters with interests in increasing the Technology Readiness Level, system integration and lower costs would be reasonable for aspiring countries. Mr. Tomkus underlined that fostering of value and customer-demand driven ecosystems to support the growth of new high tech start-ups would lead to more space-industry transfer success stories. At the end of his presentation Mr. Tomkus defined the estimated priorities of space services and technologies for Lithuania which are space science such as solar system science and space situational awareness (10%), governmental and public applications like strategic communication and transport systems (25%), and commercial applications such as strategic independence technologies (65%).

*Marta Cimbáková*, Director General of the S&T Division in the Ministry of Education, Science, Research and Sport of the Slovak Republic, described the Slovak pathway towards ESA. Ms. Cimbáková next identified the scientific, industrial and educational stakeholders and outlined the respective potentials (see Chapter 2.2). The Slovak Republic has established a joint "committee on Slovak cooperation with ESA" which is composed of delegates across all stakeholders (e.g. various Ministries, Slovak Academy of Sciences and universities) and manages the concept and process of the cooperation with the Agency. The first general meeting of Slovak stakeholders was organised in 2011 through a workshop entitled "Slovakia on the path to ESA". The country identified its main priorities in the sectors of telecommunications and navigation, which are seen as the best opportunity for return-on-investment.

Ms. Cimbáková emphasised that although Slovakia has a long and successful history in space sciences (the most advanced areas are space weather, life sciences as well as astronomy and astrophysics) and is currently participating in several space related projects, experiences with industrial space procurements are limited. Therefore, the establishment of an "interest group" could be helpful to represent the space industry sector.

Scientific stakeholders in the Slovak Republic are mainly focusing on astronomy and astrophysics. To date there is no specialised space engineering course and therefore educational activities will be intensified to promote ESA and space science in general and to inspire students to study technical and natural sciences. Ms. Cimbáková underlined that the Slovak Republic must reconsider its broad scientific priorities and focus on the most

promising fields. An ESA assessment of Slovak industrial capabilities will be performed to identify ESA projects and areas of most potential for success and return-on-investment. For its part, the government will focus on budgetary consolidation and the elaboration of reasons for investments for the participation of the Slovak Republic in ESA. Furthermore, the benefits of space investments, especially on economic growth, should be presented to the wider public. There is a need for more educational programs, public interest, political support and the wider involvement of the scientific and research authorities.

### A.1.3 Summary of the Roundtable and General Discussions

In the roundtable discussion, participants discussed the potential way forward for ESA aspiring member states. One of the focal points of the discussions was the important role of human resources. Delegates emphasised the need to investigate why it is difficult for many CEE countries to take positions in ESA and EU institutions. While for some experts one of the main reasons could be found in the lack of confidence in these institutions, for others, the problem was that many states simply do not have people to send to ESA facilities, like ESTEC or ESRIN. All panellists recognised therefore the need to invest more in university programmes and enhance the level of student education in space-related subjects. It was emphasized that the cost of training people is much lower than the cost of unemployment. Educating people or sending them abroad for education is investing in the future of a country and therefore a worthy investment.

In this light, the problem of nationals staying abroad for a better education and job opportunities and the question of how to keep those experts in the country was raised. However, it was emphasized that this issue should not keep countries from sending their young generation abroad to get special education. In this context, it was affirmed that CEE countries in general do not need a space education to start with and that a good basis in engineering is enough. However, there is still a need for specific education, e.g. project management, as many people in these countries are not prepared for these kinds of necessary skills.

Another central point of the discussion was relations between CEEs and ESA. Speakers affirmed that ESA was focused on Western Europe, which makes it difficult to get through to ESA as everything is discussed at high level. The problem of "ESA culture" was

raised and that there is a lot of confusion among people because of the difference between ESA and the EU. Another critical question is whether ESA is carefully listening to what is available in each country. Some countries (e.g. Sweden) can more easily sell to NASA than to ESA.

The second part of the roundtable focused on industry-related issues. ESA representatives underlined the need for new ESA member states to focus on short-term projects to have fast results, to keep existing partnerships and to have a faster industrial return. Furthermore, the exchange of information is essential to avoid, for example, ending up with a double product. The term "happy new member state" was coined to refer to a country effectively profiting from being part of ESA. For CEE countries the development of their space industries appears to be a complex task. First of all, for industry it is quite

hard to join the "western" space industry. In addition, to develop a space industry and enter the space market, support from government is essential, but in many cases CEE countries lack the necessary political and public support. It was underlined that small countries have no space industry but potential capabilities and that there is a difference between space business and space industry. Under these circumstances, workshop participants discussed the role of regional cooperation, to be pursued, for instance, through the creation of an industry-oriented interest group. This, according to many speakers, could represent a supporting step in developing important capabilities and industrial relations on an international level. Market niches and applications could be a fertile ground for establishing such cooperative undertakings.



