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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]

[30 October 2024]

Algeria considers international cooperation in the peaceful uses of outer space to be the optimal means of fostering the exchange and transfer of knowledge and expertise and promoting space technologies and applications in support of sustainable development and human well-being.

Accordingly, over the course of 2024, it has continued its bilateral and multilateral international cooperation efforts as part of its national space programme.

Furthermore, cooperation-related memorandums of understanding and agreements with the following entities are currently being finalized:

- The Ministry of Science and Information and Communications Technologies of the Republic of Korea, on cooperation in space science, technologies and applications
- The National Observatory of Athens, on collaboration in forest fire management
- The Commission for Controlling the Desert Locust in the Western Region, part of the Food and Agriculture Organization of the United Nations, on cooperation in locust risk management in the Western Region

The Algerian Space Agency (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:

- United Nations Conference on Space Law and Policy, held from 28 to 30 November 2023 by videoconference
- United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) Bonn International Conference on Space-based Solutions for Disaster Management – “Early Warnings for All”, held from 12 to 14 March 2024
- Third New Space Africa Conference, held from 2 to 5 April 2024 in Luanda on the theme “The role of space in closing Africa’s poverty gap”
- Sixth regular session of the Governing Board of the Regional Centre for Space Science and Technology Education in Asia and the Pacific (China), held from 22 to 28 April 2024 in Beijing
- Eighteenth meeting of the International Committee on Global Navigation Satellite Systems, held from 6 to 11 October 2024 in Wellington
- Seventy-fifth International Astronautical Congress, organized jointly by the International Astronautical Federation and the Italian Space Agency and held from 14 to 18 October 2024 in Milan, Italy

In addition, ASAL and the Office for Outer Space Affairs jointly organized, as part of the UN-SPIDER programme, a workshop on “Space-based solutions for forest fires in Algeria”, held in Algiers on 21 and 22 November 2023.

Algeria was officially admitted as a member of the International Committee on Global Navigation Satellite Systems at its seventeenth meeting, held in Madrid in October 2023. This makes Algeria the second African country, after Nigeria, to join the Committee.

At the continental level, Algeria has continued to support initiatives to promote inter-African cooperation for sustainable development and the well-being of the population in Africa. Represented by the Secretary-General of ASAL, Algeria was

elected to the African Space Council for a four-year term at the forty-fourth ordinary session of the Executive Council of the African Union, held in February 2024. The African Space Council is the governance and management body of the African Space Agency.

With regard to training and human resource capacity-building relating to space technologies, technical training courses are offered by national universities and by the ASAL National Geodesy and Space Technology Academy.

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:

- Regional Centre for Space Science and Technology Education in Asia and the Pacific (China), affiliated with the United Nations
- China: academic training at Beihang, Shanghai and Wuhan Universities
- Japan and the United Nations: nanosatellite technology training programme at the Kyushu Institute of Technology
- Republic of Korea: short training event at the Korea Aerospace Research Institute

At the national level, 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 the agriculture, public works, land registration, mining, water resources, culture and arts sectors.

The purpose of those agreements is to design, develop and implement 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 institutions, which are also provided with training, including advanced training, in the areas of remote sensing, geographic information systems and global navigation satellite systems.

With respect to space infrastructure and systems, over the course of 2024, ASAL has carried out maintenance operations to keep its satellites and ground control segments in optimum operating condition, particularly in the case of its high- and medium-resolution Earth observation satellites, namely, Alsat-2A/Alsat-2B, Alsat-1B and telecommunications satellite Alcomsat-1.

Key information on Algerian space systems includes:

- Alsat-1B: in operation for eight years; has generated 15,293 products to date, covering a total area of more than 345 million square kilometres
- Alsat-2A/Alsat-2B: in operation for 14 and 8 years, respectively, these satellites have generated more than 403,600 image products covering an area of almost 50 million square kilometres
- Alcomsat-1: completed its seventh year of operations in 2024 and has contributed to the development, for national user sectors, of applications relating to broadcasting and telecommunications in the Ku- and Ka-bands.

Armenia

[Original: English]
[8 November 2024]

The Republic of Armenia places great importance on developing its national space-related capacities and science, with a particular focus on Earth observation, one of the most impactful and dynamically growing subsectors in 2024.

In 2024, Armenia continued to make significant progress in the field of space technology and research.

One of the other important undertakings was the AMADEE-24 Mars analog simulation field mission, which was carried out in the Armash region of Armenia in April and May 2024 and was managed by the Austrian Space Forum and hosted by the Armenian Aerospace Agency. The mission brought together 200 scientists from 26 countries, who conducted various experiments in the fields of geoscience and robotics and explored the limitations and advantages of future human planetary missions. The site of the mission was selected for its geological and topographic similarity to Mars. The AMADEE-24 mission presented opportunities to study equipment behaviour involving the simultaneous usage of instruments with the option of human-in-the-loop (via two high-fidelity spacesuit simulators, a portable system, etc.); to develop platforms for testing life-detection or geoscience techniques, robotic support tools for human missions and concepts for high situational awareness of remote support teams; to study the analog as a model region for Martian counterparts; to serve as a catalyst for increasing the visibility of planetary sciences and human exploration; and to increase knowledge of how to manage human missions to Mars by deploying a realistic model for a mission support centre, astronaut actions and the related decision-making framework.

