



# General Assembly

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## Committee on the Peaceful Uses of Outer Space

### International cooperation in the peaceful uses of outer space: activities of Member States

#### Note by the Secretariat

#### Addendum

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## II. Replies received from Member States

### Algeria

[Original: French]  
[23 October 2022]

Algeria is of the view that international cooperation in the use of outer space for peaceful purposes is the most appropriate way to foster the exchange and transfer of knowledge and expertise and to promote space technologies and applications in support of sustainable development and human well-being.

Accordingly, over the course of 2022, it has continued to carry out activities under the various components of its national space programme.

At the national level, the Algerian Space Agency (ASAL) has continued to implement space application projects with sectors that are using space technologies, especially in relation to natural hazards (including forest fires, locust swarms and flooding), natural resources (including water resources, the forecasting of cereal crop yields, and geological mapping) and basic infrastructure (including housing, transport and water management).

In order to bring these multisectoral projects to fruition, steps have been taken to establish cooperation agreements with a number of the sectors in question, including agriculture, public works and culture and the arts, concerning the design, development and implementation of decision-making tools based on space technologies and applications. Value-added cartographic products derived from space data and images and geographic information systems are made available to ASAL partner entities, which are also provided with training, including advanced training, in the areas of remote sensing, geographic information systems and global navigation satellite systems.

ASAL also plays an active role, as member of an intersectoral committee led by the Ministry of Foreign Affairs and through the Algerian community abroad, in implementing the indicators relating to the goals and targets of the 2030 Agenda for Sustainable Development through the production of indicators derived from the use of space data.

With regard to training and human capacity-building in the area of space technologies, ASAL has established the School of Geodesy and Space Technology, which has launched specific training programmes geared towards meeting the growing needs of the user sector for highly qualified personnel with expertise in the use of space technology and applications, geomatics and space geodesy.

In addition, the following academic and short-term training activities abroad, conducted in person and/or remotely, have been carried out or are in progress:

- China: Regional Centre for Space Science and Technology Education in Asia and the Pacific, affiliated to the United Nations
- China: Academic training as part of the Alcomsat-1 programme (universities of Beihang, Shanghai and Wuhan)
- United Kingdom of Great Britain and Northern Ireland: Academic training as part of the Alsat-1B programme
- Japan and United Nations: Nanosatellite technology training programme at the Kyushu Institute of Technology
- Republic of Korea: Training placements at the Korea Aerospace Research Institute

With respect to space infrastructure and systems, over the course of 2022 ASAL has carried out maintenance operations to keep its satellites and ground control segments in optimum operating condition. This applies in particular to its high- and medium-

resolution Earth observation satellites, namely Alsat-2A/Alsat-2B (2.5 m) and Alsat-1B (12 m) and telecommunications satellite Alcomsat-1.

Key information on Algerian space systems:

- Alsat-1B: in operation for six years and to date has generated 13,920 products covering a total area of more than 313 million square kilometres
- Alsat-2A/Alsat-2B: in operation for 12 and 6 years, respectively, these satellites have generated more than 337,356 products covering an area of more than 37.65 million square kilometres
- Alcomsat-1: completed its fifth year of operation in 2022 and has contributed to the development, for national user sectors, of applications relating to broadcasting and telecommunications in the Ku- and Ka- bands

Algeria is also pursuing international cooperation through the conclusion of space cooperation agreements – soon to be finalized – with the Governments of the Russian Federation and the Republic of Korea and the initiation of talks with the Governments of Türkiye, Argentina and Italy on the drawing up of a memorandum of understanding on outer space. At the regional level, a cooperation agreement with the Commission for Controlling the Desert Locust in the Western Region, part of the Food and Agriculture Organization of the United Nations, is being finalized.

Furthermore, ASAL, as a member of the Arab Space Cooperation Group, took part in the Group's sixth meeting, which was organized by the United Arab Emirates Space Agency on 22 February 2021. The aim of the Group, which brings together the space agencies and institutions of the Arab countries, is to promote inter-Arab cooperation and exchange in the field of space science and technology.

ASAL took part in the following events dedicated to space technologies and applications, organized by the agencies, institutions and United Nations bodies responsible for space-related matters:

- Fourth African Space Generation Workshop in support of the United Nations Programme on Space Applications, held online on 25 and 26 February 2021
- Kick-off meeting for the CropWatch Innovative Cooperation Programme for Agricultural Monitoring of China, held online on 22 March 2021
- International Space Forum (ISF), on the follow-up to the activities of ISF-2019, organized by the Italian Space Agency and the University Mediterranea of Reggio Calabria, held online on 5 July 2021
- United Nations-Mongolia Workshop on the Applications of Global Navigation Satellite Systems, held online from 25 to 29 October 2021
- Workshop on Africa-Japan CubeSat Cooperation, held on 26 August 2022 in Tunis

At the regional level, Algeria has continued to support initiatives to promote inter-African cooperation for sustainable development and human well-being in Africa. Accordingly, a framework agreement for scientific and technical cooperation has been signed by ASAL and Félix Houphouët-Boigny University of Côte d'Ivoire with the aim of fostering academic and scientific research activities relating to outer space.

