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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

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I. Introduction

1. At its sixtieth session, in 2023, the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space recommended that the Secretariat continue to invite Member States to submit annual reports on their space activities (A/AC.105/1279, para. 42).

2. In a note verbale dated 5 August 2023, the Office for Outer Space Affairs of the Secretariat invited Member States to submit their reports by 20 October 2023. The present note was prepared by the Secretariat on the basis of replies received in response to that invitation.

II. Replies received from Member States

Australia

[Original: English]
[19 October 2023]

The Australian Government established the Australian Space Agency on 1 July 2018. The purpose of the Agency is to transform and grow a globally responsible and respected space sector that lifts the broader economy and inspires and improves the lives of Australians. To do this, the Agency will continue to increase national capability, open doors internationally, be a responsible and effective regulator of civil space activities and inspire the community about the benefits that space brings to our everyday life.

The Australian Government continues to support Australia's space sector with significant investments across a range of portfolios, including 34.2 million Australian dollars (A$) in operational funding for the Agency. The Australian Government's 2023/24 budget also maintained important funding for:

- Moon to Mars Initiative: Moon to Mars Trailblazer, Demonstrator and Supply Chain programmes
- International Space Investment initiative: India Projects
- Enhancing the regulation of space activities
- An investigation into an Australian human spaceflight regulatory framework
- National Student Space Challenge.

The sector will be supported by the A$15 billion National Reconstruction Fund, which will provide finance for projects that diversify and transform the industry and economy of Australia. The Fund will provide targeted investments in priority areas, including enabling technologies, defence capability and transport.

Australia's recent activities in the space sector include:

(a) Delivering the Moon to Mars Initiative;

(b) Delivering the Space Infrastructure Fund;

(c) Strengthening our partnership with the National Aeronautics and Space Administration (NASA) of the United States of America;

(d) Enhancing the regulation of space activities;

(e) Promoting information-sharing and enhancing capacity in space legislation and policy;

(f) Establishing the Space Regulation Advisory Collective;

(g) Promoting Australian women in space;

(h) Launching the National Indigenous Space Academy.

Delivering the Moon to Mars Initiative

The Moon to Mars Initiative supports Australian businesses and researchers in joining NASA's endeavour to go forward to the Moon and then on to Mars. The investment is in activities in Australia and includes three integrated elements: the Supply Chain Programme, the Demonstrator Programme and the Trailblazer Programme. The objectives of the Moon to Mars Initiative are to:

- Support Australia's ambitions to join NASA's endeavour to go forward to the Moon and then on to Mars
- Accelerate the growth of the Australian space industry
- Build Australian space capability and capacity
- Lift Australian involvement in national and international supply chains
- Inspire the Australian public

The Agency has awarded grants to Australian businesses for projects under the Supply Chain Programme (see https://business.gov.au/grants-and-programs/moon-to-mars-supply-chain-capability-improvement-grants/grant-recipients). Supply Chain Capability Improvement Grants provide Australian businesses with grant funds to build capacity to deliver products and services into domestic and/or international space industry supply chains that could support Moon to Mars activities.

In June 2023, 10 projects were announced as sharing in close to A$40 million under the Demonstrator Programme. The funding will assist companies in getting their technologies ready for space and in adding value to other industries, including agriculture, resources and defence (see https://business.gov.au/grants-and-programs/moon-to-mars-initiative-demonstrator-mission-grants/grant-recipients).

On 20 March 2023, the Minister for Industry and Science announced grants for two successful consortiums under stage 1 of the Trailblazer Programme (see https://business.gov.au/grants-and-programs/moon-to-mars-trailblazer/grant-recipients). Each consortium will receive A$4 million to advance their early-stage designs of a semi-autonomous rover, which aims to launch no earlier than 2026 as part of the NASA Moon to Mars mission.

Delivering the Space Infrastructure Fund

The Space Infrastructure Fund is a A$19.5 million investment in seven infrastructure projects to drive the growth of Australia's space sector and address gaps in Australia's space capability. The programme enables businesses and researchers to focus on growing and developing their day-to-day operations by providing solutions to drive benefit across the Australian space sector, adjacent industries and the economy. The Fund has provided investment across states and territories, building upon Australia's strengths and needs to establish new, critical technology capability.

Strengthening our partnership with the National Aeronautics and Space Administration

In June and July 2022, NASA conducted three successful launches from the Arnhem Space Centre, operated by Equatorial Launch Australia, near Nhulunbuy in the Northern Territory. These launches were the first conducted by NASA using a commercially operated launch facility outside the United States. The NASA missions will help astronomers measure an unstudied part of emissions from Centauri A and B, helping to model stars and understand their effects on planetary atmospheres that are only observable from the southern hemisphere. This provided an opportunity to demonstrate the capability of Australian industry to support both space launches and scientific missions.

Enhancing the regulation of space activities

The Agency commenced a suite of activities aimed at supporting the growth and competitiveness of the Australian space sector while assuring the safe and responsible use of the space environment. On 17 August 2023, the Space (Launches and Returns) Legislation Amendment (Suitably Qualified Experts) Rules 2023 came into effect, amending the Space (Launches and Returns) (General) Rules 2019 and the Space (Launches and Returns) (High Power Rocket) Rules 2019. The amendments removed most requirements that a suitably qualified expert, or a person with suitable qualifications and experience, must not be a related party of the applicant, and in one instance must "be independent of" an applicant. The amendment allows applicants for space and high-power rocket authorizations to take on the role of a suitably qualified expert or a person with suitable qualification and experience, reducing the regulatory burden on applicants while continuing to ensure safety in space activities. Further proposed amendments to the legislation are expected.

