



# **SLOVAK SPACE STRATEGY 2030<sup>+</sup>**

**SPACE AS A CATALYST FOR GROWTH**

# Table of Contents

Executive Summary	4
Introduction	6
<b>1. Space activities in the global and European context</b>	<b>8</b>
1.1 Key EU strategic documents on space policy	10
1.2 Implementation of EU space activities	12
1.3 Support for EU space activities	13
1.4 European Space Agency	14
<b>2. Current status of space activities in the Slovak Republic</b>	<b>15</b>
2.1 Space research activities in Slovakia	15
2.1.1 Slovak Academy of Sciences	15
2.1.2 Universities	16
2.1.3 Slovak participation in the Horizon Europe	17
2.2 Industry	17
2.3 Cooperation of the Slovak Republic with ESA	18
2.4 SWOT analysis of the current conditions for the development of space activities in the SR	20
<b>3. Management of space activities in the SR</b>	<b>21</b>
3.1. Current state of management	21
3.2 Improvement of ministerial and supra-ministerial management of space activities	23
3.3 Development of national legislation	23
<b>4. Vision and goals for the development of space activities in the SR until 2030</b>	<b>24</b>
4.1 Research and education	24
4.2 Services for the public administration and the people	26
4.3 Development of the space industry	28
4.4 Security and defence	30
4.5 Popularisation of space activities	34
<b>5. Financing of Slovak space activities</b>	<b>36</b>
<b>6. Implementation and updating of the Strategy</b>	<b>37</b>
List of annexes	39

# Executive Summary

**The purpose of the Slovak Space Strategy 2030\* is to highlight the importance and strategic relevance of space activities in the Slovak Republic (SR) and to outline visions and goals for their development.**

In recent decades, the space sector has transformed from a pure research area to a catalyst for economic growth in several world economies. The Slovak Republic can use this potential to strengthen and diversify its industry. Due to their diversity, space activities provide various benefits in many other areas of society's life.

In the context of the current complex geopolitical situation, the defence and security aspects of space activities are becoming increasingly important, accompanied by efforts to maintain the peaceful uses of space.

As a major actor in this field, the European Union (EU) is currently strengthening its ambitious space programme and initiating measures which the SR needs to respond flexibly.

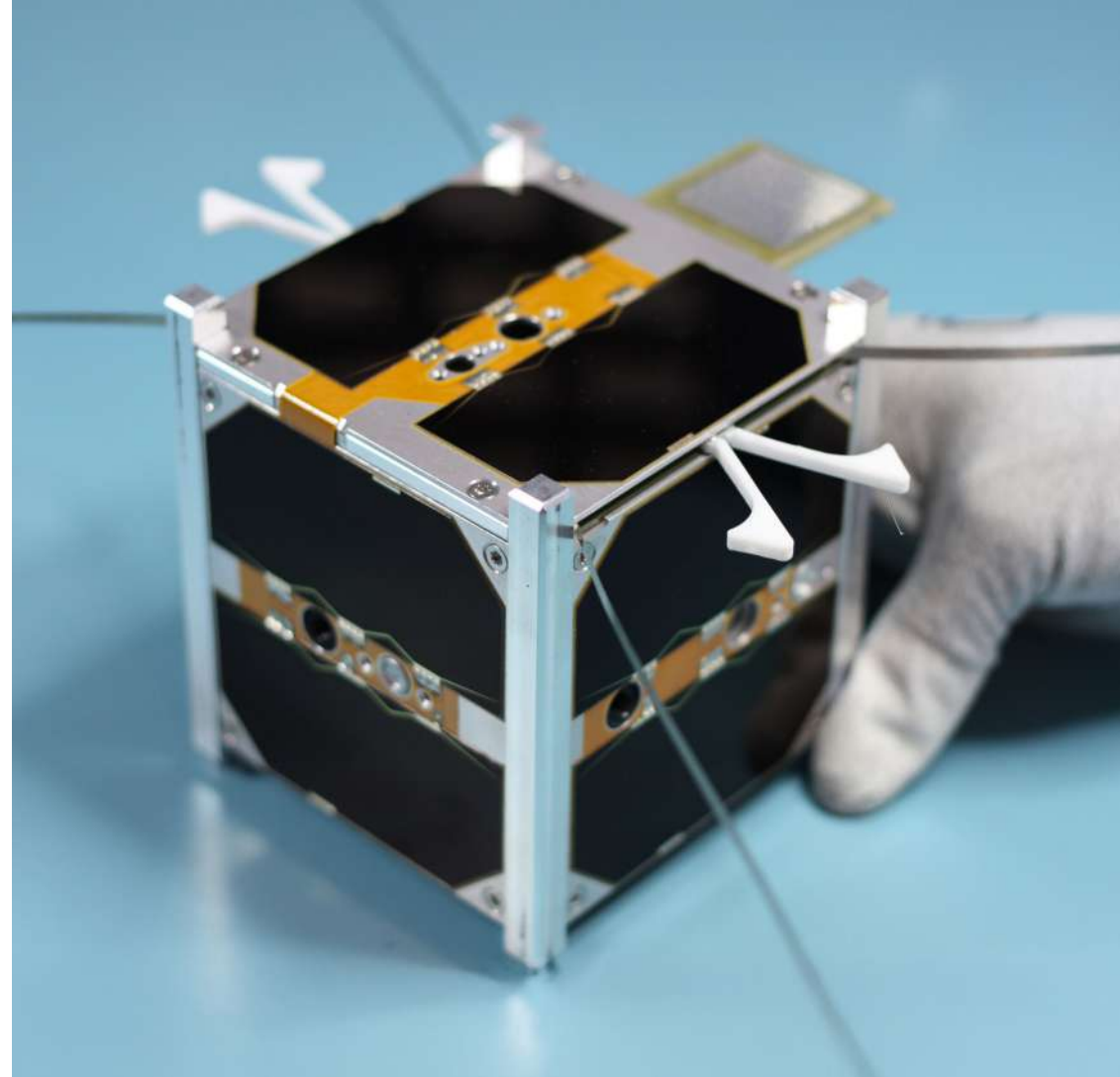
The Strategy briefly describes the importance of space activities in both the global and European context, as well as their current status in the Slovak Republic. As this is a highly cross-cutting area, the material defines the competences of the individual government departments and provides information on the current system of managing space activities in the Slovak Republic with a view to their

supra-ministerial management in the future.

Special attention is paid to the cooperation of the Slovak Republic with the European Space Agency (ESA), which is a key accelerator of the long-term development of Slovak space activities. Associate membership in ESA allows Slovak entities to participate directly in selected ESA tenders and also in the supply chains that are formed therein. This should accelerate the positive growth of the Slovak space ecosystem.

The Strategy outlines visions for the development of Slovak space activities in the following areas:

- **Research and education:** excellence in Slovak space research, education of qualified professionals for all areas of the space sector;
- **Services for state administration and population:** efficient use of European space systems data in state institutions, development and production of advanced equipment and applications for state administration, companies and citizens;
- **Development of the space industry:** a competitive space industry that will become a supplier of cutting-edge products and services as well as unique technological solutions for foreign markets;



- **Security and defence:** security of the Slovak Republic in the operational domain of space, effective peaceful use of the Union Space Programme by defence, security and rescue forces;
- **Popularisation of space activities:** awareness of the population of the importance of space activities for everyday life.

Sub-objectives and measures to support their achievement are also proposed. A special chapter is devoted to the financing of space activities in the Slovak Republic from budgetary and extra-budgetary sources, highlighting the need to increase the capacities dedicated to the implementation of the space agenda in all relevant ministries.

# Introduction

The Slovak Republic has a tradition in space research. With their wide range of scientific, technical, environmental, security, entrepreneurial and commercial applications, space activities represent a promising area for boosting economic growth. In order to maximise this potential, it will be necessary to urgently build space infrastructure in the Slovak Republic, to support the development of relevant areas and to ensure the sustainability of the development of space activities. In particular, cooperation with ESA, which Slovakia is an associate member of, is a key driver for the development of the Slovak space sector.

At the same time, it is necessary to reflect the growing importance of space for security and defence as well as environmental protection.

The main purpose of this Strategy is to set out the visions and objectives of Slovakia's space activities in individual areas and to propose the measures needed to meet them in the 2030 horizon, which will be updated if necessary. The individual measures will be set out in more detail in an action plan which will follow up on this Strategy.

The objectives contained in the European Union strategic documents, as set out in section 1.1, were taken into account in the development of the Strategy.



The Strategy was developed by the Ministry of Education, Research, Development and Youth of the Slovak Republic (MoERDY SR). However, as space activities are cross-cutting and involve several ministries, the following ministries have contributed to the preparation of this Strategy within their respective competences: Ministry of Transport of the SR (MoT SR), Ministry of Economy of the SR (MoE SR), Ministry of Investments, Regional Development and Information of the SR (MoIRDI SR), Ministry of Culture of the SR (MoC SR), Ministry of Defence of the SR (MoD SR), Ministry of Agriculture and Rural Development of the SR (MoARD SR), Ministry of Interior of the SR (MoI SR), Ministry of Foreign and European Affairs of the SR (MoFEA SR), Ministry of Environment of the SR (MoEn SR), Nuclear Regulatory Authority of the Slovak Republic (NRA SR), National Security Authority (NSA), Slovak Academy of Sciences (SAS) and through the Slovak Rectors' Conference also relevant universities.

# Space activities in the global and European context

Space-related activities are currently one of the most dynamically developing areas worldwide. The space sector has undergone a significant evolution over the last few decades: from a pure research area towards a growing economy, while the following trends can be observed:

- With their wide range of scientific, technical, environmental, security, business and commercial applications, space activities represent an extremely **promising area for economic growth**.
- Space research and industry bring new opportunities that **will set technological trends** in the upcoming decades, such as big data, artificial intelligence or digitisation.
- Given the dynamically evolving geopolitical situation, **security and defence aspects** of space activities are also coming to the fore.
- The role of space infrastructure in **protecting the environment**, combating climate change and dealing with natural disasters is coming to the fore.
- In addition to the public sector and large investors, **private investors are**

**increasingly interested in investing in space activities.**

- **There is a growing intensity of linking established industrial ecosystems with emerging space industrial ecosystems.**
- There is a growing **public interest in and awareness of space activities.**
- The development of **New Space and Space 4.0** is increasing **the connectivity between the scientific community, industry, government and society.**

The term **“New Space”** refers to the **commercialisation of the space sector**, in particular the increased investment by private actors, the growing number of public-private partnerships, new business models and procurement strategies. Private actors have an important role to play in this new ecosystem and aim to make space activities a business that operates independently of political objectives.

The term **“Space 4.0”** refers to a new, increasingly connected and participatory space age.



**The value of the global space economy** currently stands at around **€ 400 billion**<sup>1</sup> (latest available data from 2022), with various forecasts predicting further dynamic growth in the upcoming decades.

The average annual growth in the sector is almost twice that of the world economy as a whole<sup>2</sup>, while according to international analyses, each euro invested in the space sector generates on average a net economic benefit of around € 2 – 5 and an overall economic and social benefit of € 6 – 10<sup>3,4</sup>.

The global space sector employs approximately 1 million people (latest available data from 2017).<sup>5</sup>

Today, **space is becoming extremely important for security and defence**. This is highlighted by the **North Atlantic Treaty Organisation (NATO) document “NATO Overarching Space Policy”**<sup>6</sup> which was endorsed by the ministers of the Alliance’s member states in 2019. Subsequently, space was declared as NATO’s next operational domain. NATO’s Strategic Concept, adopted at the Madrid Summit in 2022<sup>7</sup>, underscores the central importance of space to the alliance’s deterrence and defence.