With regard to meetings, on 30 March 2022 ASAL participated in a meeting on the project to establish a constellation of satellites for the management of African resources and the environment. The objectives of the meeting, which was held via videoconference with the space agencies of the countries concerned, namely Algeria, South Africa, Kenya and Nigeria, were to revitalize the project and discuss the next steps for its implementation.

Algeria also participated in the following regional events, which were held remotely owing to the coronavirus disease (COVID-19) pandemic:

- Third training workshop on Earth observation for the monitoring of land degradation, organized jointly by the African Regional Centre for Space Science and Technology Education, affiliated with the United Nations, and the Sahara and Sahel Observatory and held from 16 to 18 February 2021
- Panel discussion by heads of African space agencies on current trends and innovations in the small-satellite industry, organized by the Space Generation Advisory Council and the International Academy of Astronautics and held on 29 November 2021 at the African Symposium on Small Satellites

In addition, Algeria is continuing to adapt its national legal framework governing space activities, including through the preparation of implementing legislation for the Space Activities Act, which was enacted in 2019. That implementing legislation comprises:

- Legislation relating to the procedures for registration in the National Registry of Objects Launched into Outer Space
- Legislation on mechanisms for risk prevention and emergency response

The Space Activities Act establishes a legal framework enabling the State to regulate activities that could give rise to international liability, while ensuring their achievability and sustainability, thus serving as an essential tool in guaranteeing safety and sustainable development.

## **Bahrain**

[Original: English]  
[31 October 2022]

The Kingdom of Bahrain, has been focusing its space activities efforts on promoting space science through awareness-raising, capacity-building, developing research and enhancing innovation, constructing a sound infrastructure, establishing regional and international relationships of cooperation, responding to national requirements for achieving comprehensive and sustainable development and encouraging the Kingdom to become a party in international conventions and agreements.

Space-related activities in the Kingdom of Bahrain are coordinated by the National Space Science Agency (NSSA), which was founded in 2014 by a royal decree. NSSA provides support to the Bahraini science, education, business, research and development sectors and represents the Kingdom in the international space community. NSSA carries out a broad range of activities at the national, regional and international levels, and its efforts were globally recognized with the announcement of the International Astronautical Federation (IAF) Excellence in “3G” Diversity Award during the seventy-third International Astronautical Congress in September 2022. The following is a summary of space activities:

### **1. Space segment**

(a) The first Bahraini-United Arab Emirates 3U CubeSat, “Light-1”, was successfully launched from the International Space Station into orbit in February 2022. The mission of Light-1 is to build capacity and evaluate the performance of a new miniature terrestrial gamma ray system in the space environment. Its data is currently being collected, processed and made available to research centres upon demand;

(b) NSSA recently signed a contract for the construction and launch of the first Bahraini 3U CubeSat with a European company, currently in the mission design review phase. The mission is to build capacity by including two payloads to be fully designed and assembled by the Bahrain Space Team, testing new inventions in space and responding to national requirements of Earth observation data for achieving sustainable development;

(c) In September 2022, the NSSA “Aman” payload was announced the winner of the United Nations/Mohammed Bin Rashid Space Centre Cooperation Programme on Payload Hosting Initiative during the seventy-third International Astronautical Congress. NSSA will provide a tested payload on board the centre’s 12U satellite. The payload will secure satellite images and data by implementing an optimized novel encryption algorithm;

(d) NSSA is in discussion with a partner to develop the first Bahraini payload to be on board a lunar rover.

## **2. Earth observation**

(a) The Satellite Imagery and Data Analysis Lab at NSSA has been partially established with necessary hardware and software and has started to introduce services to stakeholders to support national projects covering the areas of disaster management, infrastructure and urban planning, renewable energy, environment, agriculture, and maritime issues;

(b) One of the prominent projects currently in progress is an early detection system for the Red Palm Weevil and deficient irrigation in agricultural areas, in collaboration with local partners and a European company;

(c) Work by the NSSA lab team is in progress to prepare several geospatial databases and studies serving national stakeholders, including on palm tree count and health conditions; green area monitoring; greenhouse gas count; the location and determination of suitable land for growing mangroves; the determination of arable land; heat maps and air quality; and the determination of suitable locations to place solar panels.