Figure 27: Roundtable discussion during the ESPI workshop on „ESA enlargement“



Figure 28: Audience of the ESPI workshop on "ESA Enlargement"



## A.1.4 Workshop Programme

### Objective:

With the accession of the Czech Republic, the recent accession of Romania and the start of accession negotiations with Poland the scene has been set for the gradual enlargement of ESA by all the Member States of the EU not yet members of ESA, bringing the total membership to 29 in the medium term.

The objective of the workshop is to set up a discussion platform to elaborate on the process to facilitate the participation of new member states in ESA. The event shall address strategic elements of ESA expansion and development of space-based sustainable services in particular.

The workshop should address the difficult transition from non-member state to member state, including measures aspiring states can take to help industry and scientific organisations survive in the competitive environment of ESA. Given the already existing quite supportive frame for rapprochement to ESA there are questions on how the existing tools can be deployed by national stakeholders in the best possible fashion and questions on whether such stakeholders on their own can define further accompanying measures which will ease the way even further for aspiring countries.

### Venue:

European Space Policy Institute (ESPI)  
Palais Fanto  
Schwarzenbergplatz 6  
(Entrance: Zaunergasse 1-3)  
A-1030 Vienna, Austria  
Tel +43 1 718 1118 -0 / Fax -99  
[www.espi.or.at](http://www.espi.or.at)

Registration: [erich.klock@espi.or.at](mailto:erich.klock@espi.or.at)

Tel +43 1 718 1118 -26 / Fax -99  
[www.espi.or.at](http://www.espi.or.at)

Picture/Image credit: ESA

March 2012

## Workshop on ESA Enlargement

What interested countries can do to prepare  
themselves for ultimate accession

### Programme



ESPI, 23 March 2012  
Vienna, Austria



### Programme

8:30–9:00 Registration and Coffee

9:00–9:30 Welcome and Introduction

**Peter Hulstroj**  
Director  
European Space Policy Institute (ESPI)

**Harald Posch**  
Head of the Aeronautics and Space Agency  
Austrian Research Promotion Agency (FFG)

9:30–9:50 Keynote Address: The involvement of parliaments

**Ene Ergma**  
President of the Parliament  
Chairman of the Estonian Space Committee

9:50–11:10 Session 1: Boundary conditions

**The ESA system leading to accession**  
**Anabelle Fonseca**  
International Relations Department  
European Space Agency (ESA)

**ESA PECS process**  
**Bernard Zufferey**  
PECS Manager  
European Space Agency (ESA)

**Integrated applications as a new opportunity**  
**Pierluigi Mancini**  
Head of the Awareness and Feasibility Studies Division  
Integrated and Telecommunication related Applications Department  
European Space Agency (ESA)

**The ESA Education Programme**  
**Hugo Maree**  
Head of the Education and Knowledge Management Office  
European Space Agency (ESA)

**The ESA National Trainee Scheme**  
**Fernando Maura**  
Head of the ESAC Human Resources Service  
European Space Agency (ESA)

11:10–11:30 Coffee break

11:30–12:30 Session 2: Discussing accompanying processes

**Guy Duchossois**  
Former ESA Earth Observation satellites Mission Manager  
Initiative for Space Promotion and Education (IPEE)

**Gilles Maquet**  
ESPI General Assembly  
Former Astrium Senior Vice President

**Chiara de Caro**  
General Manager  
The European Trade Association for Business Angels (EBAN)

**Bernd Litzka**  
Programme Manager  
I2–The Business Angels Matching Service, Austria Wirtschaftsservice (AWS)

12:30–13:30 Lunch

13:30–15:30 Session 3: Opportunities and challenges for  
non-member states

**Karel Dobeš**  
Government Commissioner  
Ministry of Transport in the Czech Republic

**Marius-Ioan Pîso**  
President and CEO  
Romanian Space Agency (ROSA)

**Anna Nałecz-Kobierzycka**  
Chief Expert of the Economy Development Department  
Ministry of Economy of Poland

**Tomaž Rodič**  
Director  
Slovenian Centre of Excellence for Space Sciences and Technologies, Space-SI

**Madis Võõras**  
Head of Space Office, Advisor for Technology and Innovation  
Enterprise Estonia

**Kaspars Karolis**  
Senior official, Department of Science, Technologies and Innovations  
Ministry of Education and Science of Latvia