<sup>1</sup> United Nations (2023): Our Common Agenda. Policy Brief 7. For All Humanity – the Future of Outer Space Governance. [indonesia.un.org/sites/default/files/2023-07/our-common-agenda-policy-brief-outer-space-en.pdf](https://indonesia.un.org/sites/default/files/2023-07/our-common-agenda-policy-brief-outer-space-en.pdf)

<sup>2</sup> [www.eib.org/attachments/thematic/future\\_of\\_european\\_space\\_sector\\_en.pdf](https://www.eib.org/attachments/thematic/future_of_european_space_sector_en.pdf), page 7

<sup>3</sup> OECD: The Space Economy at a Glance 2011, page 11

<sup>4</sup> Anniversary Shows Us that NASA and Space Exploration are Worth Their Costs – UT News (utexas.edu)

<sup>5</sup> OECD (2019): The Space Economy in Figures. How Space Contributes to the Global Economy. [www.oecd-ilibrary.org/sites/c5996201-en/1/2/2/index.html](https://www.oecd-ilibrary.org/sites/c5996201-en/1/2/2/index.html)

<sup>6</sup> NATO - Official text: NATO’s overarching Space Policy, 17-Jan-2022

<sup>7</sup> NATO - PDF: NATO 2022 Strategic Concept (in English, French and other languages)

## 1.1 Key EU strategic documents on space policy

The EU is one of the most important actors in the space sector. The EU strategically manages<sup>8</sup> developments in this field and, in cooperation with ESA, formulates them into programmes which all member states of both institutions can participate in.

**The Space Strategy for Europe<sup>9</sup>** sets out the following main objectives:

- provide new services for the EU citizens and economy,
- boost the global competitiveness of the European space sector,
- strengthen the Europe's autonomous access to and use of space in a safe and secure environment,
- strengthen the EU's role as a global actor,
- promote international cooperation.

**The Union Space Programme<sup>10</sup>** (USP) consists of the following components:

- **Galileo** – an autonomous civil global navigation satellite system (GNSS) under civil control, which consists of a constellation of satellites, centres and a global network of stations on the ground, offering positioning, navigation and timing services and integrating the needs and requirements of security.
- **European Geostationary Navigation Overlay Service (EGNOS)** – a civil regional satellite navigation system under civil control which consists of centres and stations on the ground and several transponders installed on

geosynchronous satellites and which augments and corrects the open signals emitted by Galileo and other GNSSs, inter alia for air-traffic management, for air navigation services and for other transport systems.

Galileo and EGNOS provide positioning, navigation and timing services that can be used by public and private entities in Europe and worldwide.

- **Copernicus – an operational, autonomous, user-driven, civil Earth observation system** is currently the world's largest comprehensive environmental monitoring programme. It operates 8 Sentinel satellites and provides global, publicly available and open satellite and other environmental and security data.

The programme's most significant benefit is the free and open access to up-to-date, high- and medium-resolution satellite data at high global imagery frequency.

- **GOVSATCOM** (Governmental Satellite Communications) is a satellite communications service under civil and governmental control.

It is a secure government satellite communications system consisting of a terrestrial and a satellite segment, designed for security users to exchange classified and unclassified information, and it integrates European quantum infrastructure in its structures.

The objective of GOVSATCOM is to provide affordable, reliable, guaranteed, secure satellite telecommunications services to EU and Member State public administration authorities.

- **IRIS<sup>2</sup>** – Infrastructure for Resilience, Interconnectivity and Security by Satellite.

IRIS<sup>2</sup> aims to establish a satellite constellation and achieve strategic autonomy, cyber resilience and proactive and reactive defence against cyber threats. The main objective is to create a global, multi-orbital and secure architecture that will build on GOVSATCOM and EuroQCI<sup>11</sup>

(European Quantum Communication Infrastructure Initiative).

- **SSA/SST**; SSA – Space Situational Awareness; SST – Space Surveillance and Tracking System).

**SSA** is a holistic approach, including comprehensive knowledge and understanding of the main space hazards, including collisions between space objects, fragmentation and re-entry of space objects into the atmosphere, space weather and near-Earth objects;

**SST** is one of the components of SSA. SST services include a network of ground and space-based sensors capable of exploring and tracking space

objects, together with processing capabilities aimed at providing data, information and services on space objects orbiting the Earth.

**The Strategic Compass for Security and Defence<sup>12</sup>** identifies space as a strategic domain and is the EU's ambitious action plan to strengthen the EU's security and defence policy by 2030.

**The EU Space Strategy for Security and Defence<sup>13</sup>** focuses on a wide range of measures to raise security awareness of the space domain, including the protection and resilience of space systems and components, improving the joint response to space threats and developing cooperation to improve the use of space for security and defence purposes.

**The European Defence Industrial Strategy (EDIS)<sup>14</sup>** together with the draft European Defence Industry Programme (EDIP) are intended to help the defence industry to adapt to the realities of the return of conventional military conflict to Europe in the long term and to move from the current emergency mode to defence preparedness. EDIS is based on the EU's need to ensure the availability of defence industry products in the required quantities to EU Member States even in times of crisis, but at the same time to ensure the timely development and delivery of state-of-the-art core capabilities in the coming years.

<sup>8</sup> A more detailed description of the main EU legislative acts in the field of space can be found in the Annex 1.

<sup>9</sup> [eur-lex.europa.eu/legal-content/SK/TXT/?uri=COM%3A2016%3A705%3AFIN](https://eur-lex.europa.eu/legal-content/SK/TXT/?uri=COM%3A2016%3A705%3AFIN)

<sup>10</sup> <https://eur-lex.europa.eu/eli/reg/2021/696/oj?locale=en>

<sup>11</sup> [European Quantum Communication Infrastructure Initiative \(EuroQCI\) | Shaping Europe's digital future \(europa.eu\)](#)

<sup>12</sup> [data.consilium.europa.eu/doc/document/ST-7371-2022-INIT/sk/pdf](https://data.consilium.europa.eu/doc/document/ST-7371-2022-INIT/sk/pdf)

<sup>13</sup> [EU Space Strategy for Security and Defence \(europa.eu\)](#)

<sup>14</sup> [defence-industry-space.ec.europa.eu/eu-defence-industry/edis-our-common-defence-strategy\\_en](https://defence-industry-space.ec.europa.eu/eu-defence-industry/edis-our-common-defence-strategy_en)

## 1.2 Implementation of EU space activities

The coordination of the USP and other EU space activities is carried out by the European Commission (EC) and their implementation is ensured by EUSPA, ESA, EU agencies and other mandated organisations. Here is an overview of the most important ones:

- **EUSPA<sup>15</sup> (European Union Agency for the Space Programme)** is an EU agency whose main mission is to **implement the USP** and provide reliable, safe and secure space-related services, maximising their socio-economic benefits for the European society and business. By fostering the development of innovative and competitive sectors, EUSPA promotes innovation-driven growth in the European economy and contributes to the security of EU citizens, its Member States and at the same time contributes to strengthening the EU's strategic autonomy.
- **EUMETSAT<sup>16</sup> (European Organisation for the Exploitation of Meteorological Satellites)** is a European agency that operates satellites to monitor weather, climate and the environment. Slovakia, represented by the Slovak Hydrometeorological Institute<sup>17</sup>, has been a member since 2006.
- **JRC<sup>18</sup> (Joint Research Centre)** is a service of the European Commission (EC). The JRC's mission is to provide indepen-

dent, evidence-based scientific and technical support to the EC.

- **EEA<sup>19</sup> (European Environment Agency)** is an EU agency that supplies information and data to support the EU's environmental and climate goals.
- **Frontex<sup>20</sup> (European Border and Coast Guard Agency)** is an EU agency that supports the EU Member States and countries in the Schengen area in managing the EU's external borders and fighting cross-border crime.
- **SST Partnership EU<sup>21</sup>** focuses on the implementation of the SST. It is currently made up of institutions representing 15 EU Member States. These have the infrastructure that together forms the SST system which is composed of sensors that observe space objects on Earth and in space. The system is complemented by equipment that processes the information transmitted by the sensors.
- **EU SatCen<sup>22</sup> (European Union Satellite Centre)** is a European agency supporting the EU decision-making process in the context of the EU's common foreign and security policy by providing services based on the use of space assets and accompanying data, including satellite and aerial imagery, as well as related services.

## 1.3 Support for EU space activities

In addition to the USP, the EU supports space activities through other programmes and instruments. Here are the most relevant ones:

**EDF<sup>23</sup> (European Defence Fund)** supports the cooperation between industry and research institutions in the research and development of state-of-the-art defence technological equipment. The focus is on breakthrough innovative solutions and cooperation with SMEs.

**The EU Framework Programme** for Research and Innovation for 2021 – 2027, Horizon Europe<sup>24</sup>, supports research and innovation activities in space, mainly under the Pillar 2 in the Cluster 4 “Digital, Industry and Space”, but also

in some other parts such as the Pillar 3 “European Innovation Council”.

**The InvestEU Programme<sup>25</sup>** also provides support for some strategically important activities in space, notably by mobilising public and private investment and using financial instruments.

**CASSINI<sup>26</sup>** (Space Entrepreneurship Initiative) is the EC's support mechanism across all components of the USP. It covers activities throughout the business development cycle from business idea through market entry and growth. It is the largest European instrument to support start-ups.

## 1.4 European Space Agency

- **ESA<sup>27</sup>** is an international intergovernmental organisation established in 1975 for the purpose of space exploration and the development of space technologies for peaceful purposes. Within the USP, ESA cooperates with the EU on the Galileo and Copernicus programmes.
- Through **ESA's optional programmes<sup>28</sup>** and the **RPA (Requesting Party Activities)** programme, ESA member states can carry out and implement activities in all space domains of interest to them.

<sup>15</sup> [www.euspa.europa.eu](http://www.euspa.europa.eu)

<sup>16</sup> [www.eumetsat.int](http://www.eumetsat.int)

<sup>17</sup> [EUMETSAT - SHMU \(shmu.sk\)](http://EUMETSAT-SHMU(shmu.sk))

<sup>18</sup> [commission.europa.eu/about-european-commission/departments-and-executive-agencies/joint-research-centre\\_sk](http://commission.europa.eu/about-european-commission/departments-and-executive-agencies/joint-research-centre_sk)

<sup>19</sup> [European Environment Agency's home page \(europa.eu\)](http://European Environment Agency's home page (europa.eu))

<sup>20</sup> [www.frontex.europa.eu](http://www.frontex.europa.eu)

<sup>21</sup> [EU SST - EU Space Surveillance and Tracking](http://EU SST - EU Space Surveillance and Tracking)

<sup>22</sup> [SatCen - European Union Satellite Centre \(europa.eu\)](http://SatCen - European Union Satellite Centre (europa.eu))

<sup>23</sup> [European Defence Fund \(EDF\) \(europa.eu\)](http://European Defence Fund (EDF) (europa.eu))

<sup>24</sup> [Cluster 4: Digital, Industry and Space](http://Cluster 4: Digital, Industry and Space)

<sup>25</sup> [InvestEU Programme \(europa.eu\)](http://InvestEU Programme (europa.eu))

<sup>26</sup> [Space Entrepreneurship Initiative - CASSINI - European Commission \(europa.eu\)](http://Space Entrepreneurship Initiative - CASSINI - European Commission (europa.eu))

<sup>27</sup> [www.esa.int](http://www.esa.int)

<sup>28</sup> Further information on the ESA optional programmes can be found in the Annex 2

# Current status of space activities in the Slovak Republic

## 2.1 Space research activities in Slovakia

Slovakia has a long tradition in space research<sup>29</sup>. Since the late 1960s, Slovak scientists have been involved in the international Intercosmos project and have achieved significant success in many other projects at the national, European and international level. Here are only selected examples from the current activities of the relevant institutes of the Slovak Academy of Sciences and Slovak universities.