Australia also published the first tranche of regulatory guidance materials for overseas payload permits, launch facility licences, high-power rocket permits, Australian launch permits and return authorizations. These guidelines help streamline the application process and involvement in our space launch industry.

Promoting information-sharing and enhancing capacity in space legislation and policy

The Agency collaborated with India, Indonesia, Japan, Malaysia, New Zealand, the Philippines, the Republic of Korea, Singapore, Thailand, Türkiye and Viet Nam in the second phase of the National Space Legislation Initiative (NSLI). The aim of NSLI is to cooperatively enhance States' capacity to develop and implement national space laws in line with international norms through mutual learning and joint comparative analysis of existing national space laws and regulations. The report on the status of the national space legislation of countries of the Asia-Pacific Regional Space Agency Forum National Space Legislation Initiative, second phase (A/AC.105/L.336) was submitted to the Committee on the Peaceful Uses of Outer Space at its sixty-sixth session. The report provided an overview of policy and legislative frameworks for space activities, as well as the national implementation of the Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space, and the involvement of private entities in national legislation and policymaking processes.

Establishing the Space Regulation Advisory Collective

The Space Regulation Advisory Collective, an open network of over 250 non-government space sector representatives, was formed to receive input on a range of space regulation issues and to inform the regulatory function of the Australian Space Agency. This includes facilitated forums on dedicated topics, providing input to the work of the Agency's Office of the Space Regulator, as well as a mechanism to raise awareness of the regulation of space activities. The membership of the Space Regulation Advisory Collective includes industry, academia and other non-government entities. Two forums have been held in 2023: an inaugural forum in May to define priority areas of focus and a forum in October focusing on the regulation of on-orbit (Earth orbit) operations.

Promoting Australian women in space

In November 2022, the Minister for Industry and Science announced that Australia had its first female astronaut, with University of New South Wales alumna Meganne Christian selected as part of the European Space Agency's 2022 astronaut class.

In March 2023, the Minister announced that Katherine Bennell-Pegg, Director of Space Technology at the Australian Space Agency, was to be trained as an astronaut by the European Space Agency. Katherine would be the first Australian to be trained as an astronaut under the Australian flag.

Launching the National Indigenous Space Academy

In March 2023, the Australian Space Agency launched the National Indigenous Space Academy in partnership with NASA and Monash University. In August 2023, five students were selected to take part in the initiative, which involves partnering with a scientist or engineer mentor at the NASA Jet Propulsion Laboratory (JPL) in California for a 10-week, full-time internship. The internship included a space boot camp focused on aerodynamics, robotics, astrophysics, planetary science, engineering and computer and earth sciences. The Academy creates a pathway for Indigenous students to take part in NASA JPL projects and supports the development of a diverse science, technology, engineering and mathematics workforce.

Austria

[Original: English]
[18 October 2023]

Implementation of the Austrian Space Strategy 2030+, entitled “People, climate and economy: space is for everyone”

The Austrian Space Strategy was approved in November 2021. The Strategy pursues six goals, and the corresponding measures are intended to contribute in particular to the implementation of the goal set by the Federal Government to achieve climate neutrality by 2040. For monitoring the implementation of the Space Strategy, the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, which is responsible for space affairs and the Austrian Research Promotion Agency, set up a structured process in February 2022 that continuously monitors and documents the progress of implementation. One important measure is the survey of the Austrian space sector. Work on the survey began 2022 and was completed in October 2023. The results (for the financial year 2022) are:

- The space sector consists of at least 150 organizations, 60 per cent in the corporate sector, 30 per cent in the science sector and 10 per cent in the public sector and other organizations.
- The sector has a total of at least 1,300 employees. These are employed in small units (companies and organizational units of scientific institutions). The organizations are mainly located in Vienna and the provinces of Styria and Lower Austria.
- The commitment of companies to research and development is very high, at 70 to 80 per cent of full-time equivalents. As at the European and international level, space is also a high-tech sector in Austria.
- The space sector generates total revenues of at least 209 million euros per year. The space business is primarily, but not only, an export business for institutional spaceflight. The companies in the space sector are 80 per cent nationally owned. International owners are in the minority.

It is planned to repeat the survey at regular intervals, for example every two years, in order to follow the development of the sector.

Space research

International cooperation in the physics of our solar system and the diversity of exoplanets

The Space Research Institute of the Austrian Academy of Sciences develops and builds space-qualified instruments and analyses and processes the data provided by those instruments. The Institute’s core engineering expertise is in building magnetometers and on-board computers. At the Lustbühel Observatory, the Institute operates a satellite laser ranging station, which is one of the best in the world. In terms

of science, the Institute focuses on the physics of our solar system and the diversity of exoplanets. It cooperates closely with space agencies all over the world and with a variety of national and international research institutions. Currently, the Institute is involved in 24 active and future international space missions. With HelioSwarm, selected as the new Medium-Class Explorers mission of the National Aeronautics and Space Administration of the United States of America in February 2022, the Institute wants to unveil the mystery of solar wind. In June, the BepiColombo probe flew by Mercury for the second time, collecting data from the planetary environment and preparing for the main mission. Three missions with the participation of the Institute made it into the top five of the newly selected medium-size missions of ESA: CALICO, M-MATISSE and Plasma Observatory. The James Webb Space Telescope detected sulphur dioxide in the atmosphere of an exoplanet for the first time, and the Hubble and Spitzer telescopes discovered an ocean planet orbiting Kepler-138. Researchers from the Institute were involved in both findings. See www.oeaw.ac.at/en/iwf/.