**Vidmantas Tomkus**  
Director  
Lithuanian Space Association

**Marta Cimbáková**  
Director General of S&T Division  
Ministry of Education, Science, Research and Sport of the Slovak Republic

15:30–16:00 Coffee break

16:00–17:30 Roundtable discussion on the potential way forward

17:30–17:45 Concluding remarks

**Peter Hulstroj**

## A.2 Overview of Recent and Aspiring ESA Member States

	Cooperation Agreement	ECS Agreement / PECS Charter	Full Membership
<b>Austria</b>	1979 Associate Membership	-	1987
<b>Norway</b>	1981 Associate Membership	-	1987
<b>Finland</b>	1987 Associate Membership	-	1995
<b>Portugal</b>	1996	-	2000
<b>Greece</b>	1994	-	2005
<b>Luxembourg</b>	2000	-	2005
<b>Czech Rep.</b>	1996	2003 / 2004	2008
<b>Romania</b>	1992	2006 / 2006	2011
<b>Poland</b>	1994	2007 / 2008	2012
<b>Hungary</b>	1991	2003 / 2003	-
<b>Estonia</b>	2007	2009 / 2010	-
<b>Slovenia</b>	2008	2010 / 2010	-
<b>Bulgaria</b>	-	-	-
<b>Cyprus</b>	2009	-	-
<b>Latvia</b>	2009	2013 / -	-
<b>Lithuania</b>	2010	-	-
<b>Slovak Rep.</b>	2010	-	-
<b>Malta</b>	2012	-	-

Table 8: Key dates of ESA enlargement

### Completed Enlargements:

12<sup>th</sup> ESA member state – Austria (1987)

1. Obtained *Associate Membership* in 1979.<sup>260</sup>
2. Joined ESA as a full *Member* in 1987.

13<sup>th</sup> ESA member state – Norway (1987)

1. Obtained *Associate Membership* in 1981.
2. Joined ESA as a full *Member* in 1987.

14<sup>th</sup> ESA member state – Finland (1995)

1. Obtained *Associate Membership* in 1987.
2. Cooperation Agreement was renewed in 1991 and 1993.<sup>261</sup>
3. Became ESA's 14<sup>th</sup> *Member State* in January 1995.

15<sup>th</sup> ESA member state – Portugal (2000)

1. Was involved in some of ESA's optional programmes through a bilateral agreement signed in 1996.<sup>262</sup>
2. Formally became a Member in November 2000.

16<sup>th</sup> ESA member state - Greece (2005)

1. Several cooperation agreement have been signed before accession (1994<sup>263</sup>, 2001<sup>264</sup>)
2. Formal application for accession to the convention in September 2003.<sup>265</sup>
3. Accession agreement signed in July 2004.<sup>266</sup>

<sup>260</sup> Poncelet, Jean-Pol, Anabelle Fonseca-Colomb, and Giulio Grilli. "Enlarging ESA? – After the Accession of Luxembourg and Greece." ESA Bulletin 120 (November 2004)

<sup>261</sup> *Ibid.*

<sup>262</sup> "Portugal becomes ESA's 15<sup>th</sup> Member State." 20 Nov. 2000. European Space Agency 05 Dec. 2013 <[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Portugal\\_becomes\\_ESA\\_s\\_15th\\_Member\\_State](http://www.esa.int/About_Us/Welcome_to_ESA/Portugal_becomes_ESA_s_15th_Member_State)>.

<sup>263</sup> "ESA/Greece Cooperation Agreement". 4 July 1994. European Space Agency 10 Dec. 2013

<[http://www.esa.int/esaCP/Pr\\_20\\_1994\\_p\\_EN.html](http://www.esa.int/esaCP/Pr_20_1994_p_EN.html)>

<sup>264</sup> "Greece signs special accord with ESA". 1 Feb. 2001.