### 2.1.1 Slovak Academy of Sciences

Participating in major scientific projects, retaining top scientists or attracting talent requires a functioning ecosystem which the Slovak Academy of Sciences is also a part of. It has been effectively involved in building space activities in Slovakia through the activities of its institutions for more than 80 years.

- **The Institute of Experimental Physics of the Slovak Academy of Sciences** is mainly dedicated to the study of cosmic rays, solar wind and the Earth's magnetosphere using satellite data. It

provides continuous measurements of cosmic rays using a neutron monitor at the high mountain observatory on the peak of Lomnický štít. Since its foundation, it has participated in many international space satellite experiments. In recent years, it has contributed to ESA's **Double Star, Rosetta, BepiColombo and JUICE** space missions in collaboration with ESA member states.

In cooperation with local universities, private companies and the Slovak Investment and Trade Development Agency (SARIO), the Institute is involved in the Eastern Slovak Space Cluster platform, which is being established in Košice. The aim of this platform is effective cooperation in the form of bringing together and linking stakeholders involved in research and development, commercial or popularisation activities in the field of space technologies. The cluster also plans to create an ecosystem to support the emergence of new innovative start-ups delivering new

<sup>29</sup> The first observation of a launched space object took place as early as in 1957 and the first space observations from the observatory at Skalnaté pleso as early as in 1943.



products and services through space technologies. The institute is actively involved in the **Spaceport\_SK**<sup>30</sup> incubation programme, which was established in collaboration with university incubators, investors and private sector partners.

- Since its establishment, **the Astronomical Institute of Slovak Academy of Sciences** has been significantly involved in the European-wide research of the Sun by using its own unique instruments located in the observatory on the peak of Lomnický štít and by using data from satellite observations. It also participates in the European Solar Telescope (EST) project. The Institute's activities also include the study of stellar physics and exoplanet research using its own telescope and satellite data from various international missions. In the field of asteroid and comet research, the main focus is on near-Earth objects. In cooperation with the Institute of Experimental Physics of the Slovak Academy of Sciences and the Pavol Jozef Šafárik University in Košice, it participated in the establishment of the **Centre for Space Research: Space Weather Effects**.
- **The Institute of Materials and Machine Mechanics of the Slovak Academy of Sciences** carries out the research and development of new advanced materials based on non-ferrous metals and focuses on solving a wide and complex range of related problems. The Institute is also studying the effect of gravity on the formation of structures in titanium and aluminium alloys in the

framework of the ESA project.

- As part of its international activities, **the Institute of Geography of the Slovak Academy of Sciences** participates in the **URBAN Atlas Project** to provide access to detailed land use maps for nearly 800 functional urban areas across Europe, as well as tree and street maps, building block height measurements and population estimates.
  - The Slovak Academy of Sciences publishes a detailed summary of its scientific work in the space sector in the bi-annual Report on Space Research in Slovakia which is published on [nccospar.saske.sk](http://nccospar.saske.sk).
- ### 2.1.2 Universities
- **The Comenius University in Bratislava – Faculty of Mathematics, Physics and Informatics, Department of Nuclear Physics and Biophysics** has been working for a long time on research projects on the interaction of cosmic rays with space objects, the atmosphere and the Earth's surface. Programs have been developed in the framework of these activities to study the production of cosmogenic nuclides and gamma rays from the surface of planets and asteroids.
  - **The Comenius University in Bratislava – Department of Astronomy, Earth Physics and Meteorology, Division of Astronomy and Astrophysics** studies the physical and dynamical properties of the space debris population that threatens the space infrastructure using

its 70-cm telescope at the Astronomical and Geophysical Observatory in Modra. It also studies the population of small solar system bodies, meteoroids and asteroids through the AMOS global network, fully developed in Slovakia, in collaboration with the ESA Meteor Research Group.

- **The Comenius University in Bratislava – Faculty of Natural Sciences in collaboration with the Faculty of Science of the Pavol Jozef Šafárik University in Košice** carried out measurements of rodent cardiovascular rhythms under hypergravity conditions.
- **The Technical University in Košice – Faculty of Aeronautics** carried out training of pilots, later cosmonauts (Ivan Bella and his substitute Michal Fulier). The Faculty of Aeronautics is involved in the research on gamma-ray burst detection through the GRBAI-pha nanosatellite, a precursor to the planned fleet of 18 CAMELOT nanosatellites. The Faculty has built a Ground Control Centre for the satellites.
- **The University of Žilina** has successfully participated in the project of the first Slovak satellite **skCUBE**.

## 2.2 Industry

There are currently more than **46 companies directly involved in space activities** in Slovakia. Of these, 19 are active in the downstream sector (Earth observa-

- **The Slovak University of Technology in Bratislava**, Faculty of Electrical Engineering and Information Technology is dedicated to the development of cutting-edge space technologies such as information technology, robotics, mechatronics, physics, as well as electronics and photonics. The Department of Surveying of the Faculty of Civil Engineering of the Slovak University of Technology is dedicated to radar interferometry and measurement of the Earth's gravitational field.
- **The Technical University of Košice, the University of Žilina and the Slovak University of Technology in Bratislava** are actively involved in the Spaceport\_SK incubation programme which gives students the opportunity to create space startups.

### 2.1.3 Slovak participation in the Horizon Europe

In the EU Framework Programme for Research and Innovation 2021 – 2027, Horizon Europe, Cluster 4: “Digital, Industry and Space”, Slovak organisations have so far participated in the calls a total of eight times. Only one Slovak applicant has been successful so far<sup>31</sup>.

tion, navigation systems) and 27 in the upstream sector (satellite components, launch vehicle components, ground segment, telecommunications, space security,

<sup>30</sup> Spaceport\_SK - Slovak Space Office

<sup>31</sup> According to the data of the Horizon Europe National Office as of 13 March 2024

cybersecurity, biotechnology, mission planning and testing, manufacturing solutions, materials engineering, training and consulting).

Slovak companies are e.g. involved in the **development and production of satellite components**. Many companies use the **results of space research, e.g.** by creating **applications using satellite data in transport, agriculture, energy or environmental protection**. Unique competences are also emerging in new areas such as **the use of advanced materials, cybersecurity solutions, artificial intelligence or blockchain technology**. The Slovak space industry is mainly represented in the Bratislava and Košice regions, followed by the Trnava and Žilina regions.<sup>32</sup>

**The space economy represents a set of new markets representing promising high-tech applications for Slovak companies across sectors.** Slovak companies

are currently increasingly more interested in engaging in the space economy, **with Slovakia's strengths in the space area reflecting the existing focal sectors of the Slovak economy**. Strong initial sectors of the Slovak economy for spin-in<sup>33</sup> into the space economy are areas such as automotive, mechanical engineering, electrical engineering, information and communication technologies, or research and development of materials, armaments and defence.

In recent years, the proportion of firms carrying out projects involving international partners has increased significantly, which increases their chances of finding a foothold on the European market. Several of the companies are involved in activities aimed at building new start-ups and working with young talent (Spaceport\_SK incubation programme, hackathons, lectures and discussions).

## 2.3 Cooperation of the Slovak Republic with ESA

A key accelerator for a long-term development of Slovak space activities is the cooperation with the European Space Agency.

Slovakia's cooperation with the ESA started in 2010 on the basis of a **Cooperation Agreement** which enabled the

establishment of first contacts, assessment of Slovakia's capabilities and potential and exchange of information. In 2015, the **European Cooperating State Agreement between the Slovak Republic and the European Space Agency** and its financial implementation plan, the so-called PECS Charter, were signed, based on which Slo-



vakia participated in the **PECS – Plan for European Cooperating States** programme – in 2016 – 2022.

During the PECS period (under PECS calls, top-down calls<sup>34</sup> and contract completions), a total of **68 projects**<sup>35</sup> were implemented, involving 35 entities (including 20 companies).

The total financial contribution of the Slovak Republic to the ESA for the PECS period amounted to EUR 14.5 million. Of this amount, approximately 80 % returned to Slovakia in the form of contracts for exclusively Slovak entities.

**The cooperation with the ESA has seen a shift from research projects to innovative projects with a higher TRI<sup>36</sup>, has enabled the linking and deeper cooperation of individual actors** (academia, industry, R&D institutions, etc.) and the internationalisation of Slovak institutions.

PECS solutions for cutting-edge space research projects have contributed to the development and diversification of SMEs and the emergence of start-ups. Their results have fostered the emergence of innovative solutions and product creation in space software, hardware and space applications.

**Slovakia has been an associate member of the ESA since 13 October 2022.** Associate membership in the ESA allows Slovak entities to participate directly in selected ESA optional programmes and tenders, as well as in the supply chains they form.

The ESA also implements the **RPA programme** on a bilateral basis in the Slovak Republic. The programme is intended exclusively for Slovak entities to support the building of space infrastructure and the improvement of capabilities in the different domains of ESA's activities. The RPA programme takes into account the needs of the local ecosystem development and the building of a national space infrastructure in Slovakia.

This should accelerate the positive growth of the Slovak space ecosystem, i.e. the development of space infrastructure and personnel capacities.

Slovakia should remain an associate member of the ESA until 2029. Thereafter, it will be necessary to consider, on the basis of a detailed analysis, whether Slovakia will become a full member of the ESA or continue its cooperation as an associate member.

<sup>32</sup> New Space Industry Report – SARIO 2023

<sup>33</sup> Spin-in: attraction/entry of technology firms active in the terrestrial/ground sectors into the space economy, using their relevant technological competences and knowledge gained from previous activities in the terrestrial sectors. As a rule, this is an extension of the company's field of activity (sectoral diversification).