On 12 June 2024, the Republic of Armenia joined the Artemis Accords, which were signed at the headquarters of the National Aeronautics and Space Administration in Washington, D.C., in the context of the working visit by Mkhitar Hayrapetyan, Minister of High-Tech Industry of the Republic of Armenia, to the United States of America. Given the long-standing partnership between the Republic of Armenia and the United States, this significant event will serve as the impetus for expanding bilateral cooperation in the fields of science, space research and astronomy in particular.

From 14 to 18 October 2024, the delegation of the Republic of Armenia participated in the International Astronautical Congress 2024, held in Milan, Italy. The purpose of the delegation's visit was to get acquainted with the latest achievements and development trends in the space sector, as well as to introduce the scientific power of Armenia to the world and position Armenia globally as a responsible user of and reliable partner in space technologies. The Armenian delegation also participated in the annual meeting of the representatives of the countries that have joined the Artemis Accords, where a number of conceptual issues and future initiatives were discussed. The following agreements were reached within the framework of the meeting:

- The possibility of cooperation with the Ministry of High-Tech Industry of the Republic of Armenia was discussed with representatives of Novaspace, aimed at supporting sector companies in positioning themselves in international markets. Means of potential cooperation in developing strategies and providing consulting services were also discussed. An agreement was reached between the parties to continue the substantive discussions following the conference.
- The programmes implemented by the Centre for Ecological Noosphere Studies of the National Academy of Sciences of the Republic of Armenia and their prospects were discussed with the Executive Director of the International Institute of Astronautical Sciences. During the discussion, the possibility of further cooperation and exchange of experience was touched upon.

- The possibility of forming a cooperation framework was discussed with the representative of Leaf Space. Contact was established between the company and the Acting Chief Executive Officer of Geokosmos closed joint-stock company to discuss the potential for further cooperation.
- The possibility of cooperation with sectoral start-ups in the Republic of Armenia was discussed with the representative of Idea Space to implement joint science, technology, engineering and mathematics educational programmes. During the discussion, the development of educational initiatives and the creation of new opportunities for young professionals were also touched upon.
- The possibility of expanding cooperation was discussed with the representative of New South Wales, Australia, particularly regarding cooperation in the context of the International Astronautical Conference 2025, to be held in Sydney. The prospects of participation by Armenian companies, as well as the presentation of new programmes and opportunities during the Conference, were also discussed.
- As a result of a meeting in Zurich, Switzerland, with the representatives of the Federal Institute of Technology in Zurich (ETH Zurich), Graz University of Technology, the International Space University, the University of Tokyo and the Technical University of Munich, the decision was made to consider the possibility of the provision by the above-mentioned institutions of professional courses for the employees of Armenian technology companies in various formats.

These efforts demonstrate the country's strong commitment to advancing its national space capabilities and promoting the space industry and science. The impact of these developments is wide-reaching, with the potential to positively affect the extension of key sectors such as energy, public health and the environment – all crucial areas for addressing the global challenges outlined in the 2030 Agenda for Sustainable Development.

Canada

[Original: English]
[4 November 2024]

Summary

In 2024, Canada continued to prepare for the return of humanity to deep space by continuing to develop Canadarm3 for Gateway, committing a lunar utility vehicle for the Artemis programme; provided support to the International Space Station (ISS) through the use of Canadarm2 and Dextre; continued to operate the Canadian Earth observation and scientific satellite fleet, including the RADARSAT Constellation Mission, SCISAT and the Near-Earth Object Surveillance Satellite (NEOSSat); and continued to actively support the International Charter on Space & Major Disasters. Canada is set to receive a sample from the asteroid Bennu following the success of the OSIRIS-REx mission, becoming the fifth country in the world to curate a sample collected in space. This material will be studied by generations of Canadian and international scientists. Canada is preparing for two human space flights, with the participation of Colonel Jeremy Hansen in the Artemis II mission and Colonel Joshua Kutryk's mission to ISS. For the latest information and more details on the programmes, please visit the Canadian Space Agency (CSA) website at www.asc-csa.gc.ca.

International Space Station

The contribution of Canada to ISS, the Mobile Servicing System (Canadarm2, Dextre and the Mobile Base System), continues to operate successfully. Human health remains a priority for Canada, with its development of new multipurpose medical and research platforms and its conduct of research on food and health for deep space and

terrestrial uses. Canada continues to advance novel and breakthrough technology for biological sample preparation for utilization on ISS.

Human space flight

Canada continues preparations for Artemis II, the first crewed mission around the Moon in half a century. CSA astronaut Jenni Gibbons was assigned as a backup astronaut to Colonel Jeremy Hansen on the Artemis II mission. Jenni Gibbons is part of a team of key contributors, in addition to the Artemis II prime crew, who will define and validate the astronauts' training and processes for future Moon missions. Canada is also going back to ISS, as Colonel Joshua Kutryk was selected to participate in a long-duration flight to the Station. Colonel Kutryk will be the first CSA astronaut to fly under the Commercial Crew Program of the National Aeronautics and Space Administration (NASA).