European Space Agency 10 Dec. 2013

<[http://www.esa.int/esaCP/GGGC03KPEIC\\_index\\_0.html](http://www.esa.int/esaCP/GGGC03KPEIC_index_0.html)>

<sup>265</sup> "Agreement on Greece's accession to the ESA Convention signed". 19 July 2004. European Space Agency 10 Dec. 2013

<[http://www.esa.int/esaCP/SEMKWU4QWD\\_Benefits\\_0.html](http://www.esa.int/esaCP/SEMKWU4QWD_Benefits_0.html)>



4. Formally became a Member in March 2005.<sup>267</sup>

17<sup>th</sup> ESA member state - Luxembourg (2005)

1. Signed a cooperation agreement in September 2000.<sup>268</sup>
2. Formal application for accession to the convention in December 2003.<sup>269</sup>
3. Accession agreement signed in May 2004.<sup>270</sup>
4. Formally became a Member in June 2005.<sup>271</sup>

18<sup>th</sup> ESA member state - Czech Republic (2008)

1. Signed a cooperation agreement in 1996.<sup>272</sup>
2. Signed an ECS agreement in November 2003.<sup>273</sup>
3. Signed the PECS Charter in November 2004.<sup>274</sup>
4. Accession agreement signed in July 2008.<sup>275</sup>
5. Formally became a Member in November 2008.<sup>276</sup>

19<sup>th</sup> ESA member state - Romania (2011)

1. Several cooperation agreement have been signed (1992, 1999)<sup>277</sup>

2. Signed an ECS agreement in February 2006.<sup>278</sup>
3. Signed the PECS Charter in 2006.<sup>279</sup>
4. Accession agreement signed in January 2011.<sup>280</sup>
5. Formally became a Member in December 2011.<sup>281</sup>

20<sup>th</sup> ESA member state – Poland (2012)

1. Signed a cooperation agreement in January 1994.<sup>282</sup>
2. Signed an ECS agreement in April 2007.<sup>283</sup>
3. Signed the PECS Charter in April 2008.<sup>284</sup>
4. Was granted observer status in ESA's Council Meeting in June 2011.<sup>285</sup>
5. Became the 20th full member in November 2012.<sup>286</sup>

### Aspiring ESA Member States

#### ECS

#### Hungary

1. Signed a cooperation agreement in 1991.<sup>287</sup>
2. Signed an ECS agreement in April 2003.<sup>288</sup>

<sup>266</sup> *Ibid.*

<sup>267</sup> "New member states." European Space Agency 10 Dec. 2013  
<[http://www.esa.int/esaMI/About\\_ESA/SEMP936LARE\\_0.html](http://www.esa.int/esaMI/About_ESA/SEMP936LARE_0.html)>

<sup>268</sup> Poncelet, Jean-Pol, Anabelle Fonseca-Colomb, and Giulio Grilli. "Enlarging ESA? – After the Accession of Luxembourg and Greece." ESA Bulletin 120 (November 2004). p:49-53.

<sup>269</sup> "Luxembourg to sign agreement on accession to ESA Convention". 3 May 2004. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/esaCP/SEMXXE77ESD\\_index\\_0.html](http://www.esa.int/esaCP/SEMXXE77ESD_index_0.html)>

<sup>270</sup> *Ibid.*

<sup>271</sup> "New member states." European Space Agency 10 Dec. 2013  
<[http://www.esa.int/esaMI/About\\_ESA/SEMP936LARE\\_0.html](http://www.esa.int/esaMI/About_ESA/SEMP936LARE_0.html)>

<sup>272</sup> "Czech Republic accedes to the ESA Convention". 8 July 2008. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Czech\\_Republic\\_accedes\\_to\\_the\\_ESA\\_Convention](http://www.esa.int/About_Us/Welcome_to_ESA/Czech_Republic_accedes_to_the_ESA_Convention)>

<sup>273</sup> "Czech Republic becomes second ESA European Cooperating State". 30 Nov. 2004. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/esaCP/SEMES8XJD1E\\_Benefits\\_0.html](http://www.esa.int/esaCP/SEMES8XJD1E_Benefits_0.html)>

<sup>274</sup> *Ibid.*

<sup>275</sup> "Czech Republic accedes to the ESA Convention". 8 July 2008. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Czech\\_Republic\\_accedes\\_to\\_the\\_ESA\\_Convention](http://www.esa.int/About_Us/Welcome_to_ESA/Czech_Republic_accedes_to_the_ESA_Convention)>