<sup>34</sup> Further information on the top-down calls is provided on the page 6 in the Annex 3

<sup>35</sup> A list of successful Slovak projects in PECS calls and their analysis can be found in the Annex 3

<sup>36</sup> Technology readiness level/ level of technological maturity (readiness) of projects

## 2.4 SWOT analysis of the current conditions for the development of space activities in the SR

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Tradition in space research</li> <li>• Growing interest in space also from the industry perspective</li> <li>• Geographical location of the country and especially the capital city with close proximity to Austria, Hungary and the Czech Republic (ESA members)</li> <li>• Good knowledge base and innovation potential</li> <li>• Synergies with many (terrestrial/ground) thriving sectors</li> <li>• Progressive diversification of existing sectors</li> <li>• Stable partnerships in the sector</li> <li>• Associate Membership of the Slovak Republic in the ESA</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of organisational, material and personnel capacities in the relevant ministries</li> <li>• Lack of capacity to respond flexibly to European initiatives</li> <li>• Lack of national supra-ministerial structure coordinating the space activities of the Slovak Republic</li> <li>• Lower interest in STEM education</li> <li>• Little experience with the preparation and coordination of space projects</li> <li>• Untapped potential for participation in optional programmes under the ESA associate membership</li> <li>• Limited number of educational programmes in the space segment</li> <li>• Challenging commercialisation of (upstream) technologies</li> <li>• Low attractiveness for private investors</li> <li>• Insufficient funding of science, research and innovation at the national level and high dependence on public funding</li> <li>• Low rate of raising awareness of the importance of space activities</li> <li>• Difficult availability of skilled labour</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• Fostering the growth of the knowledge economy</li> <li>• Involvement of the Slovak Republic in the supply chains of strategic European projects and infrastructures</li> <li>• Opportunity to build industry with a high added value, i.e. economic benefit for Slovakia</li> <li>• Support for innovative companies and spin-off potential from science and research</li> <li>• Involvement in transnational consortia and international cooperation</li> <li>• Contributing to the achievement of European independence in space technologies and related services</li> <li>• Opportunity for Slovak experts, especially young people, to work actively in European and global institutions</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing competition</li> <li>• Outflow of skilled labour, technology companies and innovation potential</li> <li>• Lagging behind in the knowledge economy and research</li> <li>• Lack of institutional and private investors, insufficient quality of cooperation between academia, industry and state administration in the field</li> <li>• Growing danger of hybrid threats</li> <li>• Educational system is lagging behind the needs of practice</li> </ul>

# Management of space activities in the SR

## 3.1 Current state of management

The responsibility for space activities in the Slovak Republic is shared by several ministries:

- **The MoERDY SR, which coordinates space activities in the Slovak Republic**, is responsible for the cooperation of the Slovak Republic with the EU in the field of space at the political level, including EUSPA, within the UN – COPUOS, and for bilateral cooperation with the ESA.
- **MoT SR** is responsible for the Galileo/EGNOS agenda.
- The **MoEn SR** is responsible for the Copernicus agenda, cooperating also with the **MoERDY SR** and the **MoARD SR**.
- The GOVSATCOM/IRIS<sup>2</sup> agenda falls under the competence of the **MoI SR**.
- The international-legal and security-political aspects of the use of space are the responsibility of the **MoFEA SR**.
- Cooperation with the EU and NATO in the field of security is the responsibility of the **MoD SR** and the **MoFEA SR**.
- The agenda related to the development of the space industry and space

industrial policies falls under the competence of the **MoE SR**.

- In the field of space policy implemented in the Slovak Republic, the **NSA, MoIRDI SR and the Ministry of Finance (MoF SR)** can be considered as very important and specific authorities, as they operate cross-cuttingly across all components of the USP. The NSA is responsible for the areas of cybersecurity and cryptographic protection of information, the MoIRDI SR plays a key role in the area of digitisation and the MoF SR provides financial resources in the implementation of space policy objectives.
- The space programme and the implementation of space projects are often based on the implementation of nuclear technologies (e.g. space reactors) and nuclear materials. The institution that ensures the exercise of state supervision over the nuclear safety of nuclear installations as well as over nuclear materials is the **Nuclear Regulatory Authority of the Slovak Republic**. The involvement of the individual authorities in the different components of the USP can be illustrated as follows:

	COPERNICUS	GALILEO / EGNOS	GOVSATCOM/IRIS2	SSA / SST
MoI SR	●	●	●	●
MoFEA SR		●	●	●
MoH SR		●	●	
MoEn SR	●	●	●	●
MoARD SR	●			
MoT SR	●	●	●	
MoD SR	●	●	●	●
MoE SR	●	●	●	●
MoF SR	●	●	●	●
MIRDI SR	●	●	●	●
MoERDY SR	●	●	●	●
NSA	●	●	●	●

Cross-cutting cooperation is performed within the framework of **the Commission for Space Activities in the Slovak Republic**, which is an advisory body to the Minister of Education, Research, Development and Youth of the Slovak Republic. The Commission is composed of representatives of the relevant ministries and has its own advisory bodies: the Science Council and the Business Chamber.

On 1 January 2021, **the Space Office (Slovak Space Office)** was established by the Government Resolution No. 635/2020 at the MoERDY SR to coordinate the political and industrial space agenda of the Slovak Republic.

The competences **of the political component of the Space Office at the MoERDY SR** include cooperation at the international and national political and official level, bilateral cooperation with the ESA, as well as coordination of space policies and activities **in relation to the EU** (EC, Council of the EU, EUSPA) and with the **UN – COPUOS** (The United Nations

Committee on the Peaceful Uses of Outer Space).

In the same year the Space Office started cooperating with the **Slovak Investment and Trade Development Agency (SARIO) on the basis of a agreement, thus creating an industrial section of the Space Office at SARIO.**

By contractual relationship the MoERDY SR delegated to SARIO a part of the activities related to the implementation of the space agenda in the industrial sector, in particular the provision of support for the development of the industrial space sector and relevant international partnerships, including educational and popularisation activities.

Draft strategic and conceptual documents, legislative intentions and proposals for general binding regulations related to research, development and innovation in the field of space are submitted to **The Slovak Government Council for Science, Technology and Innovation.**

### 3.2 Improvement of ministerial and supra-ministerial management of space activities

As the space agenda is highly cross-cutting, its implementation requires **institutional frameworks** to be provided in the ministries concerned, which will be derived from the scope of the agenda or from the responsibility for selected parts of the space programme and related European and national legal acts. Such institutional frameworks would enable central government bodies to perform tasks that they can currently only perform to a limited extent due to a lack of staff. These include in particular the following activities: implementation of international and European legislative acts in their internal structures, drafting of legislative acts at the national level, coordination of relevant activities and cooperation at the national and international level, including cooperation with academia, universities and the private sector. The above-mentioned ministries also represent the interests of the SR in the individual components of the USP in the EU structures and implement EU legal acts resulting from their space policy agenda. The improvement of these

activities will contribute significantly to the building of the Slovak space ecosystem, which will be beneficial for the development of the competitiveness of the economy as well as for the improvement of everyday life of the people. In view of the extremely fast growing number and diversity of space activities, the possibility of establishing a **supra-ministerial body with competences for the coordination of space activities** in the Slovak Republic will be considered, following the example of some EU countries. At the same time, it would be advisable to maintain continuity and further positive development of the activities carried out in the implementation part of the agenda of individual ministries. The implementation activities currently carried out by SARIO should be formally anchored in the MoE SR, while they would continue to be carried out by the relevant agency of this ministry.

**In the long term, establishment of an independent space agency is a possible solution.**

### 3.3 Development of national legislation

As a party to the UN international conventions on cosmic<sup>37</sup> law, the Slovak Republic has a number of obligations towards the UN and other parties to such conventions. It is therefore desirable to adopt national legislation regulating the conduct of activities in the outer space. In the past, the MoERDY SR, in cooperation with the MoFEA SR, initiated the process of drafting a law

on the regulation of space activities in the Slovak Republic. In June 2023, the MoT SR took over the responsibility for the draft law. The preparation of the draft law continues in cooperation with other relevant ministries in accordance with the legislative intent of the Act on the Regulation of Space Activities approved by the Government of the Slovak Republic in April 2024.

<sup>37</sup> In the present document, the terms "space" and "cosmic" have the same meaning. The term "cosmic" was used historically in the past (from the Greek "kosmos"). In the Czech Republic, it is still used as the main translation of "space", and the term was also used in Slovakia when it was a part of Czechoslovakia. Historical documents and early translations within the EU used in the past, and some institutions where it is common and established, still use the term "cosmic".

# Vision and goals for the development of space activities in the SR until 2030

## 4.1 Research and education

**Vision 1: Slovakia will have enough qualified professionals also for the space sector industries.**

**Vision 2: Slovak basic and applied space research will be of top quality.**

The Slovak Republic has a tradition and international success in space research, which needs to be built upon, especially **in the fields of astronomy, astrophysics, astrobiology and materials research**. In view of the expected development of the space industry in the European and global space with a strongly innovative character, it is necessary to **develop education and applied research in the study programmes of communication and information technologies, robotics and cybernetics, industrial mechatronics, electronics and photonics**.

Slovak technical universities provide education in engineering, natural sciences, mathematics, computer science and cybernetics, including space.

The Technical University in Košice, Faculty of Aeronautics, provides the study programme Aeronautical and Space

Technology at the 1st level of higher education, the study programme Aeronautical and Space Engineering at the 2nd level of higher education and the study programme Aeronautical and Space Systems at the 3rd level of higher education. The priority of the Faculty of Aeronautics is to improve the quality of these study programmes in order to offer qualified personnel in the field of space research.

The Slovak University of Technology in Bratislava, Faculty of Electrical Engineering and Information Technology offers the study programme Space Engineering at the 2nd and 3rd level of higher education.

The possibilities of linking theoretical knowledge with practice are currently not sufficiently exploited. It is only relatively recently that the first start-ups have started to be created at Slovak universities and need to be supported.

### Goals to be achieved by 2030

01

Slovak universities will also prepare sufficient graduates in the study programmes needed for various areas of the space sector, such as space engineering, communication and information technology, etc., which have an impact on the priority areas defined in the updated Smart Specialisation Strategy of the Slovak Republic.

02

Slovak scientists will be increasingly involved in international space projects in the EU framework programmes for research and innovation, USP, EUSPA and other international grant schemes.

03

Specific areas of space research in which Slovakia can be competitive will be identified.

### Proposed measures

01

Slovak universities will support the development of relevant natural, technical and social sciences related to outer space, which have an impact on the priority areas defined in the updated Smart Specialisation Strategy of the Slovak Republic.

02

MoERDY SR and the MoE SR, in cooperation with industry, will create conditions for the establishment of practical training courses for students of technical sciences at Slovak universities.

03

MoERDY SR in cooperation with the ESA will support the facilitation of internships for students and PhD students at ESA centres.

04

The MoE SR, in cooperation with the MoERDY SR, will prepare an analysis to identify specific areas of space research in which Slovakia can be competitive, taking into account the lack of human capacities and facilities for space activities, the competitive activities of neighbouring countries (In particular the Czech Republic) and the current and future trends in space activities.

## 4.2 Services for the public administration and the people

**Vision 1: Slovakia will make effective use of data from the European Galileo/EGNOS, Copernicus systems in state institutions when making strategic decisions.**

**Vision 2: Slovak entities will develop and manufacture advanced equipment and applications using Galileo/EGNOS systems to provide services to public administration, businesses and citizens.**

### Background

Space technologies and their applications provide important information that can be used by public administrations to make important strategic decisions. Examples include environmental protection, forestry, agriculture, air traffic control, critical infrastructure protection, etc.

The development of the use of satellite navigation represents a huge contribution to all areas of public life. There are direct benefits from the growth of the space market as well as from the growth of the downstream market for satellite navigation-based applications and services. Indirect benefits arise from the penetration of new applications into other sectors or from technology transfer to other sectors.

Synergies with security and defence systems have been increasing recently.

**It would therefore be appropriate to step up the use of Galileo/EGNOS data in the Slovak Republic.**

**The number of users of Copernicus data and services in Slovakia is low.** There is very limited use of Copernicus data in the public and state administrations. In the MoEn SR, the use of Copernicus data is insufficient. The most active user of Copernicus data in the ministry is the Slovak Hydrometeorological Institute which uses data on physical and chemical properties of the atmosphere and climate. In other ministries, Copernicus data is mainly used in the MoARD SR in monitoring the condition of forests and agricultural land, in the MoERDY SR in research and academia, and in the MoI SR as a possible basis for crisis management and crisis resolution. In the private sphere, the data is used for the analysis and use of spatial data.