## **3. Capacity-building**

(a) NSSA organized more than 15 specialized training opportunities for its employees, as part of the capacity-building programme, mainly in three fields: Earth observing satellite building; operations; and data and image processing and analysis. Most prominent were the Space Challenges Boot Camp in Bulgaria and the Applications of Remote Sensing and Geographic Information Systems in Agriculture course organized by the Indian Institute of Technology-Roorkee. Additionally, NSSA secured hands-on learning for its employees on the operation of a satellite mission through a partner;

(b) NSSA organized five specialized workshops for stakeholders at the national level from different government entities, higher education institutes and the defence sector to learn more about important concepts related to space technologies and applications and to support sustainable development in collaboration with esteemed international space companies from Europe and the United States of America.

## **4. Research activities in the space field**

(a) Part of the NSSA mandate is to conduct scientific research to invent technical solutions and to analyse space data. As of September 2022, NSSA had managed to publish more than 30 research papers in top ranked journals and present them at well-known conferences, and also presented five research papers at the International Astronautical Congress in 2022;

(b) NSSA personnel were selected to mentor for space research by IAF;

(c) In October 2022, NSSA and a partner initiated a joint space science programme in support of the possibility of establishing a regional space research centre.

## 5. Community initiatives, awareness and events

(a) Since its establishment, NSSA has worked on promoting space science through many community initiatives targeting youth, in collaboration with the Ministry of Education, the Higher Education Council and higher education institutes and scientific research centres;

(b) NSSA completed 19 school visits, which included workshops and guest speakers, in addition to organizing six local public events and competitions in 2022. Most prominently, NSSA collaborated with the National Aeronautics and Space Administration (NASA) of the United States on the annual space applications hackathon – its fourth such collaboration – which took place in October, among a series of local events organized during World Space Week, which also included promoting the Large Diameter Centrifuge Hypergravity Experiment Series (HyperGES), a fellowship programme of the Office for Outer Space Affairs and the European Space Agency, among higher education institutes in Bahrain; organizing the participation of more than 60 students in Earth observation courses organized by Hexagon and Brilliant Remote Sensing Labs during the summer holiday; conducting sessions on STARS Camps and the “Experiment on the moon” competition in collaboration with Orbital Space; and finally selecting four students to attend the International Space Camp 2023 in the United States, in collaboration with the Kallman Foundation’s Endeavour Scholarship Program;

(c) NSSA provided a three-month internship opportunity for university students during the fourth quarter of 2022;

(d) The past two years witnessed a major increase in the presence of NSSA in the media, with NSSA sharing insights into the space programme in Bahrain, NSSA strategic progress updates and the latest trends, technologies and applications in the field to spread awareness of the importance of space science. NSSA issued more than 120 press releases in local newspapers and 300 social media updates and completed 25 TV and radio interviews. In addition, NSSA issued *SEEK* magazine, which is purposely designed to educate children and youth about space and space science, technologies and applications, and posts many space-education articles on its website and social media accounts and in local newspapers;

(e) For the first time in the Kingdom, the Bahrain International Airshow, taking place in November 2022, will host the first Space Forum on the sidelines of the event and the first external meeting of the Arab Space Cooperation Group held outside the United Arab Emirates.

## 6. International cooperation

(a) During the past few years, NSSA has succeeded in establishing diverse local, regional and international partnerships to support efforts in the space sector and contribute to achieving the optimal benefit from space science and applications. NSSA has established strong collaborations with 50 entities from 19 countries across all continents and, in 2022, NSSA signed the Artemis Accords and memorandums of understanding with Oman and the Egypt;

(b) The Kingdom of Bahrain is a member of relevant international space organizations and bodies, such as the Office for Outer Space Affairs, the Committee on the Peaceful Uses of Outer Space, IAF, the Arab Space Cooperation Group, the Space Generation Advisory Council and the Global Future Council on Space of the World Economic Forum;

(c) The Kingdom has signed three of the five main international space treaties developed under the United Nations governing activities in the peaceful exploration and use of outer space;

(d) Following its becoming an IAF member, NSSA was selected to be part of the IAF International Project/Programme Management Committee and was chosen to mentor for space research by IAF;

(e) NSSA participated in more than 45 space-related conferences and events, and spoke at more than 15 of them.