Space weather research and European Space Agency services

The University of Graz is the national coordinator of the International Space Weather Initiative and the national contact point and regional warning centre of the International Space Environment Service. The research groups on solar and heliospheric physics develop and maintain services for the European Space Agency (ESA) Space Safety Expert Service Centres. They are expert groups on solar and heliospheric weather and, since July 2023, in collaboration with Graz University of Technology, also ionospheric weather. They provide data and tools for forecasting and nowcasting space weather events from the Sun in different space weather disciplines.

Space education activities

The European Space Education Resource Office (ESERO) of ESA uses space-related topics to improve students' knowledge and competencies in the subjects of science, technology, engineering, arts and mathematics in primary and secondary education. The Austrian branch (ESERO Austria) is based at Ars Electronica in Linz and is supported by the Austrian Research Promotion Agency and the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology. ESERO Austria supports teachers in using the context of space to make the teaching and learning of relevant topics more attractive and accessible. It produces teaching materials for Austrian schools. In 2023, ESERO Austria, together with experts from academia, successfully continued the online webinar series for teachers entitled "Teaching the wonders of outer space in the classroom" and expanded teacher training. The newly established travelling exhibition "Step into space" has already been set up in various schools, and interest in it has been very high. See https://ars.electronica.art/esero/de.

International learning experiences

As part of the overall continuing education portfolio, international study trips are offered for students of the Technical University of Vienna. In the fourth quarter of 2024, in cooperation with the University of Houston, visits, lectures and group workshops with international experts and scientists in the field of space architecture will be provided for students with a first academic degree and at least three years of professional experience. See www.tuwien.at/en/ace/compact-programs/international-learning-experiences.

Participating in international networks

In November 2023, the Austrian chapter of Women in Aerospace Europe was opened. Women in Aerospace Austria aims to provide fresh inputs to the "gender equality" debate and act as a source of inspiration and empowerment for young and talented women, spotlighting the leadership of women in the space domain. See www.wia-europe.org/.

Bahrain

[Original: English]
[19 October 2023]

In 2023, the Kingdom of Bahrain has continued to focus its space activities and efforts in promoting space science through awareness, building capacity, developing research and enhancing innovation, constructing sound infrastructure, establishing relationships of cooperation, responding to national requirements for achieving comprehensive and sustainable development, and becoming a party to international conventions and agreements.

Space-related activities in the Kingdom of Bahrain are coordinated by the National Space Science Agency, which was founded in 2014 by a royal decree. The Agency provides support to the Bahraini public and private sectors and science, education, business and research and development sectors, as well as representing the Kingdom in the international space community. A summary of space activities in 2023 is provided below.

1. Space segment

(a) The process of developing, constructing and launching the first completely Bahraini 3U CubeSat with a European company (ISISPACE) is currently in progress, and the satellite is expected to be launched by the second quarter of 2024. The mission is capacity-building and to achieve Earth observation capabilities. The Bahrain Space Team is responsible for fully designing, assembling and testing four payloads on board the satellite for the purpose of capacity-building, testing new inventions in space and responding to national Earth observation data requirements for achieving sustainable development. It is considered the first CubeSat of its kind in the region to utilize artificial intelligence in processing the images on board CubeSats.

(b) Aman payload: announced the winner of the Office for Outer Space Affairs and Mohammed Bin Rashid Space Centre (MBRSC) Payload Hosting Initiative (PHI) during the seventy-third International Astronautical Congress in 2022, the project is currently in progress, and the launch is expected in the fourth quarter of 2024. The National Space Science Agency will provide a tested payload for the MBRSC 12U satellite. The payload will secure satellite images and data by implementing an optimized novel encryption algorithm.

(c) The National Space Science Agency is in discussions with partners to develop the first Bahraini payload to be one of the payloads of a lunar rover.

2. Earth observation

(a) The satellite imagery and data analysis laboratory at the National Space Science Agency has been established with essential hardware and software and is currently introducing services to stakeholders to support national projects covering the areas of disaster management, infrastructure and urban planning, renewable energy, the environment, agriculture and maritime applications.

(b) One of the prominent projects completed at the end of 2022 is the 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 National Space Science Agency laboratory team is in progress to prepare several geospatial databases and studies that serve national stakeholders. In 2023, the team completed several studies, including (but not limited to) studies on soil moisture and salinity, the impact of sea level rise on Bahrain, monitoring the concentration of chlorophyll pigment in plants, predicting the direction of dust storms and monitoring green areas in the Kingdom during the year 2022.

3. Capacity-building

(a) As part of its capacity-building programme, the National Space Science Agency organized more than 24 specialized training opportunities in 2023, mainly on Earth observation satellite building, operations, and data and image processing and analysis.

(b) In 2023, the National Space Science Agency organized five specialized workshops for stakeholders at the national level from different government entities, higher education institutes, research centres and the defence sector to learn more about important concepts related to space technologies and applications and to serve sustainable development in collaboration with esteemed international space companies.

(c) Following the PHI award and International Astronautical Foundation Excellence in 3G Diversity Award in 2022, the National Space Science Agency received four international awards in 2023, namely, the Space Generation Advisory Council (SGAC) Nebula Award, the International Astronautical Foundation Young Space Leaders award and the Environmental Systems Research Institute Special Achievement in Geographic Information Systems Award, and one member of the Agency's personnel received the annual "Outstanding young space and satellite professional below 35" award from the Society of Satellite Professionals International. Additionally, a member of the Agency's personnel won the satellite mission "best logo" award for the "813" satellite project by the National Space Science and Technology Centre in the United Arab Emirates.