**The under-utilisation of data from USP systems, as well as the low involvement of Slovak entities in the programme, is mainly caused by insufficient capacities dedicated to the space agenda in the relevant ministries and some administrative obstacles.**

### Goals to be achieved by 2030

01

The MoT, MoD, MoI and MoEn SR will have an adequate framework of material, technical, organisational and personnel support so that these ministries can act as real sponsors within their respective space agenda. They should be responsible for taking relevant strategic decisions and their subsequent application in user practice.

02

The involvement of Slovak entities in the Galileo/EGNOS and Copernicus programmes will be increased with the aim of stimulating industry and the user segment for the development and production of systems, equipment and applications using Galileo/EGNOS services.

03

The use of the Galileo Public Regulated Service (PRS)<sup>38</sup> will be promoted in state institutions, security and rescue services and in the provision of critical national infrastructure.

04

The use of EGNOS satellite services in air, road, rail and maritime transport will be promoted.

05

The use of Copernicus data and Earth observation missions will be increased for the needs of relevant ministries (e.g. in support of environmental policies and environmental monitoring).

### Proposed measures

01

The MoT, MoD, MoI and MoEn SR will include space as a separate agenda and create the necessary capacity to process it.

02

All relevant ministries and agencies, including the Horizon Europe National Office, will intensify cooperation to increase the participation of Slovak entities in EU and ESA space projects.

03

The MoT SR will ensure the administrative conditions for the use of the Galileo Public Regulated Service (PRS) in state institutions, security and rescue forces and in the provision of critical state infrastructure.

04

With an outlook to 2030<sup>4</sup>, the MoT SR will progressively prepare the implementation of the satellite flight procedures also at uncontrolled aerodromes with the intention of increasing the safety of general air traffic. Gradual implementation of EGNOS in ITS smart transport systems and M2M (Machine to Machine) communications.

05

The MoEn SR will initiate a project funded from external sources (e.g. the Slovakia 2021 – 2027 Programme) aimed at analysing the possibilities of using Copernicus data for the tasks of relevant ministries and supporting environmental policies.

<sup>38</sup> Galileo – prístup k verejnej regulovanej službe | EUR-Lex (europa.eu)

## 4.3 Development of the space industry

**Vision 1:** Slovakia will build a strong and competitive space industry that will become a supplier of high added value products and services.

**Vision 2:** In the long term, the Slovak space industry will become a source of unique technological solutions for foreign markets.

**Cooperation with the ESA is a driving force for the development of the Slovak space industry.** Under associate membership, Slovak entities have the opportunity to participate in four ESA Optional Programmes to develop the space ecosystem.

In the coming years, the amount of the ESA contribution should be gradually increased from the current level of min. EUR 4.5 million per year, depending on the absorption capacity of the Slovak space industry.

It will be important to intensify the transfer of space technologies from academia to practice. In this context, the involvement of the Slovak Republic in the Commercialisation programme, one of ESA's Optional Programmes, is of particular importance.

In the future, it will be necessary to further **consolidate the strongest and most competitive areas** of the Slovak space industry, as well as to complete the missing technological competences.

It will also be necessary to identify areas with significant commercial potential, to build the interest of domestic and foreign private investors and to create a favourable investment environment for them.

**Support for the creation of joint ventures** between Slovak and foreign established companies, with an emphasis on balanced partnerships, will contribute positively to the development of the Slovak space sector and economy.

### Goals to be achieved by 2030

01

The transfer of space technologies from academia to practice will be an integral part of the technology transfer support activities.

02

Slovak companies and research institutions will actively participate in ESA Optional Programmes.

03

Slovakia will become an ESA member state or intensify cooperation with the ESA in the next phase of associate membership.

04

The number of actors in the space industry will increase by diversifying traditional industries.

05

The involvement of Slovak companies in the commercial markets of the space economy will be intensified.

06

Specific areas of the space industry in which Slovakia can be competitive will be identified.

### Proposed measures

01

The MoERDY SR in cooperation with the MoE SR and the relevant agencies will prepare a proposal for the creation of a financial mechanism to support the incubation of start-ups.

02

The MoE SR will support the building of startups through incubation and acceleration programmes and organise hackathons as a source of new ideas.

03

The Slovak Space Office will promote the potential for commercialisation through training programmes.

04

The Slovak Space Office, in cooperation with the ministries involved and the ESA, will organise information activities aimed at promoting the cooperation with the ESA and increasing the participation of Slovak entities in selected ESA Optional Programmes.

05

The Slovak Space Office, in cooperation with the ESA, will assess the potential and absorption capacity of Slovakia for joining the ESA or the next phase of associate membership.

06

The MoE SR, in cooperation with the MoERDY SR and the MoF SR, will assess the current situation and subsequently prepare a proposal to make the business environment more attractive also in the field of space industry.

**07** The Slovak Space Office will provide strategic links to foreign partners for effective internationalisation of projects.

**08** The MoE SR will assist Slovak companies in cooperation with the MoFEA SR to identify new opportunities arising within the commercial markets of the space economy.

**09** The MoE SR in cooperation with the MoERDY SR will develop an analysis to identify specific areas of the space industry in which Slovakia can be competitive, taking into account the lack of staff and facilities for space activities, the competitive activities of neighbouring countries (especially the Czech Republic) and current and future trends in space activities.

## 4.4 Security and defence

**Vision 1:** Slovakia will be a secure country in the operational domain of space with the aim of efficient and peaceful use of the Union Space Programme.

**Vision 2:** Slovakia will make an effective use of data from SSA/SST, GOVSATCOM/IRIS<sup>2</sup>, Galileo/EGNOS and other European satellite systems in state institutions, security and rescue forces and in the protection of critical infrastructure.

### Background

The current dynamically evolving geopolitical situation in the world and the behaviour of global players pose new

strategic challenges to the space sector, especially in the peaceful use of space.

Aspects of space threats perception and the need to increase the resilience of space systems and components have become one of the dominant themes of the EU and NATO. In this context, the Slovak Republic will have to respond flexibly to new defence and security initiatives within both international organisations.

At the EU level, new legislative acts are also planned in relation to the member states, which are cross-cutting, i.e. inter-ministerial in nature, but require a unified, strategic and binding response from the country as a whole.

Participation of the Slovak Republic in initiatives and activities is possible in the case of the EU, e.g. through collaborative projects within the Permanent Structured Cooperation (PESCO), the European Defence Agency (EDA), or the EU Satellite Centre (EU SatCen), to which an expert from the Slovak Republic can be sent as a part of joint activities. It is also possible to apply for financial grants under the European Defence Fund (EDF), participation in the EU SST Partnership or EU SatCen.

In the case of NATO, it is mainly the implementation of the objectives resulting from the identification of space as a new operational domain, as well as participation in the activities of NATO Centres of Excellence focusing on the space operational domain, or on the area of combating hybrid or cyber threats.

From the perspective of enhancing the security of the Slovak Republic and protecting its citizens in the context of war conflicts, hybrid threats, natural disasters and cyber-attacks, the use of USP programmes for military, police, fire and

rescue and civil protection is crucial and essential in the near future.

The GOVSATCOM and IRIS<sup>2</sup> programmes will ensure an uninterrupted global access to secure and highly resilient communications, and can also support the defence and security missions and operations of the Slovak Republic and enhance the internal security.

The positioning and timing signals provided by the GALILEO and EGNOS global navigation satellite systems are increasingly being used in all the space activities mentioned above, but particularly in the fields of economic development and security, including synchronisation of the electricity transmission system, e-commerce and mobile electronic communication networks, efficient management of the road, maritime and air traffic, car navigation and search and rescue services. The Union Space Programme should exploit synergies between these sectors, taking into account the benefits of space technologies for such sectors, support the development of compatible equipment and promote the development of relevant standards and certifications. Synergies between space activities and activities related to the security and defence of the Union and its Member States are also enhanced. Full control over satellite navigation should therefore guarantee the technological independence of the Union, including in the longer term, as regards infrastructure equipment components, and ensure its strategic autonomy.



## Goals to be achieved by 2030

01

The Slovak Republic, represented by the MoD SR, will implement the objectives set in the EU and NATO strategic framework documents focusing on the defence aspects of the operational domain of space.

02

Slovak entities will apply for projects under EU and NATO defence initiatives, including participation in innovation platforms.

03

Slovakia will participate in the EU SST Partnership.

04

State administration authorities will develop their capabilities using space technologies in support of crisis management.

05

The GOVSATCOM and IRIS<sup>2</sup> programmes will be implemented at the national level to establish a communication infrastructure for the exchange of classified and unclassified information, in particular for crisis management and state administration authorities, thereby enhancing the security of the Slovak Republic.

06

The Galileo PRS and IRIS<sup>2</sup> infrastructure will be implemented at the national level in connection with the introduction of new encryption methods.

## Proposed measures

01

The MoD will ensure the personnel and financial resources in both the civilian and military parts of the ministry with a focus on the implementation of EU and NATO objectives within the operational domain of space.

02

The MoD will intensify cooperation with the civil, academic and industrial spheres in order to increase the readiness of Slovak entities to compete for international projects within the framework of EU and NATO defence initiatives.

03

The MoD will communicate the opportunities for Slovak entities to participate in EU and NATO innovation platforms.

04

The MoD SR, in cooperation with the MoE SR and the Slovak Space Office, will enter into negotiations with academia and industry on the possibility of securing the appropriate infrastructure and capacities necessary for joining the EU SST Partnership.

05

The MoD SR will enter into negotiations with the EU SST Partnership, monitor the development of the conditions for the accession of the SR to the EU SST Partnership, and subsequently quantify the resources needed to achieve this goal and develop a proposal for their provision.

06

The MoD will develop its capabilities in the use of satellite technologies for the purpose of identification of threats against the SR and its partners and in support of the national and international crisis management.

07

The use of space programmes in crisis management and planning will be intensified.

08

Cooperation between the NSA, the EU and the ESA will be intensified.

09

The SR will contribute to the objectives of the IAEA, the EURATOM Treaty and the OECD/NEA, while intensifying cooperation between the NRA SR, the MoERDY SR, the EU and the ESA.

07

The MoI SR will ensure sufficient personnel with a focus on the outer space and its use for national security.

08

In cooperation with other ministries and institutions involved, the MoI SR will prepare an analysis of the possibilities of implementation and benefits of the GOVSATCOM and IRIS<sup>2</sup> programmes in the SR.

09

The NSA, in cooperation with the MoI SR, MoD SR, MoT SR and MoIRDI SR, will support the implementation of a communication infrastructure based on post-quantum encryption algorithms at the national level.

10

The MoERDY SR in cooperation with MoIRDI SR will support the research on new encryption methods at the Slovak Academy of Sciences and relevant universities.

11

The MoI SR will deepen its cooperation with other ministries and foreign partners, in particular EUSPA, on individual space programmes with a view to their use in crisis management, crisis planning and civil protection and rescue activities.

12

The NSA, in cooperation with the MoI and the Slovak Space Office, will deepen its cooperation at the national and international level on the security of EU space programmes and on ensuring and facilitating a secure exchange of classified information between the SR, the ESA and other partners.

13

The NSA will actively participate in the development of security rules and measures for individual space programmes within the EUSPA.

14

The NSA will enhance cooperation in the field of cyber security with the ESA, with an emphasis on a mutual exchange of knowledge and support in dealing with incidents and threats in this area.

15

The NRA SR will provide nuclear safety oversight of nuclear facilities and nuclear materials used in the fulfilment of tasks and implementation of projects within the framework of the Slovak space programme.