Planetary sciences

In September 2023, OSIRIS-REx returned its sample to Earth, which may refine understanding of the solar system's history, how Earth formed and possibly the origin of water and life on Earth. The country's OSIRIS-REx Laser Altimeter on the NASA asteroid-sampling mission OSIRIS-REx played a critical role in localizing the sampling site on the asteroid Bennu. Canadian scientists have started their analysis of the sample as part of the international science team, and CSA is scheduled to receive its sample in 2025, upon completion of the curation facility at CSA headquarters.

Lunar exploration

The Budget 2024 provided funds for the Lunar Exploration Accelerator Program (LEAP 2.0) to advance areas of Canadian expertise in remote healthcare and food production technologies through the Health Beyond Initiative and Deep Space Food Production. Key objectives of those initiatives include advancing technologies that will provide astronauts in deep space with access to safe and healthy food and remote healthcare by adapting the technologies for Canadians in remote, isolated communities.

Canada continued to advance the Lunar Surface Exploration Initiative, which included concept studies for the next major Canadian infrastructure contribution to human space flight to the lunar surface. In the context of lunar exploration, Canada also secured funding to design, build and operate a utility vehicle capable of surviving the harsh lunar night. This will contribute to the NASA Artemis programme by aiding the crew, transporting resources and performing logistics and construction duties.

In February 2024, CSA and Impact Canada concluded the Deep Space Healthcare Challenge to develop innovative healthcare technologies for remote communities and crews on long-duration space missions. The winner developed the EZResus application, which streamlines the information needed by emergency personnel in the critical first hour of resuscitation. CSA also concluded the Deep Space Food Challenge, a collaboration with NASA. The Canadian winner uses an innovative approach to produce a diverse range of fresh foods with the CanGrow solution. With the potential to generate over 700 kg of nutrient-dense food annually, the system maximizes its produce and high-quality protein sources with minimal resources.

Space situational awareness

Space-based space situational awareness work by Canada continues to provide data on deep-space objects to the United States-led Space Surveillance Network, helping to ensure the safety of space objects in Earth orbit. The NEOSat space telescope supports advanced research and development by tracking and characterizing space objects from low Earth orbit to deep space. The Conjunction Risk Assessment and Mitigation System of Canada continues to provide invaluable analysis services to help satellite operators managing over 100 satellites in Canada and partners make informed decisions in response to on-orbit close approaches identified by the Space

Surveillance Network. The service plays an important role in avoiding on-orbit collisions.

Earth observation

CSA received funding under the Budget 2024 to design and develop a replenishment satellite for the RADARSAT Constellation Mission and identify options for the successor to the Mission, and it is advancing the development of these two projects. The Mission continues to support the Government in its mandate to monitor the impacts of climate change, as well as supporting efforts to protect the environment and foster sustainable development, manage natural resources and support disaster relief.

CSA and Natural Resources Canada continue to develop the WildFireSat mission, aimed at providing daily monitoring of all active wildfires in Canada from space. The primary goal of WildFireSat is to support wildfire management, but it will also provide Canadians with more precise information on smoke and air quality conditions. The mission will use infrared sensors to measure the energy coming from wildfires, based on microbolometer technology, and will enable more accurate measurement of the carbon emitted by wildfires, an important requirement under the international agreement on carbon reporting. WildFireSat is planned to be launched in 2029.

Canada also continues to develop the High-Altitude Aerosols, Water Vapour and Clouds mission – a fully Canadian contribution to the NASA Atmosphere Observing System. The mission will provide critical data to support severe and extreme weather prediction, climate modelling, air quality forecasting and disaster monitoring. The mission is planned to be launched in 2031.

This year, CSA chaired the international Committee on Earth Observation Satellites and helped advance the safeguarding of biodiversity through Earth observation satellites. CSA also hosted the Committee's plenary at its headquarters, highlighting 40 years of international collaboration and important achievements.

Science, technology, engineering and mathematics engagement

As part of the commitment by CSA to increasing equity, diversity and inclusion in the space sector, Canadian post-secondary institutions and not-for profits may request funding from CSA for projects aimed at offering post-secondary students from underrepresented groups an opportunity to increase their level of applied knowledge in space science and technology and promote their professional development. So far, three projects have been funded.

Furthermore, CSA met its commitment to make all its content and resources available both virtually and in person, allowing Canadians across the country to learn more about upcoming missions and Canadian contributions to space science, technology, engineering and mathematics (STEM). CSA is also collaborating with organizations serving young people from equity-seeking communities underrepresented in space STEM fields. As a concrete example, a prototype of the Lunar Adventure Kit was created in collaboration with and with input from nine communities in Nunavut (a territory in Northern Canada) and includes learning resources in the local language (Inuktitut), as well as culturally relevant references to Arctic food sources and plants for future astronauts on the Moon.