4. Research activities in the space discipline

(a) Supporting research in space science, technology and applications is an integral part of the National Space Science Agency's mission. In 2023, the Agency managed to publish more than 15 research papers for well-known conferences and in top-ranked journals and recently participated with six research papers in the International Astronautical Congress 2023.

(b) After becoming a member of the International Astronautical Federation (IAF), the National Space Science Agency was selected to be part of the IAF International Programme/Project Management Committee, and one member of the Agency's personnel was selected as a mentor for space research by the IAF.

5. Community initiatives, awareness and events

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

(b) In 2023, the National Space Science Agency completed more than 29 school visits, which included workshops and inviting guest speakers, and organized the participation of more than 45 school students and two instructors in Earth observation courses organized by Hexagon and Brilliant Remote Sensing Labs during the summer holiday, in addition to the participation of four students and one instructor in the International Space Camp in the United States, in collaboration with Kallman Worldwide, Inc.

(c) The past two years have witnessed a major increase in the presence of the National Space Science Agency in the media, where the Agency shares insights on the space programme in Bahrain, the Agency's strategic progress updates and the latest trends, technologies and applications in the field to spread awareness of the importance of space science and technology. In 2023, the Agency issued more than 71 press releases in local newspapers, 200 social media updates and five television and radio interviews. In addition, the Agency posted more than 12 space education articles to its website and social media accounts and in local newspapers.

(d) In 2023, the National Space Science Agency organized five local public events, most prominently collaborating with the National Aeronautics and Space Administration (NASA) of the United States of America in the annual space apps hackathon for the fifth time in 2023, among a series of local events organized during World Space Week. In addition, Bahrain hosted the second Middle Eastern Space Generation Workshop of SGAC, being the first Arab country to host that event.

(e) The National Space Science Agency is in the process of initiating three-month internship opportunities for university students during the fourth quarter of 2023.

6. International cooperation

(a) During the past few years, the National Space Science Agency has succeeded in establishing diverse local, regional and international partnerships to support efforts in the space sector and contribute to achieving optimal benefit from space science and applications. The Agency has established strong collaboration arrangements with more than 50 entities, and in 2023 the Agency signed two memorandums of understanding, with Brilliant Remote Sensing Labs and the University of Strathclyde; three others are in progress.

(b) The Kingdom of Bahrain is a member of relevant international space organizations, such as the Committee on the Peaceful Uses of Outer Space, IAF, the Arab Space Cooperation Group, SGAC and the space committee of the World Economic Forum.

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

(d) Following the signature of the Artemis Accords on the Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids for Peaceful Purposes, the National Space Science Agency is an active member of two working groups.

(e) The National Space Science Agency participated in more than 54 space-related conferences, symposiums and events in 2023, with Agency staff members being speakers at many of them. One global initiative was the Agency’s participation in the “Space for water” project organized by the Office for Outer Space Affairs; in addition, one member of the Agency’s personnel was selected to be a mentor expert for a number of women in the field of space in the “Space for women” project organized by the Office for Outer Space Affairs.

(f) In 2022, the University of Leicester, United Kingdom, received funding from the Foreign Commonwealth and Development Office to support the National Space Science Agency with plans to help develop its satellite imagery and data analysis laboratory into a regional space research centre. The study was completed in mid-2023.

(g) In 2023, the University of Leicester, United Kingdom, and Geospatial Insight were successful in phase 1 of the United Kingdom Space Agency (UKSA) International Bilateral Fund to work with the National Space Science Agency on a programme that utilizes space technologies and applications for monitoring greenhouse gas emissions in Bahrain and the wider Gulf region. Additionally, in 2023, the United Kingdom-headquartered AstroAgency and the Dubai-based AzurX were successful in phase 1 of the UKSA International Bilateral Fund to work with MBRSC and the National Space Science Agency on a programme that utilizes space technologies and applications for water resources management, urbanization and infrastructure planning, monitoring carbon credit allocation to support environmental, social and governance initiatives, oil and gas leak detection, and natural disaster monitoring.

(h) The National Space Science Agency is currently collaborating with the National Centre for Space Science and Technology to work on two space applications,

mainly in the fields of monitoring carbon stock in mangrove trees and producing land-cover/land-use classification and identification maps.

(i) The National Space Science Agency qualified for the final stage of an international competition to launch a space payload aboard a spacecraft to detect frozen water on the surface of the Moon.

Cyprus

[Original: English]
[3 October 2023]

In Cyprus, space activities started in the late 1970s, aiming initially at receiving satellite data for meteorology, as well as at telecommunications. From 1980, the Makarios teleport of the Cyprus Telecommunications Authority (Cyta) was in operation. Later, Cyprus became a member of the International Telecommunications Satellite Organization, the International Mobile Satellite Organization and the European Telecommunications Satellite Organization. In May 2003, the first Greek and Cypriot telecommunications satellite, Hellas-Sat II, was launched. Since then, several telecommunications satellite operators have established their headquarters in Cyprus. In May 2004, the Republic of Cyprus joined the European Union, which gave Cypriot stakeholders the opportunity to participate actively in European Union research and space-related programmes (i.e. Sixth and Seventh Framework Programmes for Research and Technological Development, Horizons 2020, Galileo/European Geostationary Navigation Overlay Service (EGNOS) and Copernicus).

With regard to space activities in Cyprus, major developments have been undertaken, based on a decision by the Council of Ministers in 2008. In this framework, the relevant minister was assigned responsibility for the space policy sector, and the Department of Electronic Communications was appointed as the executive arm for the implementation of the European Space Agency (ESA)-Cyprus agreement. The cooperation agreement between the Republic of Cyprus and ESA was signed in August 2009, and the European Cooperation State/Plan for European Cooperating States (ECS/PECS) agreement was signed in July 2016. In November 2021, Cyprus and ESA signed the new ECS+/PECS agreement, with a period of validity of another five years (2022–2027). Cyprus considers that the most important outcome of the agreement is the formation of a “space culture” nationally and the preparation of Cyprus in the most efficient manner for future closer cooperation with ESA, that is, associate membership.