## **Bolivia (Plurinational State of)**

[Original: Spanish]  
[24 October 2022]

As part of the country's policies on universalizing telecommunications services, in 2010 the Bolivian Government created the Bolivian Space Agency (ABE) as the body responsible for managing and implementing the Túpac Katari Satellite Programme. The Supreme Decree establishing the agency (Decree No. 423 of 10 February 2010) states in its preamble that the purpose of the satellite is to provide telecommunications services to all people living in the Plurinational State of Bolivia who lack access to such services. The functions of ABE were expanded through Supreme Decree No. 4735 of 8 June 2022 to include, notably, the task of contributing to the narrowing of the digital divide in the country by means of space technologies. Satellite technology, on account of the coverage it provides, is an effective and efficient means of deploying communications networks in remote areas with very low population density. The use of ground-based means of communication to meet that need would require the investment of millions of dollars, and deployment would take several years.

The Túpac Katari-1 satellite was launched on 20 December 2013 and entered into commercial operation in April 2014. To date, ABE has sold the services of the satellite segment of the Túpac Katari-1 satellite to public and private institutions and has also made satellite television and radio services available free of charge and provided Internet services to remote rural localities with the aim of universalizing access to telecommunications services. Ninety per cent of the satellite's capacity has been used so far.

## **India**

[Original: English]  
[28 October 2022]

India pursues bilateral and multilateral relations with other countries and space agencies in the peaceful uses of outer space. Over the years, India has signed space cooperation documents with 61 countries and 5 multinational bodies. The cooperative activities identified therein include activities around technology protection, ground station support, cooperation in aerosol monitoring satellite missions, space situational awareness and the peaceful uses of outer space.

The synthetic aperture radar satellite, a joint realization of the National Aeronautics and Space Administration (NASA) of the United States of America and the Indian Space Research Organization (ISRO), has completed major milestones and is currently undergoing integrated payload level checks at the NASA Jet Propulsion Laboratory. ISRO is in discussion with Japan, the Russia Federation, France and South Africa to establish reference stations for its regional satellite navigation system, Navigation with Indian Constellation (NavIC). To support India's human spaceflight programme, ISRO is also collaborating with the France, Japan, the Russian Federation and the United States on various aspects of human spaceflight capabilities.

In addition to these ongoing activities, a few new ISRO international cooperation initiatives have been introduced. Discussions are progressing with Australia on placing a temporary ground station to support the Gaganyaan mission. ISRO and the European Space Agency (ESA) have agreed on the absolute calibration of the ISRO global navigation satellite service receiver in ESA facilities to promote interoperability between NavIC and the European Satellite Navigation System (Galileo), thereby improving availability and position accuracy for users. In support

of capacity-building in Bhutan, India and Bhutan are jointly building a small satellite and Bhutanese engineers are being trained in ISRO centres on the design, assembly, integration and testing of the satellite and on processing the data from such a satellite. Under the India-Association of Southeast Asian Nations space cooperation, the process for establishing a ground station in Viet Nam has been initiated. In response to a request from Mexico, a mobile application for forest fire monitoring using satellite data has been developed and delivered to the Mexican Space Agency. In addition, a memorandum of understanding for cooperation in the field of space has been signed with Luxembourg and the Mohammed Bin Rashid Space Centre of the United Arab Emirates.

The Government of India has announced reforms in the space sector with the intention of promoting more private sector participation in space activities. A new space regulator, the Indian National Space Promotion and Authorization Center, has been established for authorizing and supervising space activities in the country.

In 2018, India announced an eight-week capacity-building programme on nanosatellite development, named UNISpace Nanosatellite Assembly and Training (UNNATI) as a UNISPACE+50 initiative. The first two trainings, conducted in 2019, reached 60 officials from 33 nations. The third training started in October 2022 and is aimed at reaching about 32 officials from 22 nations.

ISRO continues to share its facilities, expertise in the application of space science and technology by conducting short-term and long-term courses through the Indian Institute of Remote Sensing and the United Nations-affiliated Centre for Space Science and Technology Education in Asia and the Pacific at Dehradun. At present, there are more than 4,500 participants from more than 110 countries in the programmes.

ISRO continues to play an active role in the deliberations of the Committee on the Peaceful Uses of Outer Space. India is chairing the working group under the agenda item on the long-term sustainability of outer space of the scientific and technical subcommittee. The working group held both formal meetings and informal consultations during the sixty-fourth session of the Committee.

ISRO also actively participates in the meetings of prominent multilateral forums including the International Astronautical Federation, the International Academy of Astronautics, the International Institute of Space Law, the Committee on Earth Observation Satellites, the International Society for Photogrammetry and Remote Sensing, the Coordination Group on Meteorological Satellites, the International Committee on Global Navigation Satellite Systems, the Committee on Space Research, the International Space Exploration Coordination Group and the Inter-Agency Space Debris Coordination Committee.