Space for Women and gender mainstreaming toolkit

A key outcome of the fourth United Nations/Canada Space for Women Expert Meeting was the gender mainstreaming toolkit for the space sector. Canada views the gender mainstreaming toolkit of the Office for Outer Space Affairs as a starting point for an ongoing international dialogue on gender equality in the space sector and hopes that it will be built on through future expert meetings. The toolkit was successfully launched during the sixty-seventh session of the Committee on the Peaceful Uses of

Outer Space, held in June 2024. It offers simple and practical measures that space organizations can adopt to help bring about meaningful improvements in gender equality in the global space community and help organizations overcome the ongoing challenges faced by women in the space sector. The toolkit also contributes to the achievement of Sustainable Development Goal 4, on quality education, and Goal 5, on gender equality.

National technical, science and human capacity-building

In 2023, Canada built on the success of the Canadian CubeSat Project with a second iteration, called the CubeSats Initiative in Canada for STEM (CUBICS). Through CUBICS, nine selected projects will see students develop CubeSats that will contribute to the enhancement of scientific understanding in the area of climate change. The teams are currently in the final design phase of their CubeSats and have received a week of hands-on training directly at CSA.

CSA continued its stratospheric balloon initiative, STRATOS, in collaboration with the French National Centre for Space Studies (CNES). In June 2024, CSA and CNES collaborated on the successful launch of a stratospheric balloon from the Esrange Space Center in Kiruna, Sweden, towards Northern Canada. This transatlantic flight was a first for both organizations. Also in June 2024, CSA conducted a series of small expandable balloon launches from the Timmins base to provide students with an opportunity to test and validate new technologies and perform scientific experiments in a near-space environment.

As part of its memorandum of understanding with the National Research Council of Canada, CSA participated in two parabolic flight campaigns over the summer of 2024. For the first time, these campaigns were carried out near CSA headquarters, at the National School of Aeronautics in Longueuil. The CSA space medicine group tested various health technologies in a reduced gravity environment.

Space policy and legislation

In 2024, the Government of Canada announced the establishment of the National Space Council, a whole-of-government approach to support space exploration, space utilization, technology development, research and security. The new National Space Council will enable greater coherence and the level of collaboration required to address cross-cutting issues that span commercial, civil and defence space domains.

Since its annual report of 2023, Canada has registered four satellites with the United Nations.

Myanmar

[Original: English]
[31 October 2024]

The Republic of the Union of Myanmar has implemented the Myanmar Satellite System in 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 lifespan is from 14 October 2019 to 13 October 2034.

The total bandwidth of 864 MHz can be used in C-band and 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, and 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 in the 2022/23 academic year and one junior engineer took the Master of Engineering in Aerospace – Space System Engineering course in the 2023/24 academic year at Myanmar Aerospace Engineering University, and one junior engineer took the fourteenth postgraduate course on satellite communications in the 2024/25 academic year in Ahmedabad, India.

In April 2024, the Information Technology and Cyber Security Department hosted an internship programme for final-year electronic engineering students at Yamethin Technological University and fourth-year electronic engineering students at Mandalay Technological University, and in June 2024 for final-year students at Bhamo University of Computer Studies.

In July 2024, one official from the Information Technology and Cyber Security Department attended the Seminar on BeiDou Satellite Navigation System Technologies and Product Application for Developing Countries in China.

Also in July 2024, one official from the Information Technology and Cyber Security Department attended the Seminar on Satellite Internet Development and Construction for Developing Countries in China.

In August 2024, one official from the Information Technology and Cyber Security Department also attended the Seminar on Aerospace Quality Management and Systems Engineering for Developing Countries in China. One official is taking the fourteenth postgraduate course on satellite communications at the Indian Space Research Organisation from 2 September 2024 to 31 May 2025.

In October 2024, the Information Technology and Cyber Security Department also hosted an internship programme for third-year physics and English major specialization students at Nay Pyi Taw State Academy. In the internship programme, knowledge was shared of various subjects, including the status of information and communication technologies in Myanmar, improvement of the telecommunications sector in Myanmar, an introduction to mobile communications, Internet services, dial-up, Asymmetric Digital Subscriber Line (ADSL), fibre to the x (FTTx), Softswitch for the next generation network, an introduction to satellite communications, job opportunities for electronic engineers, effective communication skills, spacecraft design, sizing and launch systems, an introduction to nano-satellites, satellite communication systems and their applications, Voice over Internet Protocol and Internet services using a portable very small aperture terminal (VSAT) and flyaway VSAT, and the role of cybersecurity in e-government implementation.

Netherlands (Kingdom of the)

[Original: English]
[11 November 2024]

With a focus on climate monitoring, satellite communications and research, the Netherlands continues to contribute to both European and global space efforts. The space strategy emphasizes sustainability, scientific excellence and collaboration with international partners. By fostering technological development, strengthening space infrastructure and promoting strategic autonomy, the Netherlands is shaping the future of space exploration and its practical applications on Earth.