## 4.5 Popularisation of space activities

**Vision:** Slovak citizens will be informed about the importance of space activities for their everyday life.

### Background

Outer space is now not only the domain of cutting-edge research, but it also offers solutions for the everyday life of the people. This needs to be brought to the

attention of the general population through popular and various forms of non-formal education and dissemination of information about science and technology.



### Goals to be achieved by 2030

01

Awareness of the importance of space activities for the daily life of Slovak citizens will be raised.

### Proposed measures

01

The Slovak Space Office and the Slovak Centre of Scientific and Technical Information will also organise awareness-raising and communication activities aimed at the wider public, including young people.

02

A space-themed website and social networks will also be aimed at popularising space activities.

03

The Slovak Central Observatory in Hurbanovo and other relevant institutions will organise popular competitions for children about space.

04

The theme of space will be included in the programme of formats aimed at popularising science, such as the Researcher's Night or the Week of Science and Technology in Slovakia.

**An overview of the most important milestones for achieving the objectives of the Slovak Space Strategy 2030\*:**

Period	Milestones
2024 - 2025	<b>Milestone 1:</b> Adopt national space legislation
	<b>Milestone 2:</b> Establish sufficient capacities for the space agenda at the MoT, MoD, MoI, MoEn SR, NSA
2026 - 2028	<b>Milestone 4:</b> Establish a supra-ministerial body to coordinate Slovak space activities
	<b>Milestone 5:</b> Slovakia joins the EU SST Partnership
2029 - 2030	<b>Milestone 6:</b> SR joins the ESA or proceeds to the next stage of the associated membership in the ESA

## Financing of Slovak space activities

The main source of public funding for civilian space activities is the contribution of the Slovak Republic to the ESA within the budget of the MoERDY SR, which is used within the framework of the associate membership in the ESA to finance the mandatory contribution to the ESA, to finance the participation of Slovak entities in ESA Optional Programmes, as well as to support the construction of the Slovak space infrastructure. In the upcoming period, this contribution will need to be gradually increased in line with the absorption capacity of the Slovak space industry.

The Slovak Republic also participates in the financing of EU **SatCen and EDA within the budget of the MoD SR** and the membership contribution to **EUMETSAT** is paid within the budget of the **MoEn SR**.

In the future, sufficient financial resources should be foreseen for membership contributions to the above-mentioned and possibly other relevant agencies and other partnerships.

**Additional national funding will be needed to support the development of the Slovak space ecosystem**, to support the cooperation of academia with industry, and to deepen international partnerships.

For the implementation of the space agenda and of the individual space

programmes, it is necessary for the state to **ensure sufficient earmarked funding for the ministries responsible for the space agenda** and its individual programmes.

Support for space activities is included in the **Recovery Plan**<sup>39</sup> as well as in the Slovakia 2021 – 2027 Programme<sup>40</sup>. It will therefore be appropriate to support projects aimed at the development of space activities financed from such sources, both to support the development of space infrastructure and human resources, but also to prepare the necessary analyses and recommendations. Another source could be the effective use of resources from European programmes (e.g. Horizon Europe, USP, EDF, etc.).

Slovak space activities are currently mostly publicly funded. It is therefore crucial for the further development of commercial space activities **to support the willingness of Slovak investors and funds to include such activities in their investment portfolios**.

At the same time, it is prospectively important to systematically **attract also private foreign investors** who can bring considerably more capital, motivate local funds to co-invest and, last but not least, strategically help projects to expand into foreign markets.

<sup>39</sup> Domov | Plán obnovy (planobnovy.sk)

<sup>40</sup> Program Slovensko 2021 - 2027 | Eurofondy 2020 (gov.sk)

## Implementation and updating of the Strategy

The Slovak Space Strategy will be implemented by the relevant state administration authorities. It will be followed by an action plan which will consist of sub-action plans proposed by the relevant ministries, together with specific measurable indicators.

The Strategy and the action plan will be continuously evaluated and updated in accordance with the timing of the USP, contractual cooperation with the ESA, respecting the rapidly evolving national, European and global trends in the development of space activities.





# List of annexes

<b>Annex 1:</b> Main EU legislative acts on space policy	40
<b>Annex 2:</b> ESA Optional Programmes	44
<b>Annex 3:</b> Successful Slovak projects in PECS Calls for Proposals	46
<b>Annex 4:</b> Glossary of terms and abbreviations	54

# Main EU legislative acts on space policy

- [Treaty on European Union](#) (Title V – Provisions on the common foreign and security policy)
- [A Global Strategy for the European Union's Foreign and Security Policy](#)
- [Space strategy for Europe](#)
- [Regulation \(EU\) 2021/696 of the European Parliament and of the Council of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme and repealing Regulations \(EU\) No. 912/2010, \(EU\) No. 1285/2013 and \(EU\) No. 377/2014 and Decision No. 541/2014/EU](#)
- [Regulation \(EU\) 2023/588 of the European Parliament and of the Council of 15 March 2023 establishing the Union Secure Connectivity Programme for the period 2023-2027](#)
- [Commission Implementing Decision \(EU\) 2023/1054 of 30 May 2023 laying down rules for the application of Regulation \(EU\) 2021/696 of the European Parliament and of the Council as regards the service portfolio for the Governmental Satellite Communications services offered by the system established under the Union Space Programme](#)
- [Commission Implementing Decision \(EU\) 2023/1055 of 30 May 2023 setting out the rules on the sharing and prioritisation of satellite communication capacities, services, and user equipment to fulfil the function referred to in Article 66\(2\) of Regulation 2021/696 of the European Parliament and of the Council](#)
- [Commission Implementing Decision \(EU\) 2023/1053 of 30 May 2023 laying down rules for the application of Regulation \(EU\) 2023/588 of the European Parliament and of the Council as regards operational requirements for governmental services provided under Union Secure Connectivity Programme and its service portfolio](#)
- [EU Space Strategy for Security and Defence](#) (Council Conclusions on the EU Space Strategy for Security and Defence)
- [Council Decision \(CFSP\) 2021/698 on the security of systems and services deployed, operated and used under the Union Space Programme which may affect the security of the Union, and repealing Decision 2014/496/CFSP](#)

## More detail on the most significant acts:

**The Space Strategy for Europe<sup>1</sup>** sets out objectives such as providing new services to the EU citizens and economy, fostering the global competitiveness of the European space sector, strengthening Europe's autonomous access to and use of space in a safe and secure environment, strengthening the EU's role as a global actor, and promoting international cooperation.

**The Union Space Programme<sup>2</sup>** (hereinafter referred to as the "USP") is adopted in the form of **Regulation (EU) 2021/696 of the European Parliament and of the Council of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme. The general objectives** of the Programme are to:

- a) provide or contribute to the provision of high-quality and up-to-date and, where appropriate, secure space-related data, information and services without interruption and wherever possible at global level, meeting existing and future needs and able to support the Union's political priorities and related evidence-based and independent decision making, inter alia for climate change, transport and security;
- b) maximise the socio-economic benefits, in particular by fostering the **development of innovative and competitive European upstream and downstream sectors**, including SMEs and start-ups,

thereby enabling growth and job creation in the Union and promoting the widest possible uptake and use of the data, information and services provided by the Programme's components both within and outside the Union;

- c) enhance **the safety and security of the Union and its Member States** and reinforce the autonomy of the Union, in particular in terms of technology;
- d) promote the role of the **Union as a global actor** in the space sector, encourage international cooperation, reinforce European space diplomacy including by fostering the principles of reciprocity and fair competition, and to strengthen its role in tackling global challenges;
- e) enhance **the safety, security and sustainability of all outer space activities** pertaining to space objects and debris proliferation, as well as space environment, by implementing appropriate measures, including development and deployment of technologies for spacecraft disposal at the end of operational lifetime and for space debris disposal.

**The Programme shall consist of the following components:**

- a) **'Galileo', an autonomous civil global navigation satellite system (GNSS)** under civil control, which consists of

<sup>1</sup> [eur-lex.europa.eu/legal-content/SK/TXT/PDF/?uri=CELEX:52016DC0705](https://eur-lex.europa.eu/legal-content/SK/TXT/PDF/?uri=CELEX:52016DC0705)

<sup>2</sup> [eur-lex.europa.eu/legal-content/SK/TXT/PDF/?uri=CELEX:32021R0696](https://eur-lex.europa.eu/legal-content/SK/TXT/PDF/?uri=CELEX:32021R0696)

a constellation of satellites, centres and a global network of stations on the ground, offering positioning, navigation and timing services and integrating the needs and requirements of security;

**b) ‘European Geostationary Navigation Overlay Service’ (EGNOS)**, a civil regional satellite navigation system under civil control which consists of centres and stations on the ground and several transponders installed on geosynchronous satellites. EGNOS augments and corrects the open signals emitted by Galileo and other GNSSs, inter alia for air-traffic management, for air navigation services and for other transport systems;

**c) ‘Copernicus’, an operational, autonomous, user-driven, civil Earth observation system** under civil control, building on the existing national and European capacities, offering geo-information data and services, comprising satellites, ground infrastructure, data and information processing facilities, and distribution infrastructure, based on a free, full and open data policy and, where appropriate, integrating the needs and requirements of security;

**d) ‘Space Situational Awareness’ or ‘SSA’**, which includes the following sub-components:

**da) ‘SST (Space Surveillance and Tracking)’ sub-component**, a space surveillance and tracking system aiming to improve, operate and provide data, information and services related to the surveillance and tracking

of space objects that orbit the Earth;

**db) ‘SWE (Space Weather Events)’ sub-component**, observational parameters related to space weather events; and

**dc) ‘NEO (Near Earth Objects)’ sub-component**, the risk monitoring of near-Earth objects approaching the Earth;

**e) ‘GOVSATCOM’ (Governmental Satellite Communications), a satellite communications service under civil and governmental control** enabling the provision of satellite communications capacities and services to Union and Member State authorities managing security critical missions and infrastructures.

**f) IRIS<sup>2</sup> (Infrastructure for Resilience, Interconnectivity and Security by Satellite)** – an emerging programme within GOVSATCOM, which will consist of a set of satellites in low Earth orbit. The aim is to establish uninterrupted global high-speed and broadband secure encrypted connectivity, with minimal delay and flexibility, particularly over areas of strategic interest to the European Union.

The programme is based on the Regulation (EU) 2023/588 of the European Parliament and of the Council of 15 March 2023 establishing the **Union Secure Connectivity Programme for the period 2023-2027**. The programme is intended to provide **government services to protect critical infrastructure**, surveillance, support external activities or crisis

management and contribute to improving the resilience of the Union. In addition, it enables **the provision of commercial services to the private sector**, thus contributing to the competitiveness of the European industry and further innovation based on space technologies.

An integral part of IRIS<sup>2</sup> will be a new EU secure communication system **EuroQCI (The European Quantum Communication Infrastructure)**<sup>3</sup>. The system will consist of a terrestrial segment based on fibre optic communication networks connecting strategic sites at the national and cross-border level and a space segment based on satellites.

In 2022, the EU Competitiveness Council adopted conclusions on the EU’s approach to **Space Traffic Management (STM)**<sup>4</sup>, **calling for strengthening the Union’s capabilities in space surveillance and tracking of objects in space, coordinating regulatory and standard-setting activities, as well as strengthening the Union’s voice on the international stage to promote a common approach**. The EU’s objective in this area is to protect European citizens, influence global debates and respond effectively to global challenges.

<sup>3</sup> [The European Quantum Communication Infrastructure \(EuroQCI\) Initiative | Shaping Europe’s digital future \(europa.eu\)](#)

<sup>4</sup> [defence-industry-space.ec.europa.eu/eu-space-policy/eu-space-programme/eu-approach-space-traffic-management\\_en](#)

# ESA Optional Programmes

Through the ESA Optional Programmes, ESA member states can carry out and implement activities in all space domains of interest to them.