Space technologies are of strategic importance for economic growth, social prosperity and cohesion, protection of the environment, enhancing public security and civil defence, and the promotion of excellence in science, research and innovation. Recognizing this strategic importance, Cyprus has set its priorities in the sectors of satellite communications, Earth observation, space navigation and the enhancement of relations with international organizations.

Regarding satellite communications, Cyprus has important infrastructure, since the country is already operating ground satellite stations which are used by major European operators. Eight licences have also been granted to organizations to launch telecommunications satellites into orbit using Cypriot resources.

Additionally, the geographical location of Cyprus is ideal, as it is possible to connect to satellites flying over Asia, Africa and Europe, contributing significantly to the country’s goal of becoming a regional hub in the field of electronic communications.

As regards satellite navigation, in Cyprus, important infrastructure has been developed and is operating as part of the search and rescue service of the Galileo system. This infrastructure is a ground receiving station (medium Earth orbit local user terminal, or MEOLUT) capable of detecting and locating emergency beacons, and Cyprus is one of the three European host countries of such infrastructure. Also, very recently, the European Union Agency for the Space Programme took the decision to develop

two ranging integrity monitoring stations in Cyprus for the operation of the EGNOS system. This positive development serves to demonstrate the importance of Cyprus as a regional node (or hub) in the field.

Moreover, it is worth noting that Cyprus is currently working towards the establishment of an optical gateway, critical for connecting the country to the rest of the European Quantum Communication Infrastructure network for advanced secure space communications.

The field of Earth remote sensing is also an important priority for our country. Bearing in mind that Cyprus has some of the best climatic conditions for remote sensing, the country can secure funds and attract investment in this sector with the aim of developing applications in both the public and private sectors. It is very important that the know-how gained from academia and research is transferred to the industry for the commercial development of related services.

As mentioned above, the Republic of Cyprus participates in the ESA Plan for European Cooperating States to gain experience and familiarity with ESA programmes and procedures. While Cyprus does not yet participate in any mandatory or optional ESA programmes, the country does fully participate in related European Union research and space programmes. Furthermore, Cyprus is a member of the Committee on the Peaceful Uses of Outer Space, a member of the organization Eurisy and a member of the Satellite Memorandum of Understanding within the European Conference of Postal and Telecommunications Administrations.

As far as recent space developments in Cyprus are concerned, it is important to highlight the publication of the national space strategy, which was approved by the Council of Ministers on December 2022. The Space Strategy for Cyprus 2022–2027 is an operational document that was collectively developed by the Department of Electronic Communications of the Deputy Ministry of Research, Innovation and Digital Policy. Its aim is to structure and coordinate space policy-related matters in Cyprus, as well as to demonstrate the willingness of the stakeholders to work together for the strengthening of the national space ecosystem.

Nowadays, the space ecosystem plays a fundamental role in our everyday lives. Many of the services we use, particularly in relation to communication, observation and navigation, rely on data derived from space. The use of space technologies, along with a structured strategy, is a high priority on the political agenda of Cyprus, as these technologies can play a key role in promoting research and innovation, an inclusive society, achieving a smart and sustainable economy, as well as the wider development of excellence.

Further to that, a noteworthy reference is the national space bill for outer space activities, which has now been submitted to the House of Representatives of the Republic of Cyprus for passage into law. The passage of the bill into law is expected around the beginning of October 2023. The proposed space legislation has its origins in the treaties and principles established by the Committee on the Peaceful Uses of Outer Space. The purpose of the bill is to create the appropriate institutional framework, considering the international obligations of the Republic of Cyprus and ensuring that space activities are carried out in a manner that is safe for the environment, the safety of persons and property and the general interests of the Republic. With the enactment of this legislation, Cyprus will lay a solid foundation for the development and strengthening of its space ecosystem.

In addition, part of the country’s action plan is the establishment of a business incubation centre and the creation of a local space cluster, including the establishment of synergies with existing local initiatives. Specifically, a business incubator is a specialized workspace aimed at supporting start-up businesses, spin-offs and small and medium-sized enterprises through the provision of facilities, external expert advisers, entrepreneurial and administrative support, as well as other assistance. Given its significance, this action is expected to be soon materialized.

Finally, it is worth mentioning the high-level workshop on the topic “Satellite-based services for disaster risk management”, held in Nicosia on 17 May 2023 under the auspices of the Deputy Minister of Research, Innovation and Digital Policy. The event was co-organized by the Department of Electronic Communications of the Deputy Ministry, the European Union Agency for the Space Programme and Eurisy, and aimed to highlight the potential of satellite applications in the field of disaster risk management. Delegates had the opportunity to share views and experiences and to discuss ways of using satellite technologies in the management of emergency situations arising from natural disasters, focusing on the further exploitation of the Copernicus, Galileo and Governmental Satellite Communications programmes of the European Union.

Meanwhile, a search and rescue drill was conducted at sea using space technologies and the services of the European Union Galileo and Copernicus space programmes, under the coordination of the search and rescue coordination centre in Larnaca, Cyprus. The exercise was conducted within the framework of the multinational civil-military cooperation exercise “Argonautis 2023” with the participation of many government services as well as human resources and aeronautical means of foreign countries.