Launching the long-term space agenda of the Netherlands

The Dutch long-term space agenda, *From Space for Earth*, outlines a strategic vision for 2035, emphasizing the importance of space technology in areas such as infrastructure, climate monitoring, science and national security. Developed collaboratively by five ministries and involving key stakeholders, this plan includes six core missions. These missions are aimed at enhancing satellite communications, navigation and Earth observation capabilities, improving climate and environmental data usage and maintaining the Netherlands' leading position in space research and innovation. The agenda stresses the need for increased investment to meet the European Space Agency (ESA) standards and to ensure open strategic autonomy. By strengthening governance and expanding national and international cooperation, the Netherlands seeks to benefit economically and secure vital services. Proposed measures include a gradual increase in funding and the development of advanced satellite systems, with an emphasis on sustainability and the leveraging of Dutch technological expertise. (For more information, see www.rijksoverheid.nl/documenten/rapporten/2024/01/25/bijlage-bij-kamerbrief-bij-rapport-vanuit-de-ruimte-voor-de-aarde.)

Green light for the development of the TANGO climate mission

After two years of negotiations by the Netherlands Space Office (NSO), ESA has approved the Dutch TANGO mission. The Netherlands, in collaboration with ESA under the Earth observation programme, will develop TANGO, building on the technology used by Tropomi to measure methane emissions. The TANGO mission consists of two small satellites that can precisely monitor CO₂ and methane emissions from individual sources. Dutch organizations ISISpace, TNO, SRON and KNMI are developing the instruments for TANGO. Following its launch in 2027, Governments, scientists and businesses will have new tools to enforce climate regulations and reduce emissions, marking a significant milestone in atmospheric research leadership.

PACE launch and the SPEXone climate instrument

On 8 February, the National Aeronautics and Space Administration launched its new climate satellite, the Plankton, Aerosol, Cloud, ocean Ecosystem (PACE), carrying the Dutch instrument SPEXone. SPEXone will measure the properties of atmospheric aerosols, providing essential data to improve climate models. Aerosols significantly impact climate change and air pollution, but the exact effects remain uncertain. These uncertainties affect the reliability of long-term global temperature rise predictions. SPEXone will analyse aerosol characteristics, such as size and composition. Combining SPEXone data with measurements from other instruments aboard the PACE satellite will help reduce uncertainties in climate models, leading to more accurate climate forecasts.

Interdepartmental tabletop exercise on space incidents

On 16 May 2024, the Ministry of Foreign Affairs and the Ministry of Defence jointly organized the first interdepartmental tabletop exercise focused on space incidents. The primary goal of this exercise was to identify the necessary communication lines,

information sources and decision-making processes needed for crisis management in the space domain and related critical infrastructure. The exercise highlighted the need to formalize procedures for responding to space incidents as a key step moving forward.

Seventh annual ScyLight Conference

The annual ESA ScyLight Conference on optical communication and quantum technology was held this year in the Netherlands at the High Tech Campus in Eindhoven. NSO contributed to shaping the conference programme. A key part of the event was a morning session on quantum communication, at which NSO participated in a panel discussion about the future of the quantum Internet and the role of space in its development, alongside the Quantum Internet Alliance, the European Commission and ESA. Two student workshops were held to engage younger participants in these emerging technologies. With 250 attendees and positive feedback on both the programme and the venue, the seventh edition of the Conference was a great success.

Innovation mission from India

From 27 to 30 May, NSO organized an innovation mission from India. The mission involved 12 Indian companies and over 40 Dutch organizations. Activities included presentations on the Dutch and Indian space ecosystems, site visits to the European Space Research and Technology Centre (ESTEC) and Airbus, a reception at the Indian Embassy in The Hague and a day at the Aerospace Innovation Hub of Delft University of Technology. Numerous positive discussions were held between Dutch and Indian companies, fostering future collaboration in the space sector. This mission was aimed at strengthening ties and exploring opportunities for joint ventures between the two countries' space industries.

Association of Space Explorers Planetary Congress in the Netherlands

The Netherlands hosted the thirty-fifth Association of Space Explorers Planetary Congress from 30 September to 4 October 2024, in Noordwijk and Amsterdam. Over 100 astronauts from 38 countries participated, focusing on the theme "Generation space – shaping the future together". Activities included panels and technical sessions at ESTEC, a community day with astronaut visits to schools and institutions and youth-focused challenges to inspire future engineers. The event highlighted space exploration's impact on sustainability and global collaboration, with cultural and public events planned in Amsterdam to engage with a broader audience.

Organization of the European Space Research and Technology Centre Open Day

The ESTEC Open Day 2024 was held on 6 October at the ESTEC site in Noordwijk. This annual event offers the public a rare glimpse into Europe's largest space technology centre, where visitors can explore cutting-edge spacecraft developments, meet ESA astronauts and learn from space scientists and engineers. Interactive exhibits and guided tours showcase current and future ESA missions, emphasizing innovation and space exploration. The event is aimed at engaging and inspiring space enthusiasts of all ages, making space technology accessible and exciting.

Netherlands Organization for Applied Scientific Research Satcom Summit

The Netherlands Organization for Applied Scientific Research (TNO) Satcom Summit, held on 7 November 2024, is a key event focusing on satellite communications. It brings together experts from various fields to discuss advancements in satellite technology, especially in optical and quantum communication. One of the highlights includes exploring the role of laser satellite communication, a technology that offers higher data transfer speeds and improved security. The event is aimed at promoting collaboration between industry leaders, researchers and organizations involved in space and communication technologies. It

also serves as a platform for sharing innovations and exploring the future of satellite communication networks.