## **Lao People's Democratic Republic**

[Original: English]  
[1 November 2022]

### **Summary**

Laosat-1 was launched by an LM-3B/E rocket from the Xichang Satellite Launch Centre on 20 November 2015, at 16:07 (UTC). After the launch and early orbit phase, the satellite was positioned successfully at 128.5 degrees East, on 27 November 2015.

To date, the spacecraft (subsystems and units) and all the payload equipment have been performing reliably without experiencing any critical anomalies. The satellite is operating well and all on-board equipment, including the primary and redundant equipment, is functioning correctly.

The measured performance of the solar array and battery indicates that sufficient power margin will be available until the satellite end of life.

### **Satellite payload**

Laosat-1 is equipped with a C-band and Ku-band payload consisting of the antenna subsystem and the repeater subsystem. There are two antennas, 14 C-band active transponders and 8 Ku-band active transponders.

### **Station keeping**

Laosat-1 is positioned at 128.5 degrees East and the station-keeping manoeuvres performed include East-West station-keeping manoeuvres, North-South station-keeping manoeuvres and double-pulse manoeuvres.

With regard to current orbital elements, as at 3 October 2022, the orbital elements, as calculated on 5 October 2022, were as follows:

- Semi-major axis (m): 42165231.667
- Eccentricity: 0.000211
- Inclination (degree): 0.14856
- Right ascension of ascending node (degree): 90.514425
- Argument of perigee (degree): 47.326129
- Mean anomaly (degree): 17.105827

### **Satellite ground control stations**

The single ground control station for the monitoring and control of Laosat-1 is located at a satellite control facility in Vientiane.

The Ministry of Post and Telecommunications of the Lao People's Democratic Republic has been actively involved in the design, development, launch and operation of satellites since 2015. The Laosat-1 operation team was also initially trained in all aspects of satellite control and operations in China. The operation team has the backup support of a large number of Laosat-1 engineers who have been extensively trained by the China Association for Science and Technology in satellite design, development, manufacturing and testing in China. The team also enjoys the support of other highly qualified, trained and experienced Laosat-1 engineers who have been closely involved in the satellite system and subsystem design and in its product assurance.

### **Payload operations**

The satellite payload services are monitored 24/7 at the station of the Lao People's Democratic Republic by Laosat-1 engineers. All the equipment used for this purpose is also backed up by sufficient redundancy on site.

A payload capacity of more than 12 transponders has been leased to numerous national and international customers, which are satisfied with the quality of services supported by the satellite.

### **Conclusion**

No critical or major anomalies have so far occurred or been detected on the satellite. Since its launch on 20 November 2015 at 16:07 UTC, the satellite has been performing in line with its designed specifications and supporting various types of communication services, and all statuses on the satellite are normal. Most of its payload capacity has already been leased to numerous national and international customers, and most of the services are running.

## Mexico

[Original: Spanish]  
[28 October 2022]

Mexico contributes to international cooperation in the peaceful uses of outer space through the Mexican Space Agency (AEM), which promotes, coordinates and carries out activities in collaboration with national scientific and academic institutions and with space agencies, international bodies and intergovernmental organizations within the framework of international cooperation agreements.

In Mexico, during the COVID-19 pandemic, AEM organized online meetings with various space agencies around the world, including the National Aeronautics and Space Administration of the United States of America, the European Space Agency (ESA), the National Centre for Space Studies of France and the Italian Space Agency. During those meetings, different approaches, technologies and best practices relating to the use of space technologies to address the impact of the COVID-19 pandemic were exchanged. These experiences, in addition to strengthening international cooperation ties, will facilitate preparedness for the future. In the face of a health emergency such as the one we are experiencing, no country has all the answers, and international cooperation is crucial for strengthening our planetary resilience and mitigating the adverse effects of the pandemic.

In the region of Latin America and the Caribbean, critical steps are being taken. With the creation of the Latin American and Caribbean Space Agency (ALCE), the Latin American region will have a coordinating body for space activities that will be responsible for strengthening academic collaboration among members of the region and for joint work with other space agencies, such as ESA.<sup>1</sup> This collaboration will promote the exchange of data, equipment and software, the transfer of technology, experience and best practices and the building of human capital among the countries of the region. One very important possibility is the development of shared infrastructure in the form of both ground infrastructure and satellites for communications and Earth observation. ALCE will undoubtedly be of great assistance in dealing with the impact of any future pandemic. It is hoped that this initiative will be strengthened for the good of the region.

## Netherlands

[Original: English]  
[28 October 2022]

### Introduction

The Netherlands remains committed to the international rule of law both on Earth and in outer space. In accordance with the United Nations treaties related to outer space, the Netherlands established the Dutch Space Activities Act. The number of space activities in the Netherlands is growing structurally, resulting in an increase in the number of Dutch space operators and satellites under Dutch jurisdiction and control. In 2022 there were five licensees under the Dutch Space Activities Act, which operated 21 Dutch satellites: 10 geostationary satellites and 11 low Earth orbit satellites. In light of the expectation that the number of satellites under Dutch jurisdiction will continue to increase over the coming years, the Netherlands is particularly committed to a safe, secure and sustainable outer space environment.