<sup>276</sup> "New member states." European Space Agency 10 Dec. 2013  
<[http://www.esa.int/esaMI/About\\_ESA/SEMP936LARE\\_0.html](http://www.esa.int/esaMI/About_ESA/SEMP936LARE_0.html)>

<sup>277</sup> "Romania accedes to ESA Convention". 20 Jan. 2011. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Romania\\_accedes\\_to\\_ESA\\_Convention](http://www.esa.int/About_Us/Welcome_to_ESA/Romania_accedes_to_ESA_Convention)>

<sup>278</sup> "Romania becomes third ESA European Cooperating State". 27 Feb. 2006. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/esaCP/SEM12HMVGJE\\_Benefits\\_0.html](http://www.esa.int/esaCP/SEM12HMVGJE_Benefits_0.html)>

<sup>279</sup> *Ibid.*

<sup>280</sup> "Romanian flag raised at ESA". 24 Jan. 2012. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Romanian\\_flag\\_raised\\_at\\_ESA](http://www.esa.int/About_Us/Welcome_to_ESA/Romanian_flag_raised_at_ESA)>

<sup>281</sup> *Ibid.*

<sup>282</sup> "ESA/Poland cooperation agreement". 28 Jan. 1994. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/esaCP/Pr\\_4\\_1994\\_p\\_EN.html](http://www.esa.int/esaCP/Pr_4_1994_p_EN.html)>

<sup>283</sup> "Poland becomes fourth ESA European Cooperating State". 4 May 2007. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Poland\\_becomes\\_fourth\\_ESA\\_European\\_Cooperating\\_State](http://www.esa.int/About_Us/Welcome_to_ESA/Poland_becomes_fourth_ESA_European_Cooperating_State)>

<sup>284</sup> "Poland and ESA sign the Plan for European Cooperating State (PECS)". 5 May 2008. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Poland\\_and\\_ESA\\_sign\\_the\\_Plan\\_for\\_European\\_Cooperating\\_State\\_PECS](http://www.esa.int/About_Us/Welcome_to_ESA/Poland_and_ESA_sign_the_Plan_for_European_Cooperating_State_PECS)>

<sup>285</sup> "ESA Council opens up to ten EU member states". 21 Nov. 2011. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/ESA\\_Council\\_opens\\_up\\_to\\_ten\\_EU\\_Member\\_States](http://www.esa.int/About_Us/Welcome_to_ESA/ESA_Council_opens_up_to_ten_EU_Member_States)>

<sup>286</sup> "ESA DG in European Space Directory 2012". 25 Apr. 2012. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/esaMI/DG/SEMPXCNW91H\\_2.html](http://www.esa.int/esaMI/DG/SEMPXCNW91H_2.html)>

<sup>287</sup> "Hungary and ESA sign PECS Agreement for another five years". 11 Nov. 2008. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/SPECIALS/PECS/SEMERT60A2G\\_0.html](http://www.esa.int/SPECIALS/PECS/SEMERT60A2G_0.html)>

3. Signed the PECS Charter in November 2003<sup>289</sup>, extended in November 2008<sup>290</sup>.
4. Was granted observer status in ESA's Council Meeting in June 2011.

#### Estonia

1. Signed a *cooperation agreement* in 2007.<sup>291</sup>
2. Signed an *ECS agreement* in November 2009.<sup>292</sup>
3. Signed the *PECS Charter* in September 2010.
4. Was granted *observer status* in ESA's Council Meeting in June 2011.

#### Slovenia

1. Signed a *cooperation agreement* in May 2008.<sup>293</sup>
2. Signed an *ECS agreement* in January 2010.<sup>294</sup>
3. Signed the *PECS Charter* in November 2010.
4. Was granted *observer status* in ESA's Council Meeting in June 2011.

#### Latvia

1. Signed a *cooperation agreement* in July 2009.<sup>295</sup>
2. Signed an *ECS Agreement* in March 2013
3. Was granted *observer status* in ESA's Council Meeting in June 2011.