Spain

[Original: Spanish]
[6 November 2024]

The present report describes the space activities carried out by the Kingdom of Spain during the past year, with a special focus on international cooperation activities in outer space, space sustainability and national research on space debris.

In the past year, Spain has continued to make progress in its space activities, in which international cooperation has played a very important role.

The Spanish Space Agency has maintained and expanded its international collaboration with other space agencies at both the bilateral and multilateral levels.

The following activities may be highlighted:

- The year 2024 marked the sixtieth anniversary of the inauguration of the Deep Space Communications Centre, which is operated in collaboration with the National Aeronautics and Space Administration (NASA) and forms part of the NASA Deep Space Network. Following the renewal of the agreement on the hosting of the Centre, the Spanish Space Agency has strengthened and expanded its collaboration with NASA on that infrastructure.
- Spain continues to operate the meteorological stations Rover Environmental Monitoring Station (REMS) and the Mars Environmental Dynamics Analyzer (MEDA), which are integrated into the NASA rovers Curiosity and Perseverance, on Mars. Those stations provide valuable scientific data that facilitate understanding of the Martian climate and that will also be important for future robotic and crewed missions to Mars.
- The Spanish Space Agency coordinates the European Union Space Surveillance and Tracking (EU-SST) partnership, a flagship programme that provides services relating to collision avoidance, fragmentation and re-entry and is financed by the European Union. The partnership is formed of 15 States members of the European Union, represented by their constituent national entities – in most cases European space agencies – and provides services to more than 200 organizations belonging to the 27 States members of the European Union and also to non-European Union countries.
- The Spanish Space Agency is responsible for the management and operational control of S3TOC, the Spanish centre for space surveillance and tracking. S3TOC is a European reference centre for coordination among operational satellites and, together with the centre operated by France, is responsible, at the European level, for providing an alert service with a view to the avoidance of in-orbit collisions. More than 500 satellites belonging to 79 different organizations around the globe are registered with the centre.
- Over the course of 2024, the Spanish industry has contributed to the training of a number of countries in space surveillance and tracking systems, providing optical sensors, tracking radars and control centres with a range of software solutions, thus contributing to the sustainability and freedom of use of outer space. Such collaboration with third countries lays the foundations for possible future initiatives relating to the management and coordination of space traffic, since they constitute the operational pillar of such activities.
- The Atlantic Constellation, an initiative led by Spain and Portugal and aimed at the joint development of a constellation of Earth observation satellites, is another example of international cooperation. Since the project is in its initial

stages, other countries can participate by providing their own satellites or sharing technological and scientific developments.

Spain is also continuing to collaborate extensively with other countries in international and intergovernmental organizations in which space technologies and missions are being developed and regulations and rules of conduct are being negotiated with a view to improving sustainability.

- Spain is one of the main contributors to the activities of the European Space Agency (ESA), through which it is carrying out a large number of projects in collaboration with other countries. Spain participates in most ESA missions, and has led the Cheops, Land Surface Temperature Monitoring (LSTM), Solar wind Magnetosphere Ionosphere Link Explorer (SMILE), Proba-3 and Analysis of Resolved Remnants of Accreted galaxies as a Key Instrument for Halo Surveys (ARRAKIHS) missions, among others.
- Moreover, Spain participates actively, in collaboration with other countries, in the space programmes of the European Union, such as the European Satellite Navigation System (Galileo), the European Geostationary Navigation Overlay Service (EGNOS), the European Union Governmental Satellite Communications (GOVSATCOM) programme, Copernicus and the space situational awareness (SSA) programme. The most important project led by Spain in this area is the development of the ground segment for the second generation of Galileo satellites. In addition, Spain participates in space research and development programmes, such as Horizon Europe, and in the working groups established to draw up future regulations governing European space activities.
- Spain is also a member of other European organizations, such as the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), for the monitoring of the climate and meteorological events.

It should also be highlighted that Spain is very active in all areas relating to space sustainability, participating in numerous activities and developing cutting-edge technologies. The following are some of its key activities:

- Spain is leading the ESA Destructive Re-entry Assessment Container Object (DRACO) mission, the development of which was initiated in 2024 and the objective of which is to improve knowledge of satellite disintegration processes during atmospheric re-entry. This will make it possible to improve re-entry risk models and adapt design methods to reduce the impact of re-entry on Earth.
- The Spanish space sector is leading the process of designing mechanical interfaces to facilitate the removal of objects in orbit, such as the MICE and CAT systems, which are aimed at facilitating the on-orbit capture of satellites in order to be able to repair or remove them. The year 2024 has also seen the launch of the Spanish satellite LUR-1, which is designed specifically to be captured and removed at the end of its mission and thus to demonstrate – on orbit – these important technologies, which contribute to space sustainability.
- Within ESA, Spain is participating in technology development and in the Active Debris Removal/In-Orbit Servicing (ADRIOS) missions, which are aimed at removing objects in orbit (active debris removal) and providing on-orbit services to extend the lifetime of satellites by enabling their repair or the delivery of fuel (in-orbit servicing).
- Spain participates actively in all international forums in which the sustainability of space activities is discussed. Naturally, Spain participates actively in the Committee on the Peaceful Uses of Outer Space and the groups associated with it, such as the group on long-term sustainability and the recently formed Action Team on Lunar Activities Consultation. One of the notable initiatives promoted within the Committee by Spain, in collaboration with Chile, is the Dark and

Quiet Skies initiative, in connection with which a variety of activities have been organized over the past year.