The ESA offers the following *Optional Programmes* to choose from on the basis of individual technology domains:<sup>1</sup>

## 1) Science and Exploration:

a) *The Science Programme* (ESA's core science programme) – mandatory for member states involved in e.g. the collaboration on the Webb Telescope mission with NASA, contributing to the Gaia mission or the launch of the Ariane 5 launcher;

and the *PRODEX programme* (programme for the development of scientific experiments);

b) *Human and Robotic Exploration* (space exploration under the Terrae Novae – European Exploration Envelope Programme (E3P), e.g. by exploring low Earth orbit (LEO/*Low Earth Orbit*), the Moon and its surroundings, and Mars);

contributing to the operation of the International Space Station (ISS) by 2030 with partners.

## 2) Applications:

a) *Earth Observation (EO)* – given the significant role of remote sensing in understanding the functioning of the Earth system and its evolution, especially in

the context of climate change and other environmental issues, **the FutureEO Earth observation programme** is of particular importance as the leading scientific, research and development programme for Earth observation. ESA focuses on all elements and areas of Earth observation. It also forms the basis for innovative space technologies that prepare all future EO missions and the implementation of state-of-the-art satellite missions in the Earth sciences.

b) *Telecommunications and Integrated Applications* – the ARTES (Advanced Research in Telecommunications Systems) programme aims to improve the innovation capability and competitiveness of European industry in global satellite communications markets and to enable satellite-based solutions to meet societal needs, highlighting current trends such as 5G/6G and sustainable connectivity, as well as quantum and optical communications and space-based systems for safety and security.

c) *Navigation* – NAVISP elements such as Positioning, Navigation and Timing (PNT) enable European companies and institutions in particular to promote PNT solutions worldwide and thus develop commercial products in several innovative market sectors such as autonomous transport and green mobility, sustainable cities, drones and robotics.

3) **Space Safety** – as the successor to the Space Situational Awareness Programme (SSA), **the Space Safety Programme (S2P)** seeks to protect Earth, humanity and property from hazards emanating from space. It introduces new missions and takes into account the growth of commercial actors operating in emerging markets.

4) **Space Transportation** – the Space Transportation programme aims to provide autonomous access to space for Europe through the services of Ariane (FR) and Vega (IT) launchers according to evolving market needs. Launch vehicle Vega C was successfully launched in July 2022 and a successful flight of an Ariane6 launcher was carried out in July 2024, launching the Slovak GRBBeta satellite into orbit.

## 5) Technology and operations

a) *Technology* – ESA provides strategic guidance and training across the full range of the so-called Technology Readiness Levels (TRLs) for the European institutional and commercial space sector. For almost 30 years, the successful **GSTP** (General Support Technology Programme) has been continuously evolving to address current strategic trends and innovation in areas such as digitalisation, artificial intelligence, cybersecurity and space solar power.

b) *Operations* – ESA's expertise and experience in the operation of space missions enables the maximisation of mission duration and scientific impact, as well as the development of next-generation ground stations (data systems, space communications, flight dynamics and navigation) for the benefit of ESA missions and to enhance the competitiveness of the European industry.

6) **Commercialisation** – proposal for a new **ScaleUp** programme to promote innovation and commercialisation in the European space sector (through its INNOVATE element) and to support the development of economic operators with a focus on new and emerging space markets (through its INVEST element).

ESA's programmes and activities provide important and strategic contributions to strengthening the European competitiveness, independence and resilience to meet essential societal requirements in close coordination with member states, associate members and European institutional partners.

## Optional Programmes which the Slovak Republic has signed up to participate in

The Slovak Republic, represented by the MoESRY SR, signed up to participate in the following ESA Optional Programmes during the ESA Ministerial Council in November 2022:

- **Earth Observation (EO)**,
- **General Support Technology Programme (GSTP)**,
- **Space Safety Programme (S2P)**,
- **Commercialisation programme with the intention to establish ESA Business Incubation Centre** (ESA BIC) in Slovakia.

Participation in the above-mentioned Optional Programmes results from the capabilities of Slovak entities actually demonstrated during the cooperation with the ESA and is in line with its recommendations as well as with the approved budget in accordance with the Slovak Government Resolution No. 635/2020.

<sup>1</sup> This selection was up-to-date as at the date of the Strategy development, i.e. based on ESA's offer of Optional Programmes relevant for the period 2023 – 2025, when the ESA Ministerial Council decided on the following programmes for the next 3 years in Paris in November 2022.

# List of successful Slovak projects in PECS Calls for Proposals and their analyses

Projects of the 1st PECS Calls for Proposals (2016)				
	Organization	Project name	Activity type	Project duration
1	Pavol Jozef Šafárik University in Košice	Simulating the cooling effect of urban greenery based on solar radiation modelling and a new generation of ESA sensors (SURGE)	A) Flight hardware	24 months
2	Faculty of Mathematics, Physics and Informatics, Comenius University Bratislava	Development of a Supporting Optical Sensor for High-Area-to Mass-Ration Objects Cataloguing and Research (HamrOptSen)	B) Research and development activities	24 months
3	Institute of Materials and Machine Mechanics of the Slovak Academy of Sciences	Novel magnesium composite for ultralight structural components (MagUltra)	B) Research and development activities	24 months
4	CTRL s. r. o.	Development and preparation of a novel capacitive multturn absolute rotary encoder for space applications (CAPMARE)	B) Research and development activities	24 months
5	Faculty of Electrical Engineering and Information Technology of the Slovak University of Technology in Bratislava	Radiation induced terahertz wave and power generation in magnetic microwires (RIT)	A) Flight hardware	23 months
6	Institute of Experimental Physics of the Slovak Academy of Sciences	Feasibility study to observe ionospheric disturbances by one pixel UV detector	A) Flight hardware	17 months
7	Faculty of Electrical Engineering and Information Technology of the Slovak University of Technology in Bratislava	Space for Education, Education for Space (SEES)	E) Educational activities	24 months

Projects of the 2nd PECS Calls for Proposals (2017)				
	Organization	Project name	Activity type	Project duration
1	Slovak University of Technology	GOCE-based high-resolution gravity field modelling in a space domain (GOCE-numerics)	B) Research and development activities	24 months
2	National Forest Centre	ATBIOMAP	B) Research and development activities	24 months
3	insar.sk. s. r. o.	Retrieval of Motions and Potential Deformation Threats using Sentinel-1 (remotIO)	B) Research and development activities	24 months
4	Orbisys s. r. o.	Distributed European Network of Ground Stations (DENGs)	B) Research and development activities	12 months
5	Algoritmy:SK, s. r. o.	Software tools for monitoring NATURA 2000 habitats by satellite images (NATURAsat)	D) Preparatory activities	24 months
6	Institute of Experimental Physics of the Slovak Academy of Sciences	Follow-up of feasibility study to observe ionospheric disturbances by airglow monitoring network (AMON-net)	B) Research and development activities	24 months
7	Slovak University of Technology	Additive manufacturing of Ceramic Components by FDM Technology (AM-FDC)	B) Research and development activities	24 months
8	GOSPACE s. r. o.	Stratospheric Autonomous Landing System Application (SALSA)	B) Research and development activities	16 months



Projects of the 3rd PECS Calls for Proposals (2018)				
	Organization	Project name	Activity type	Project duration
1	International laser centre	Laser Post-ionization Mass Spectrometer Platform for High Performance Meteorite Analysis – LaPoM2et	B) Research and development activities	24 months
2	Advanced Technologies Research Institute Faculty of Materials Science and Technology of the Slovak University of Technology in Bratislava	Preparation for ATHENA Mission by establishing Slovak research team oriented to existing X-ray Missions and AGN Study	D) Preparatory activities	24 months
3	Faculty of Mathematics, Physics and Informatics, Comenius University Bratislava	Improvement of European capabilities for LEO objects tracking with optical passive sensors	B) Research and development activities	24 months
4	Institute of Experimental Physics of the Slovak Academy of Sciences	Slovak contribution to ESA-JUICE mission: Development of Anti-Coincidence Module ACM for Particle Environment Package	A) Flight hardware	24 months
5	NEEDRONIX s. r. o.	Sun sensor feasibility study – recap	D) Preparatory activities	19 months
6	YMS, a. s.	Sentinel 2 based support of forest disturbance mapping and monitoring (Sen2For-MaM)	C) Space applications, products and services	24 months
7	Institute of Experimental Physics of the Slovak Academy of Sciences	SPACE::LAB – place to attract, educate and involve young generation in space science and engineering	E) Educational activities	24 months

Projects of the 4th PECS Calls for Proposals (2019)				
	Organization	Project name	Activity type	Project duration
1	BioX Technologies s. r. o.	Al'thospira: Biomass Recovery	B) Research and development activities	20 months
2	Touch4IT s. r. o.	SBAS Geometry Analysis Tool	B) Research and development activities	15+6 months
3	CTRL s. r. o.	Adjustment of a Novel Capacitive Multiturn Absolute Rotary Encoder for Space Application – Beam Pointing System (CAPMARE2).	A) Flight hardware	18 months
4	Faculty of Electrical Engineering and Information Technology of the Technical University of Košice	TUKE Space Forum	E) Educational activities	24 months
5	BOROSPACE s.r.o.	Wax Fuel Embedded Structure (WAFER) for Hybrid Rocket Motor	B) Research and development activities	18 months
6	ABmerit s. r. o.	ESA-Sen2Agri connection with ESTE	B) Research and development activities	15 months
7	Faculty of Mathematics, Physics and Informatics, Comenius University Bratislava	Study of meteoroid composition by meteor spectroscopy and simulated ablation of meteorites	B) Research and development activities	24 months

Projects of the 5th PECS Calls for Proposals (2020)				
	Organization	Project name	Activity type	Project duration
1	3IPK, a. s.	Blockchain Software Tool for Spacecraft Components Incoming and Outgoing Inspection	B) Research and development activities	12 months
2	Faculty of Mathematics, Physics and Informatics, Comenius University Bratislava	Potential solid lubricant for extreme temperatures based on vanadium boride	D) Preparatory activities	14 months
3	CTRL s. r. o.	Capacitive Absolute Sensor for Space Applications - CAPSE	B) Research and development activities	16 months
4	Institute of Nuclear and Physical Engineering, Faculty of Electrical Engineering and Informatics	Space Engineering Through (True) Training (SETT)	E) Educational activities	24 months
5	Trifid Automation	Sky Simulator for Fine Guidance Sensors	B) Research and development activities	18 months
6	Institute of Experimental Physics of the Slovak Academy of Sciences	SIREN Space Ionizing Radiation Experts Nursery	E) Educational activities	18 months
7	Faculty of Mining, Ecology, Process Control and Geotechnologies of the Technical University of Košice	University course Earth Observation with ESA missions	E) Educational activities	18 months
8	Astros Solutions s. r. o.	Slovak Automated Space Surveillance and Tracking Optical System	B) Research and development activities	18 months
9	Algoritmy:SK s. r. o.	NaturaSat - software for exploring Natura 2000 habitats by satellite data	B) Research and development activities	24 months
10	M2M Solutions, s. r. o.	Ground Station Scheduling Broker	C) Space applications, products and services	24 months