<sup>288</sup> "Hungary and the Czech Republic sign Cooperating State agreements with ESA". 4 Dec. 2003. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/esaCP/SEM1TLUZJND\\_index\\_0.html](http://www.esa.int/esaCP/SEM1TLUZJND_index_0.html)>

<sup>289</sup> *Ibid.*

<sup>290</sup> "Hungary and ESA sign PECS Agreement for another five years". 11 Nov. 2008. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/SPECIALS/PECS/SEMERT60A2G\\_0.html](http://www.esa.int/SPECIALS/PECS/SEMERT60A2G_0.html)>

<sup>291</sup> "Estonia signs Cooperation Agreement with ESA". 26 June 2007. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Estonia\\_signs\\_Cooperation\\_Agreement\\_with\\_ESA](http://www.esa.int/About_Us/Welcome_to_ESA/Estonia_signs_Cooperation_Agreement_with_ESA)>

<sup>292</sup> "Estonia becomes fifth ESA European Cooperating State". 12 Nov. 2009. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Estonia\\_becomes\\_fifth\\_ESA\\_European\\_Cooperating\\_State](http://www.esa.int/About_Us/Welcome_to_ESA/Estonia_becomes_fifth_ESA_European_Cooperating_State)>

<sup>293</sup> "Slovenia signs Cooperation Agreement with ESA". 9 June 2008. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Slovenia\\_signs\\_Cooperation\\_Agreement\\_with\\_ESA](http://www.esa.int/About_Us/Welcome_to_ESA/Slovenia_signs_Cooperation_Agreement_with_ESA)>

<sup>294</sup> "Slovenia becomes sixth ESA European Cooperating State". 25 Jan. 2010. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/esaCP/SEM2BMRJR4G\\_index\\_0.html](http://www.esa.int/esaCP/SEM2BMRJR4G_index_0.html)>

<sup>295</sup> "Latvia signs Cooperation Agreement". 24 July 2009. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Latvia\\_signs\\_Cooperation\\_Agreement](http://www.esa.int/About_Us/Welcome_to_ESA/Latvia_signs_Cooperation_Agreement)>

#### Non-ECS

#### Bulgaria

1. Was granted *observer status* in ESA's Council Meeting in June 2011.
2. Is *discussing cooperation agreement*.<sup>296</sup>
3. Showed interest in joining ESA.<sup>297</sup>

#### Cyprus

1. Signed a *cooperation agreement* in August 2009.<sup>298</sup>
2. Was granted *observer status* in ESA's Council Meeting in June 2011.

#### Lithuania

1. Signed a *cooperation agreement* in October 2010.<sup>299</sup>
2. Was granted *observer status* in ESA's Council Meeting in June 2011.

#### Malta

1. Was granted *observer status* in ESA's Council Meeting in June 2011.
2. Signed a *cooperation agreement* in February 2012.<sup>300</sup>

#### Slovakia

1. Signed a *cooperation agreement* in April 2010.<sup>301</sup>
2. Was granted *observer status* in ESA's Council Meeting in June 2011.

<sup>296</sup> "ESA Council opens up to ten EU member states". 21 Nov. 2011. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/ESA\\_Council\\_opens\\_up\\_to\\_ten\\_EU\\_Member\\_States](http://www.esa.int/About_Us/Welcome_to_ESA/ESA_Council_opens_up_to_ten_EU_Member_States)>

<sup>297</sup> "Bulgaria Slated to Join European Space Community". 9 April 2009. Sofia News Agency 10 Dec. 2013  
<[http://www.novinite.com/view\\_news.php?id=102652](http://www.novinite.com/view_news.php?id=102652)>

<sup>298</sup> "Cyprus signs Cooperation Agreement". 1 Sept. 2009. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Cyprus\\_signs\\_Cooperation\\_Agreement](http://www.esa.int/About_Us/Welcome_to_ESA/Cyprus_signs_Cooperation_Agreement)>

<sup>299</sup> "Lithuania signs Cooperation Agreement". 12 Oct. 2010. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Lithuania\\_signs\\_Cooperation\\_Agreement](http://www.esa.int/About_Us/Welcome_to_ESA/Lithuania_signs_Cooperation_Agreement)>

<sup>300</sup> "Malta signs Cooperation Agreement". 23 Feb. 2012. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Malta\\_signs\\_Cooperation\\_Agreement](http://www.esa.int/About_Us/Welcome_to_ESA/Malta_signs_Cooperation_Agreement)>

<sup>301</sup> "Slovak Republic signs Cooperation Agreement". 4 May 2010. European Space Agency 10 Dec. 2013  
<[http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/Slovak\\_Republic\\_signs\\_Cooperation\\_Agreement](http://www.esa.int/About_Us/Welcome_to_ESA/Slovak_Republic_signs_Cooperation_Agreement)>



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