- In addition to the United Nations, the Spanish Space Agency participates in other forums, such as the International Organization for Standardization, the Consortium for Execution of Rendezvous and Servicing Operations (CONFERS), the Artemis Accords, ESA and the European Union, in which, inter alia, the question of how best to regulate space activities sustainably in the future is discussed.

At the national level, Spain continues to support a large number of initiatives aimed at promoting space activities and sustainability, as follows:

- Spain continues to carry out activities forming part of the Strategic Project for Economic Recovery and Transformation (PERTE) Aerospace programme, supporting numerous space technologies, including those relating to sustainability. In 2024, a call for tenders was launched for the Space Technology Programme, which is a component of PERTE.
- As part of its programme of national activities, and with the additional contribution of European funds, Spain has expanded the capacity of its space surveillance and tracking radar (S3TSR) over the course of 2024, increasing its technical performance through the scalability of the design. Moreover, the facilities of the S3TOC operations centre have been expanded both physically and functionally.
- A “call for ideas” with regard to space surveillance and tracking has been launched, giving a wide range of entities the opportunity to participate, including universities, small enterprises and large corporations. Proposals that broaden the concept of space surveillance and tracking to encompass possibilities for space traffic management have been submitted.
- National programmes have included, in particular, the development – now completed – of communications satellites Spainsat NG I and II, which are to be launched into orbit in 2024 or 2025. The satellites will provide services to a large number of government departments and will operate in geostationary orbit.
- The past year has also represented a milestone for the Spanish space sector owing to the first launch of Miura 1, the first of a family of launch vehicles developed entirely in Spain and expected to contribute to the sustainable development of outer space through the use of biofuels and recovery of the first stage of future launch vehicles such as Miura 5.
- Sustainability has also been a key topic in discussions at the national level regarding regulatory matters. The need for regulations to promote and facilitate the management of space activities in a sustainable manner has been taken into account in discussions both on the drafting of national legislation and on the updating of the registry of objects.

In sum, numerous sustainability-related space activities have been carried out in Spain in the past year, most of them involving international collaboration.

United States of America

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The United States of America continues to make the safe, sustainable and responsible use of outer space the cornerstone of its outer space endeavours. Below are several highlighted national achievements the United States is pleased to share with Member States.

National Aeronautics and Space Administration

The National Aeronautics and Space Administration (NASA) conducts human space exploration in low Earth orbit with commercial and international partners, including on the International Space Station (ISS), which serves as a catalyst for economic development and the advancement of scientific knowledge and new technologies that improve lives here on Earth.

ISS continues to play a pivotal role in Earth, space, physical and biological sciences for the benefit of people living on the planet. In February 2024, NASA launched the Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) satellite. Orbiting hundreds of miles above the Earth, the PACE mission is shedding light on the massive impact of tiny things – microscopic life in water and microscopic particles in the air. With new global insights provided by NASA for the benefit of all, PACE will answer questions about how the oceans and atmosphere interact in a changing climate.

NASA is also operating new science instruments and technology demonstrations on the Moon for the first time in 50 years following the first successful delivery of the agency's Commercial Lunar Payload Services initiative.

The NASA Europa Clipper has embarked on its long voyage to Jupiter, where it will investigate Europa, a moon with an enormous subsurface ocean that may have the necessary conditions to support life. The spacecraft launched on 14 October 2024 and will orbit Jupiter while performing dozens of close fly-bys of its moon Europa, gathering detailed measurements with highly advanced instruments. There is strong evidence that beneath Europa's icy surface is a global ocean of water, and scientists want to investigate whether this is an environment that could support life. Europa is one of the most promising places in our solar system to find an environment suitable for life beyond Earth. Evidence suggests the ocean beneath Europa's icy surface could contain the ingredients for life – water, the right chemistry and energy.

In September 2023, the OSIRIS-REx capsule landed in the Utah desert after completing its seven-year, 3.7-billion-mile journey to gather material from the asteroid Bennu to better understand the origins of the universe. The spacecraft is not done, however; it is now on its way to the asteroid Apophis to witness its nearly unprecedented close approach to Earth in 2029, where Apophis will fly by our planet at a distance closer than some satellites in orbit.

In March 2024, NASA released its Space Sustainability Strategy, which will guide the Administration's efforts to measure and assess space sustainability, identify cost-effective solutions, incentivize the adoption of sustainable practices and enhance collaboration with the global space community.

Department of Commerce

The United States Department of Commerce has made progress in supporting commercial space activities by advancing new regulatory frameworks, awarding commercial contracts and fostering international partnerships. Notable accomplishments are listed below.