From an overall perspective, space technologies, data and services have the potential to help achieve the country’s strategic objective of diversification and to harness its resources to create added value and inspire innovation, while at the same time helping to improve the efficiency and the products of traditional Cypriot industries.

To sum up, Cyprus perceives the dynamic prospects of space and is committed to supporting the development of space-related capabilities and the growth of a thriving space sector.

Jordan

[Original: English]
[9 October 2023]

The Regional Centre for Space Science and Technology and Education for West Asia/the Royal Geographical Centre leads space initiatives and activities in Jordan and works in close partnership with many universities and space astronomy institutions, such as the Jordanian Astronomical Society, and commercial space astronomy institutions, such as Jordan Star for Space Research, and Institute of Electrical and Electronics Engineers (IEEE) clubs at various Jordanian universities, such as the IEEE Aerospace and Electronic Systems Society chapter at the University of Jordan, the Voyager Space Club at Al Hussein Technical University and the Antares Club at Princess Sumaya University for Technology, in addition to academic programmes with Mutah University in the field of geographic information systems and space communications. This cooperation is considered a driving force for Jordan’s aspirations in the field of space and capacity-building.

Activities and events in 2022–2023:

- Master’s programme in geographic information systems at Mutah University and the Regional Centre/Geographical Centre
- New master’s programme in space communications at Mutah University and the Regional Centre/Geographical Centre
- Basic course in space science and technology, with 180 participants, at the Regional Centre/Geographical Centre
- Two-day seminar in space science and technology at Al Hussein Technical University and the Regional Centre/Geographical Centre
- National CanSat competition (in preparation) of the Regional Centre/Geographical Centre and Al Hussein Technical University

- Study on establishing a space communications laboratory as part of the Regional Centre/Geographical Centre
- Memorandum of understanding between Al Hussein Technical University and the Regional Centre/Geographical Centre
- Space debris research at the Regional Centre/Geographical Centre and the Jordanian Astronomical Society and International Astronomy Centre
- Many lectures related to space technologies and telescopes at Jordanian schools and universities

Myanmar

[Original: English]
[6 October 2023]

The Republic of the Union of Myanmar has implemented the Myanmar Satellite System with two phases, namely MyanmarSat-1 as phase 1 and MyanmarSat-2 as phase 2.

For the MyanmarSat-1 project, the bandwidths in C-band and Ku-band for national communications infrastructure were leased from 27 May 2016 to 13 October 2019.

The MyanmarSat-2 project was implemented in 2019, and its life span is from 14 October 2019 to 13 October 2034.

The total bandwidth of 864 MHz can be used in the C-band and the Ku-band by MyanmarSat-2. C-band and Ku-band capacity is used to provide broadband Internet service, broadcasting and border security across Myanmar. MyanmarSat-2 is utilized to enhance mobile connectivity with a powerful platform that enables mobile network operators, enterprises and Internet service providers to deliver faster and more efficient connectivity services.

In addition, the system has the ability to expand connectivity to additional rural and remote areas to narrow the digital divide. Myanmar aims to support the e-government sector, e-health, e-education, relief and rehabilitation for natural disaster management and response with the Myanmar Satellite System. High-quality satellite channels will be accessible for long-term use at reasonable prices for local and regional users.

Through the use of space technologies, benefits for international peace, safety and security can be created. The Government of Myanmar will therefore make efforts to ensure peaceful, safe and secure, sustainable space activities. Moreover, as a milestone of the UNISPACE+50 symposium for the wider space community to exchange views on the future of international space cooperation and the peaceful uses of outer space, Myanmar will take part in the regional and global development of present and future space science and technology for the peaceful uses of outer space.

Representatives from Myanmar attended the Office for Outer Space Affairs Space Camp, the World Space Forum, International Telecommunication Union study group meetings and Asia-Pacific Telecommunity meetings for international cooperation in the peaceful uses of outer space and for space-related capacity development.

To enhance the development of human resources for MyanmarSat-3, three junior engineers from the Satellite Communication Department took the Postgraduate Diploma in Space and Satellite System Engineering course at Myanmar Aerospace Engineering University in the 2022/23 academic year.

In September 2022, 25 officials from Myanmar attended the online course on Beidou satellite navigation system technology and products for developing countries, jointly hosted by the Ministry of Commerce of China and Wuhan Research Institute of Posts and Telecommunications for international cooperation and for space-related capacity development.

In April 2023, one official from the Information Technology and Cyber Security Department also attended the advanced satellite communications online course jointly conducted by the Association of Southeast Asian Nations and the Advanced Level Telecommunications Training Centre of India for regional cooperation.

In June 2023, two officials from the Information Technology and Cyber Security Department also visited the Asia Tech event in Singapore to gain knowledge of satellite communications products, technology and solutions.

Slovakia

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[19 October 2023]

The Astronomical Institute of the Slovak Academy of Sciences is representing Slovakia in two large European projects focused on research on the Sun: the European Solar Telescope (EST) is a pan-European project with the goal of designing and constructing an innovative telescope with a main mirror that is 4 m in diameter. EST will be optimized to acquire multi-wavelength observations of the photosphere and chromosphere, recording data simultaneously from several detectors. One of the main scientific goals is the study of the emergence of magnetic fields on the solar surface and the subsequent transfer of magnetic and kinetic energy from the deep layers to the higher regions of the solar atmosphere. EST will therefore contribute to investigations of the harmful effects of solar activity on space and ground assets, including communications technologies, navigation systems, power distribution systems, data transmission systems and the Earth's environment and society as a whole.

The second project, the Solar Activity Monitor Network (SAMNet), on the other hand, is a planned international network of ground-based solar telescope stations dedicated to continuously monitoring the Sun. The main objective of SAMNet is to provide observational data for advanced space weather research, forecasting and warning. One of the SAMNet sentinels will be located at the observatory at the top of Lomnický štít peak.