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<sup>1</sup> Javier López Casarín, “Agencia Latinoamericana y del Caribe del Espacio, una nueva etapa en la búsqueda del conocimiento en pro de la humanidad”, *Noticias de América Latina y del Caribe*, 16 October 2020. Available from [www.nodal.am/2020/10/agencia-latinoamericana-y-caribena-del-espacio-una-nueva-etapa-en-la-busqueda-del-conocimiento-en-pro-de-la-humanidad](http://www.nodal.am/2020/10/agencia-latinoamericana-y-caribena-del-espacio-una-nueva-etapa-en-la-busqueda-del-conocimiento-en-pro-de-la-humanidad).

The main highlights of outer space activities in 2022 were:

1. Long-term sustainability analysis of the Dutch Space Activities Act.
2. Geodata for Agriculture and Water.
3. National growth fund investments in laser communications.
4. Hiber abandons plans for an Internet-of-things satellite network.
5. Launch of the Delfi-PocketQube satellite.
6. Update of the Netherlands space policy.
7. Artemis 1 powered by Dutch solar panels.
8. Tropospheric Monitoring Instrument remains operational.

### **1. Long-term sustainability analysis of the Dutch Space Activities Act**

The Netherlands is conducting an analysis of how the 21 long-term sustainability guidelines match up with existing regulations and how the Dutch Space Activities Act could be adapted accordingly. Additionally, the analysis looks at new space initiatives and expected developments in the short and long term, and what impact they have on current rules and regulations. For example, the Netherlands has seen a significant increase in international requests for telemetry, tracking and control support for foreign satellites, especially during the launch and early orbit phase. The results of this analysis are expected before the end of this year and will serve as input for deliberations as to whether to amend the Dutch Space Activities Act at a later stage.

### **2. Geodata for Agriculture and Water**

The Netherlands supports the use of satellite data for achieving the Sustainable Development Goals by funding the Geodata for Agriculture and Water (G4AW) Facility. This year, the programme reached the milestone of supporting 4 million smallholder food producers with satellite-based information services. In 2021, the Netherlands Space Office, responsible for the G4AW programme, received the GEO Innovation Award from the Group on Earth Observations in Geneva for its role as an early adopter of space data for sustainable development. More public investment is needed, however, in order to further scale up existing information services that help smallholders to increase their productivity in an environmentally sustainable manner and ensure the efficient use of water. The Netherlands cooperates closely with the Food and Agriculture Organization of the United Nations in making data on water productivity in agriculture available.

### **3. National growth fund investments in laser communications**

Laser satellite communications is the solution for high-speed secure communications in space. Dutch stakeholders have long been involved in European Space Agency programmes aimed at the development of technologies and products for optical communication between satellites, ground stations and aircraft. This year, the development of laser satellite communications has been accelerated by funding from the Dutch National Growth Fund, which invests in fields that have the highest potential for structural and sustainable economic growth. The technology is part of the NXTGEN HIGHTECH project, which in total has received 450 million euros. Over the next seven years, public and private stakeholders will invest nearly 150 million euros for research and development activities in laser satellite communications.

### **4. Hiber abandons plans for an Internet-of-things satellite network**

Despite a promising start, Dutch start-up Hiber has decided to drop its plans for an Internet-of-things small satellite constellation. Four satellites had been launched to date. Issues with two of those satellites prevented Hiber from launching a commercial service. Fixing them would be too costly, while the Covid-19 pandemic has prevented

it from sourcing additional funds to complete the rest of the planned constellation. Instead, Hiber intends to provide Internet-of-things services through a third-party system.

#### **5. Launch of the Delfi-PocketQube satellite**

The Delfi-PocketQube (Delfi-PQ) satellite was launched on the Falcon-9 rideshare mission on 13 January 2022. Delfi-PQ is a picosatellite developed through the Delfi Programme of the Technical University Delft and built to the 3P PocketQube form factor. This new PocketQube platform, with a standardized cube size of 5 cm, is seen as an opportunity for innovation and offers research challenges in the field of systems and component miniaturization. Delfi-PQ consists of a core platform securing basic functionalities that will iteratively evolve over time. Advanced subsystems as well as payloads will be developed as separate projects, using a standard interface specification. Only when they are ready in terms of hardware and software and can be successfully integrated and tested will they become a formalized part of the next satellite, either as a technology demonstration payload or as an extended capability of the core platform. After the first PocketQube launch, development iterations will continue and the frequency of launches is expected to increase.