Projects of the 6th PECS Calls for Proposals (2021)				
	Organization	Project name	Activity type	Project duration
1	CTRL s. r. o.	Design and qualification of a Capacitive Absolute sensor - EQM (CAPSE2)	A) Flight hardware	18 months

2	3IPK, a. s.	Blockchain-augmented configuration management for spacecraft engineering	B) Research and development activities	14 months
3	Institute of Landscape Ecology of the Slovak Academy of Sciences	Towards quantification of non-photosynthetic vegetation from Copernicus Hyperspectral Imaging Mission for the Environment (Acronym: CHIME_NPV)	D) Preparatory activities	24 months
4	Institute of Experimental Physics of the Slovak Academy of Sciences	Feasibility study of data-driven Autonomous Service for Prediction of Ionospheric Scintillations (ASPI)	D) Preparatory activities	18 months
5	CTRL s. r. o.	Preparatory activity for an ASIC development applicable for space sensors (CAPASIC)	D) Preparatory activities	14 months
6	STATON, s. r. o.	Ultra-high temperature thin coatings for aerospace industry	D) Preparatory activities	20 months
7	Solargis s. r. o.	Enhanced solar radiation now-casting based on geostationary satellite data (NOWCASTSAT)	C) Space applications (downstream)	18 months
8	University of Žilina	Advanced electronics with supercaps	B) Research and development activities	18 months
9	insar.sk s. r. o.	Retrieval of Motions and Potential Deformation Threats using InSAR Geodesy (remoIO)	B) Research and development activities	24 months
10	YMS, a. s.	Satellite-based delineation of yield productivity zones for Slovak crop fields (SatZones)	C) Space applications (downstream)	18 months
11	Astros Solutions s. r. o.	Validation of re-entry models by using real optical measurements obtained by AMOS global network (AMOS-Re-entry)	B) Research and development activities	24 months
12	GEODETICCA VISION, s. r. o.	Space CARTOGRAPHER	D) Preparatory activities	18 months
13	Strýco Berco s. r. o.	Formulation and Assessment of Multi-agent Active Debris Removal Application	D) Preparatory activities	19 months
14	BioX Technologies s. r. o.	MELISSA Feeder	B) Research and development activities	18 months
15	BioX Technologies s. r. o.	Limnospira - Lipidom and Pathways	B) Research and development activities	23 months

Projects of the 7th PECS Calls for Proposals (2022)				
	Organization	Project name	Activity type	Project duration
1	Comenius University in Bratislava	H <sub>2</sub> and CN emissions as tracers of H <sub>2</sub> O molecules and organic compounds in meteoroids: a feasibility study and instrument design	D) Preparatory activities	18 months
2	Comenius University in Bratislava	Modelling the night sky brightness produced by space objects	D) Preparatory activities	16 months
3	Technical University of Košice	Proposal for Slovak universities curriculum adaptation toward S2P market (SK-S2P-Edu)	E) Educational activities	10 months
4	DECENT Group, a.s.	dCorePQfabric	D) Preparatory activities	9 months
5	Astros Solutions s.r.o.	Roadmap for EuroQCI optical ground station deployment in Slovakia - Study	D) Preparatory activities	15 months
6	Pavol Jozef Šafárik University in Košice	ENEUM: Enhancing Earth Observation Curriculum with a Focus on ESA Sensors	E) Educational activities	18 months
7	Institute of Materials and Machine Mechanics of the Slovak Academy of Sciences	Feasibility Study of Contact Capacitor Discharge Welding Gear for Space Debris Capture	D) Preparatory activities	19 months

## Analysis of the PECS Calls for Proposals

During the 7 PECS calls for proposals carried out in 2016 – 2022, **a total of 131 project proposals were submitted, of which 61 projects of Slovak entities were funded and implemented.**

Overview of projects implemented in the seven ESA PECS calls for proposals by activity type:			
Activity type	Initial minimum TRL	Target minimum TRL	Number of projects
Flight hardware	4	6	6
Research and development activities	3	not more than 5	28
Space applications, products and services	4	6	4
Preparatory activities	1	3	15
Educational activities			8

The average duration of a project is 20.2 months and the average cost per project is 145,000.

The thematic domains of the projects were: general technology (39% of projects), Earth observation (24%), space security (14%), education (4%), science (6%), space transport (4%), space research (7%) and navigation (2%).

**Top-down calls** were also announced for 2021 – 2022. These are specific calls for proposals announced by ESA with already specifically redefined contract assignments based on the potential of the Slovak space industry, so that Slovak entities strengthen their competences in priority areas of space technologies, deepen their international partnerships and thus prepare for future participation in ESA programmes.

In addition to these calls, additional contracts with foreign partners (as principal investigators) were concluded with Slovak entities, in which Slovak entities became contractors and project partners (up to a maximum of 20%).

In total, **68 projects** were implemented during the PECS period, involving 35 entities (20 of which were companies). The total financial contribution of the Slovak Republic to the ESA for the PECS period amounted to EUR 14.5 million. Of this, approximately **80% returned to Slovakia** in the form of contracts (exclusively) for Slovak entities.

While at the beginning the main respondents to ESA PECS calls were mainly research and academic institutions, in the course of the subsequent calls private

companies and industry-oriented firms also came to the fore. **The current ratio of industrial (private) actors to research and academic institutions was 60% to 40% as of 30 June 2023.** (According to the ESA, the ideal ratio in a country is 75% to 25%).

Considerable progress has also been made in recent years in raising the Technology Readiness Level (TRL) of PECS projects. While by January 2020 only 16% of implemented activities were targeting TRL 4 or above, by the first quarter of 2022 this was already around 50% , with further increases expected.

**The cooperation with the ESA has seen a shift from research projects to innovative projects with higher TRLs, has enabled the linking and deeper cooperation of different actors** (academia, industry, R&D institutions, etc.) and the internationalisation of Slovak institutions.

PECS project solutions, focused on cutting-edge space research, have contributed to the development and diversification of SMEs and the emergence of start-ups. Their results have contributed to the emergence of innovative solutions and products in the field of space software, hardware and space applications.

# Glossary of terms and abbreviations

For better clarity of the text, below you may find some of the most frequently used phrases (and their abbreviations, if any) as they are used in English and Slovak technical texts.

English abbreviation	Full wording in English	Slovak abbreviation	Full wording in Slovak
ARTES	Advanced Research in Telecommunications Systems		Pokročilý výskum v telekomunikačných systémoch (jeden z programov ESA)
CASSINI	Space Entrepreneurship Initiative		iniciatíva pre podnikanie v oblasti vesmíru
Copernicus	European Union's Earth Observation Programme		operačný autonómny systém civilného pozorovania Zeme
COPUOS	The United Nations Committee on the Peaceful Uses of Outer Space		Výbor OSN pre mierové využívanie vesmíru
E3P	European Exploration Envelope Programme		Európsky program prieskumu vesmíru - Program ESA pre európsky prieskum vesmíru *
EC	European Commission	EK	Európska komisia
EDA	European Defence Agency		Európska obranná agentúra
EDF	European Defence Fund		Európsky obranný fond
EEA	European Environment Agency		Európska agentúra pre životné prostredie
EGNOS	European Geostationary Navigation Overlay Service		Európska geostacionárna navigačná prekryvná služba
EDIP	European Defence Industry Programme		Program európskeho obranného priemyslu
EDIS	European Defence Industrial Strategy		Stratégia európskeho obranného priemyslu
EO	Earth Observation	PZ	pozorovanie Zeme
ESA	European Space Agency		Európska vesmírna agentúra

ESA BIC	ESA Business Incubation Centre		Inkubačné centrum ESA pre podnikanie
EU	European Union	EÚ	Európska únia
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites		Európska organizácia pre využívanie meteorologických satelitov
EURATOM	European Atomic Energy Community		Európske spoločenstvo pre atómovú energiu
EuroQCI	The European Quantum Communication Infrastructure		Iniciatíva Európskej kvantovej komunikačnej infraštruktúry
EU SatCen	European Union Satellite Centre		Satelitné centrum EÚ
EUSPA	European Union Agency for the Space Programme		Agentúra Európskej únie pre vesmírny program
EU SST	SST Partnership EU		Partnerstvo EÚ SST
FRONTEX	European Border and Coast Guard Agency		Európska agentúra pre pohraničnú a pobrežnú stráž
Future EO	Future Earth Observation		*- Program ESA pre pozorovanie Zeme
Galileo	Europe's Global Navigation Satellite System (GNSS)		autonómny civilný globálny systém satelitnej navigácie
GOVSATCOM	Governmental Satellite Communications		Vládna satelitná komunikácia
GSTP	General Support Technology Programme		*- Program všeobecnej technickej podpory (program ESA)
IAEA	International Atomic Energy Agency	MAAE	Medzinárodná agentúra pre atómovú energiu (patrí do štruktúr OSN)
INNOVATE			prvok programu ESA ScaleUp
INVEST			prvok programu ESA ScaleUp
Invest EU			program spájajúci viaceré európske finančné nástroje, ktoré sú v súčasnosti k dispozícii na podporu investícií v EÚ
IRIS <sup>2</sup>	Infrastructure for Resilience, Interconnectivity and Security by Satellite		Infraštruktúra pre satelitnú odolnosť, interkonektivitu a bezpečnosť
ISS	International Space Station		Medzinárodná vesmírna stanica

JRC	Joint Research Centre		Spoločné výskumné centrum
LEO	Low Earth Orbit		nízka obežná dráha Zeme
NATO	North Atlantic Treaty Organization		Organizácia Severoatlantickej zmluvy
NASA	The National Aeronautics and Space Administration		Národný úrad USA pre aeronautiku a vesmír
NAVISP	Navigation Innovation and Support Programme		*- Program ESA pre navigáciu, inovácie a podporu
NEO	Near-Earth objects		objekty v blízkosti Zeme
OECD/NEA	Nuclear Energy Agency -in the framework of the Organisation for Economic Co-operation and Development		Agentúra pre jadrovú energiu pri Organizácii pre hospodársku spoluprácu a rozvoj
PECS	Plan for European Cooperating States		Plán pre európske spolupracujúce štáty
PESCO	Permanent Structured Cooperation		Stála štruktúrovaná spolupráca
PNT	Positioning, Navigation and Timing		Polohovanie, navigácia a časovanie
PRODEX	PROgramme de Développement d'Expériences scientifiques (fr.)		Program vývoja vedeckých experimentov
PRS (Galileo)	Public Regulated Service	VRS (Galileo)	Verejná regulovaná služba Galileo
RPA	Requesting Party Activities		Činnosti žiadajúcej strany
S2P	Space Safety Programme		Program vesmírnej bezpečnosti (program ESA)
SARIO	Slovak Investment and Trade Development Agency	SARIO	Slovenská agentúra pre rozvoj investícií a obchodu
SAS	The Slovak Academy of Sciences	SAV	Slovenská akadémia vied
ScaleUp			*- Program komercializácie (program ESA)
	Space Transportation		*- Program ESA zameraný na vesmírnu dopravu
SSA	Space Situational Awareness		získavanie informácií o situácii vo vesmíre

SST	Space Surveillance and Tracking		system pre dohľad nad vesmírnym priestorom a sledovanie tohto priestoru
STM	Space Traffic Management		riadenie vesmírnej prevádzky
SWE	Space Weather		*- parametre z pozorovaní týkajúce sa javov vesmírneho počasia
TRL	Technology readiness level		úroveň technologickej vyspelosti (pripravenosti) projektov
	Union Space Programme	VPÚ	Vesmírny program Únie

\*- Free translation – as used in the Slovak Republic



2 0 2 4