The Institute of Experimental Physics of the Slovak Academy of Sciences contributed with its work to the ongoing European Space Agency (ESA) space mission Jupiter Icy Moons Explorer (JUICE, launched to Jupiter in 2023, target to be reached in 2031). Within the JUICE mission, the Institute contributed in cooperation with international partners to the construction of the anti-coincidence detector module for the Particle Environment Package science suite, which has already been successfully put into commission during the ongoing flight to Jupiter.

The Institute of Experimental Physics of the Slovak Academy of Sciences has started its first project within the ESA Requesting Party Activities scheme, in cooperation with the Politecnico di Torino in Italy, dedicated to the study of enhancing the reliability and timeliness of ESA Vigil mission predictions through a machine learning approach.

The Institute of Experimental Physics of the Slovak Academy of Sciences, in cooperation with the Institute of Atmospheric Physics of the Czech Academy of Sciences, installed a Doppler sounding system for research into ionospheric disturbances in eastern Slovakia. Measurements from Slovakia now contribute to the network for monitoring the ionosphere over the Czech Republic, Belgium, France, Argentina and Taiwan.

The Institute of Experimental Physics of the Slovak Academy of Sciences and its observatory at Lomnický štít peak have become a member of a consortium of high-altitude observatories in Europe, the Virtual Alpine Observatory. The main goal of its observational programme is the continuous monitoring of cosmic rays.

The Faculty of Mathematics, Physics and Informatics of Comenius University in Bratislava acquires observation astrometric (for orbit improvement and cataloguing)

and photometric data (attitude state estimation, night sky background contamination) on regular basis for objects from low Earth orbit up to cis-lunar regions with its 0.7 m Newton telescope (AGO70), situated at the Faculty of Mathematics, Physics and Informatics Astronomical and Geophysical Observatory in Modra, Slovakia.

For more than 60 years, the Slovak Astronomical Society has been bringing together professional and amateur astronomers, as well as supporters of this scientific field, which has a long and rich tradition in Slovakia. Observations of celestial objects, whether by ground-based or space-based observatories, and international cooperation are essential parts of astronomical research. This collaboration does not have to involve only professional astronomers and institutions. Observations made by amateur astronomers or citizen science projects also make an important contribution to a deeper understanding of the universe.

The significance of cooperation between professional and amateur astronomers, as well as the complementary utilization of observations obtained by space missions (e.g. the European Space Agency Gaia mission) and ground-based observatories, is well illustrated by the results obtained in the field of symbiotic systems by Slovak scientists from Pavol Jozef Šafárik University in Košice, members of the Slovak Astronomical Society. Since long-term spectroscopic observations are particularly important to confirm the symbiotic nature of the candidates, they have initiated and coordinated several spectroscopic observing campaigns in cooperation with observers from the Astronomical Ring for Amateur Spectroscopy.[1] Close collaboration with this international amateur team has led, for example, to a better characterization of the symbiotic candidate V503 Her[2] and other candidates for classical symbiotic stars,[3] the discovery of the new southern symbiotic system DeGaPe 35 and the new eclipsing symbiotic binary Hen 3-860 observed during the outburst,[4] as well as the detection of the galactic symbiotic nova V618 Sgr in a repeat outburst.[5]

Since it is usually not possible to obtain such long-term data sets at professional ground-based observatories due to the limited amount of observing time available, observations by the international community of amateur astronomers play an essential role in monitoring symbiotic systems. For this reason, an international team led by Slovak astronomers from Pavol Jozef Šafárik University in Košice prepared the New Online Database of Symbiotic Variables,[6] a modern, complex and most up-to-date catalogue of these binaries that currently contains more than 1,000 objects in the Milky Way and another 16 galaxies. At the same time, the Database constitutes the most comprehensive collection of orbital, stellar and observational parameters of all known symbiotic binaries. The database has been very well received, as evidenced by the widespread interest of the international astronomical community.

As mentioned above, a key part of astronomical research is ground-based observations of space objects, for which a naturally dark and quite sky is required. The Slovak Astronomical Society is anxiously monitoring the commercial activities of some private companies that are planning or already building constellations of satellites consisting of several thousand to tens of thousands of individual satellites to cover the Earth with Internet access. The number of artificial bodies in orbit around the Earth is already severely limiting astronomical observations, not only in the optical but also in the radio band. The Society has been very active in the field of dark sky protection for many years and, in cooperation with other entities, participated in the establishment of three dark sky parks in Slovakia. The Society also actively supports the efforts of the International Astronomical Union and the European Astronomical Society to ensure the sustainable use of near-Earth space, to protect the

[1] See https://aras-database.github.io/database/about.html.
[2] See https://doi.org/10.3847/1538-3881/ace109.
[3] See https://doi.org/10.1093/mnras/stab2034.
[4] See https://doi.org/10.1093/mnras/stab3512.
[5] See https://doi.org/10.1093/mnras/stad1434.
[6] Available at http://astronomy.science.upjs.sk/symbiotics/.

dark and quiet sky, and to preserve the possibility of international cooperation in the exploration of the universe for future generations.

The Slovak private sector is developing an autonomous sensor network to monitor space debris and near-Earth asteroids. The Slovak private sector developed the capability of autonomously observing objects on very low Earth orbits (from 200 km altitude) up to heliocentric orbits. Legal and technical interfaces have been established with partners abroad from the Czech Republic, Germany, Poland, Switzerland, Ukraine and ESA to provide to partners the astrometric and photometric measurements.