#### **6. Updated Netherlands space policy**

As part of its regular three-year cycle, the Netherlands has updated its space policy. The Netherlands recognizes the importance of space in both the Dutch economy and in its society as a whole. Satellite data, navigation and communications are indispensable parts of our daily lives. The updated Netherlands space policy is defined within four domains: (a) innovation and growth; (b) security and strategic autonomy; (c) care for planet Earth; and (d) science and inspiration. In total, the Netherlands is looking to invest over 500 million euros in space activities in the period 2023–2025.

In addition, the Netherlands Space Office will develop a long-term space agenda that will help to guide public decision-making in the coming decade, identifying which investments are necessary to tackle tomorrow's challenges, while ensuring a sustainable and prosperous society today.

#### **7. Artemis 1 powered by Dutch solar panels**

Half a century since the last manned missions to the Moon, Artemis 1 is set to launch. Part of this mission to return to the moon is the European Service Module, which provides water, propulsion and electricity to the Orion Multi-Purpose Crew Vehicle. The electricity is provided by solar panels, 12 in total, built by Airbus Defence and Space Netherlands in Leiden. Airbus Netherlands will build the solar panels for the upcoming five Moon missions, including for human spaceflight.

#### **8. Tropospheric Monitoring Instrument remains operational**

In 2017 the Tropospheric Monitoring Instrument TROPOMI was launched on-board the Sentinel-5 Precursor satellite as part of the European Earth Observation Programme (Copernicus). The Netherlands, together with its European partners in Copernicus, was responsible for the technical development of the TROPOMI instrument. The performance of the instrument exceeded expectations and, five years onward, TROPOMI continues to deliver invaluable atmospheric data, leading to new insights into combating climate change and into air-quality management.

### **Slovakia**

[Original: English]  
[28 October 2022]

The Slovak Republic actively contributes to the promotion of international cooperation in the peaceful uses of outer space. The purpose of these activities is to

support the democratization of space through best practices and experience-sharing in the area of space ecosystem set-up and building partnerships between well-established and new space stakeholders, with a particular focus on industry.

### **Cooperation with the European Space Agency**

The Slovak Republic became the newest associate member State of the European Space Agency (ESA) on 13 October 2022, following the ratification of the Association Agreement between the Slovak Republic and ESA by the President of the Slovak Republic on 12 October 2022. The agreement was signed on 14 June 2022 in Noordwijk, the Netherlands, at the European Space Research and Technology Centre. The associate membership supersedes the bilateral Slovak-ESA cooperation under the Plan for European Cooperating States (PECS), an ESA programme implemented in Slovakia since 2016 by the Ministry of Education, Science, Research and Sport of the Slovak Republic. PECS has resulted in 68 projects selected for implementation through seven calls for proposals with a planned budget amounting to 14.5 million euros and an average value per contract of 150,000 euros. Some activities are still ongoing.

The key existing competences identified in Slovakia demonstrated during the PECS period are:

- Space hardware instrumentation and analysis
- Use of Earth observation satellite data – downstream products and applications.
- Participation in space situational awareness and tracking

### **Slovak Space Office**

The Slovak Space Office was established in the Ministry of Education, Science, Research and Sport of the Slovak Republic on the basis of governmental resolution 635/2020 on 1 January 2021 in order to govern and coordinate space activities in Slovakia and to cooperate with ESA as well as in the context of the European Union Agency for the Space Programme (EUSPA) and in matters related to the Committee on the Peaceful Uses of Outer Space. However, Slovakia perceives outer space not only as an important domain for research and exploration, but also as one of the key pillars of the modern economy. For this reason, the industrial space activities were entrusted to the Slovak Investment and Trade Development Agency (SARIO), under the auspices of the Ministry of Economy of the Slovak Republic, and the Industry Branch of the Slovak Space Office was created there in May 2021.

The Industry Branch of the Slovak Space Office at SARIO supports the sector portfolio diversification of Slovak companies towards space and other promising high-tech areas with significant growth potential through sector-entry consultancy and matchmaking activities to boost the growth and internationalization of the Slovak space ecosystem. In order to work efficiently on the international level, SARIO actively develops its international partner network, which includes foreign space agencies, such as the Japan Aerospace Exploration Agency, the German Aerospace Centre, the Israel Space Agency, the Italian Space Agency and the Korea Aerospace Research Institute as well as industry associations, clusters and companies.