On 30 May 2023, the Industry Branch of the Slovak Space Office established at the Slovak Investment and Trade Development Agency organized the fourth edition of its flagship space industry conference, "Emerging Space", focused on emerging space ecosystems, with main objective of helping emerging space ecosystems grow and be valuable members of the global space community. The event drew the attention of more than 400 in-person and online participants. It also attracted a stellar line-up of speakers from international organizations, space agencies and the European space industry, as well as leading global and European associations and non-governmental organizations.

During the seventy-fourth International Astronautical Congress in Baku, the "Space for emerging ecosystems – emerging ecosystems for space" session was organized to discuss regional specifics of building space ecosystems and to present activities of the International Astronautical Federation in that area, in particular those of its Administrative Committee on Connecting Emerging Space Ecosystems, in which the Slovak Space Office plays an active role.

Sudan

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1. Introduction

Since space applications have recently spread all over the globe, nowadays space is no longer used only by developed and high-tech countries. Developing countries, such as the Sudan, are working hard to make use of outer space applications, despite some of them suffering severe economic difficulties. Thus, the Sudan has established the Institute of Space Research and Aerospace (ISRA) under the National Centre for Research (NCR) in order to monitor, plan, supervise and manage space activities in the Sudan. The National Centre for Research is working under the umbrella of the Ministry of Higher Education and Scientific Research of the Government of the Sudan.

Space activities have been undertaken in the Sudan since the early 1970s, when small, specialized units were established for remote sensing as parts of some governmental departments, such as Soil Maintenance, Land Investments, the Water Programme, Forestry and the Department of Surveying at the University of Khartoum. In 1977, the National Remote Sensing Centre was established under the umbrella of the National Council for Research. That centre was later transformed into the Remote Sensing and Seismology Authority, which is one of the institutes of NCR. It is active in the field of analysing and interpreting space images of the Earth's surface to extract useful data about the environment and natural resources, as well as human activities, such as farming.

In 2012, the Sudan launched its national space programme in order to promote the development of space activities intended to contribute to the country's economy and scientific development. The Institute of Space Research and Aerospace was established in 2013 as a unique output of the Sudan space programme, to fill the gap in local research and development in space science and aerospace engineering and to become

the seed for the space agency of the Sudan in the future. The Institute comprises five departments: Aerospace Engineering, Astronomy and Space Physics, Communication Systems, Electronic Systems and Applied Programming.

2. Launch of satellites

In November 2019, the SUSAT-1 remote sensing satellite was launched from the south of China. Now, it is the only satellite of the Sudan that is still in orbit. SUSAT-1 is a 16 kg microsatellite that is orbiting in low Earth orbit at 500 km above sea level. It is dedicated to both civil and military applications and has a space image resolution of 5 m.

The Khartoum North satellite ground station was built by a British company several years before the launch of SUSAT-1. Its role was to receive space images from free and commercial satellites, but later it was upgraded in order to control the launched satellite and to receive the space images obtained and sent by it. It is worth mentioning that SUSAT-1 carries no nuclear power sources on board.

3. Activities of the Institute of Space Research and Aerospace

During the past 10 years, researchers from the Institute of Space Research and Aerospace managed to implement several research projects in different fields of space science and space technology. Among those projects was the design of the ISRASAT-1 cube satellite, the design and launch of the ISRAHAB-1 high-altitude balloon, the design of a mini radio telescope and the design of the Mayada short-range, fixed-wing unmanned aerial vehicle for agricultural applications.

Recently, researchers from the Institute of Space Research and Aerospace have been designing and building a low-cost satellite ground station that receives data from ISRASAT-1 and different cube and nanosatellites. The ground station was planned to be one of several stations of the BIRDS cube satellites network. That project was started in 2022, but has been stopped due to the current military conflicts. The project was supposed to scale up the station to include receiving space images from free and commercial remote sensing satellites, which send optical and radar image data in the X-band.

In addition, Institute of Space Research and Aerospace researchers have been working to establish an optical astronomical observatory outside Khartoum. In the future, the intended observatory is expected to include a radio astronomical telescope capable of exploring deep space stars and planets. The observatory is planned to be national and to serve in tracking satellites and the Moon, as well as detecting threatening objects such as asteroids, meteors and comets, and monitoring space debris.

4. Cooperation in space activities

In order to enrich research in space science and technology and make use of both human and instrumentation resources, the Institute of Space Research and Aerospace has participated in an alliance with two other research institutes in the region around the Sudan, namely, the National Research Institute of Astronomy and Geophysics in Egypt and Al al-Bayt University in Jordan.

The title of the proposed joint research project is “Study, observation, tracking and prediction of space debris and near-Earth objects”, which is in line with the current trends in research on space debris, the safety of space objects and problems relating to their collision with space debris. It has been submitted by the alliance to the Federation of Arab Scientific Research Councils (FASRC) in order to obtain the required funding. The permanent location of FASRC is in the Sudan; however, due to the current military conflict, it has been moved temporarily to Egypt.

5. World Space Week

Since 2015, the Institute of Space Research and Aerospace has been arranging annual celebrations of World Space Week for eight consecutive years in collaboration with

the World Space Week national coordinator of the Sudan. Celebrations have included seminars, lectures and exhibitions. That conforms with the role of Institute of Space Research and Aerospace in the field of public outreach in space. Unfortunately, because of the current military conflicts in Khartoum and other cities in the Sudan, the Institute of Space Research and Aerospace could not celebrate World Space Week in October 2023.

6. Conclusion

Space activities in the Sudan have been extremely affected by the military conflicts in the country, which have been taking place within the State of Khartoum since 15 April 2023.