The 2021 online event “Emerging Space”, the Slovak flagship space industry conference, was organized by the Slovak Space Office, with attendance by more than 400 participants. The event provided expert panels on the topics of emerging space ecosystems, emerging technological domains and markets and emerging sector players. It included speakers from the Office for Outer Space Affairs, ESA, the European Space Policy Institute, the International Astronautical Federation (IAF), EUSPA and ASD-Eurospace.

The Industry Branch of the Slovak Space Office organized two side events during the most recent sessions of the Committee on the Peaceful Uses of Outer Space, in 2021 and 2022, focusing on emerging space countries and ecosystems. During the

Committee session in 2022, the “Emerging space @ COPUOS 2022” side event took place on 7 June 2022, and included representatives from the International Space University and IAF. In 2021 the Industry Branch held a side event entitled “Space Ecosystem building in emerging space countries” together with partners from industry associations (ASD-Eurospace) and the European Space Policy Institute.

### **International Astronautical Congress**

During the seventy-third International Astronautical Congress, which took place in Paris from 18 to 22 September 2022, the Slovak Space Office organized a special session with the theme of “Building bridges between the established and emerging industry” in cooperation with main partners from the Office for Outer Space Affairs, Eurisy and ASD-Eurospace, and joined by speakers representing institutions and companies from Singapore, Nigeria, Bulgaria, Italy and Ecuador. This activity was conducted in close collaboration with the Office for Outer Space Affairs and its space economy awareness-raising initiative. A similar session led by Slovakia was also held during the Expo 2020 Dubai space week in October 2021 as a part of the Best Practice Area sessions.

### **International regional cooperation**

On 13 December 2021, the Memorandum of Understanding of the Visegrad Group Countries on Enhancing Cooperation in the Field of Space Research and Peaceful Use of Outer Space was signed in Budapest at the prime minister level in order to strengthen cooperation between the Visegrad Group countries in the field of space research, development and innovation; share experience; and support mutual academic, scientific and industrial cooperation.

### **Activities of the Institute of Experimental Physics of the Slovak Academy of Sciences**

The search for exospheric refilling and emitted natural abundances/planetary ion camera (SERENA/PICAM) science payload, constructed with participation of the Institute of Experimental Physics of the Slovak Academy of Sciences (IEP SAS) is on the ESA BepiColombo cruise flight to the planet Mercury. The second flyby of Mercury took place on 23 June 2022. The first science results from SERENA/PICAM during the first flyby of Mercury, on 1 October 2021, are currently accepted for publication in the journal *Nature*.

The anti-coincidence detector module, constructed at IEP SAS, is already installed on board the ESA Jupiter Icy Moons Explorer (JUICE) spacecraft as part of the Particle Environment Package. The launch of JUICE is currently planned for April 2023.

In the field of cosmic ray modelling, IEP SAS research is mainly devoted to the modulation and distribution of cosmic rays in the heliosphere and the motion of cosmic ray particles in the Earth’s magnetosphere.<sup>2</sup>

The Slovak National Space Safety Programme Study was elaborated in 2022. IEP SAS led the space weather domain part of the study. The results of the study will allow the straightforward contribution of Slovak institutions to the international effort to predict and mitigate hazardous space weather events.

The Faculty of Mathematics, Physics and Informatics of Comenius University Bratislava actively collaborates with the Astronomical Institute of the University of Bern on data collection for space debris objects to support their cataloguing. The Faculty acquires on regular basis astrometric observation data for objects in higher orbits with its 0.7-m Newton telescope situated at the Faculty’s Astronomical and Geophysical Observatory in Modra, Slovakia.

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<sup>2</sup> Gecášek and others, “COR system: A tool to evaluate cosmic ray trajectories in the Earth’s magnetosphere”, *Advances in Space Research*, vol. 70, No. 4 (15 August 2022). See also <https://cor.crmmodels.org>.

The Slovak private sector is developing an autonomous sensor network and coordinates international campaigns dedicated to the monitoring of space debris and near-Earth asteroids. The Slovak private sector is developing its own capability for autonomously observing objects from very low Earth orbit up to heliocentric orbit. Legal and technical interfaces have been established with partners abroad, including from Poland and Czechia as well as with ESA, to connect to their sensors and sensor networks. These interfaces have been used for intensive campaigns where several partners' sensors were coordinated by the Slovak private sector to efficiently collect astrometric and photometric data of space objects simultaneously.

#### **Activities of the Slovak Central Observatory in Hurbanovo**

The Slovak Central Observatory is monitoring solar activity through daily drawings of sunspots; recording images of the solar photosphere and the chromosphere using a telescope with an H-alpha filter; and observing the solar spectrum using a spectrograph.

The Slovak Central Observatory organized the National Solar Physics Meeting with international participation from 6 to 10 June 2022 in Piešťany, presenting the results of space weather research activities.

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