The Office of Space Commerce Traffic Coordination System for Space (TraCSS), the country's new civil space situational awareness and space traffic coordination capability, launched version 1.0 of the system in September 2024 to provide warnings of potential in-space collisions to a beta set of nine satellite operators, totalling over 1,000 space objects. Through the next year, TraCSS will further develop and onboard additional users. Full public access and the migration of users from the United States Department of Defense to TraCSS for space situational awareness and space traffic coordination safety data and services is planned for fall 2025. TraCSS is being developed to blend government and commercial space situational awareness capabilities and provide data and services to support space flight safety, space sustainability and international coordination.

The Bureau for Economic Analysis hosted a space economy measurement workshop, bringing together experts from across the United States Government, private industry, academia and international organizations. Workshop feedback will be used to expand and improve the Bureau for Economic Analysis space economy statistics, as well as best practices for measuring the size and impact of the space economy across the globe.

The Department included space industry leadership in its Interagency Convening on Equitable Economic Growth, hosted a women in space commerce event during Women's History Month and started a Department-wide workstream focused on increasing diversity, equity and inclusion in the space workforce.

The National Institute for Standards and Technology (NIST) sponsored a workshop on standards and policy for in-space servicing, assembly and manufacturing, held on 20 and 21 March 2024.

On 25 June 2024, the Department of Commerce published a compendium of space industry technical standards, including standards relevant to space situational awareness and space traffic coordination. To foster the economic growth and technological advancement of the United States commercial space industry, the Department of Commerce participates in the development and promotion of space technical standards. The Department is particularly involved in standards related to space situational awareness, data-sharing and coordination. The compendium provided a consolidated reference to space-related standards, best practices, reports and other documents developed or coordinated by the International Organization for Standardization, the Consultative Committee on Space Data Systems, ASTM International, NIST, NASA, the Consortium for Execution of Rendezvous and Servicing Operations (CONFERS), the American Institute of Aeronautics and Astronautics and other organizations.

The National Oceanic and Atmospheric Administration (NOAA) National Environmental Satellite, Data, and Information Service (NESDIS) provides secure and timely access to global environmental data and information from satellites and other sources to promote and protect the nation's environment, economy and quality of life.

NOAA and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) signed an updated geostationary satellite backup agreement to reposition geostationary satellites, should an emergency and loss of critical observation occur, to fill gaps in European and the United States operational geostationary meteorological satellite systems. Building on the original backup agreement from 1993, the 2024 agreement ensures the critical partnership will continue for decades to come.

NESDIS and the Korea Space Weather Center (KSWC), now represented by the Korean AeroSpace Administration, signed a space weather agreement to further cooperation on space weather activities and included plans for KSWC to build a ground station antenna to support future NOAA space weather missions at Lagrange point 1.

Additionally, NOAA and the Japan Aerospace Exploration Agency (JAXA) updated their memorandum of understanding on global observing satellite missions to include collaboration on data from the JAXA-European Space Agency Earth Cloud Aerosol and Radiation Explorer (EarthCARE) mission. This cooperation will expand the operational and research uses by NOAA of EarthCARE for weather and climate monitoring.

The newest NOAA geostationary satellite, GOES-19, was launched in June 2024. GOES-19 is the final satellite in the Geostationary Operational Environmental Satellites (GOES) – R Series, the western hemisphere's most sophisticated weather-observing and environmental-monitoring system, and will become the operational GOES-East satellite in Spring 2025. The GOES–R Series provides critical data to countries in the western hemisphere, including severe weather, hurricane,

aviation, natural hazard, atmosphere, ocean, cryosphere and space weather data. The GOES-19 Compact Coronagraph (CCOR-1), the world's first operational, space-based coronagraph, began observing the Sun's corona, the faint outermost layer of the solar atmosphere, on 19 September 2024. CCOR-1 monitors the corona to forecast coronal mass ejections. When directed toward Earth, coronal mass ejections can cause geomagnetic storms and other types of space weather that can impact satellites, global navigation satellite systems such as the Global Positioning System, astronaut safety, aviation communications and electric power grids. CCOR-1 is the first in a series of NOAA coronagraphs with similar instruments placed on the Sun-Earth line and around the Sun, as part of the NOAA Space Weather Follow-On programme and Space Weather Next programme.

In March 2024, NOAA-21 became the primary afternoon weather satellite in the Joint Polar Satellite System constellation. NOAA-21 became operational in late 2023 and provides a continuous stream of data to improve the accuracy of global three-to-seven-day weather forecasts. This includes observations for extreme weather events and the monitoring of climate change.

Federal Aviation Administration

The Federal Aviation Administration (FAA) continues to demonstrate its ability to be a regulatory body that prioritizes safety and responsibility while enforcing effective regulations that are not overly burdensome, as evidenced by its licensing of 121 commercial launches (orbital and suborbital) and six re-entries in the first 10 months of 2024. FAA continues to engage with countries to share experiences, challenges and lessons learned in regulating commercial launches, engaging in bilateral dialogues with over 20 countries in 2024, including on topics such as spaceports and commercial space transportation safety. FAA also presented a paper at the fourteenth Air Navigation Conference of the International Civil Aviation Organization (ICAO), which encouraged the commission to engage with the Committee on the Peaceful Uses of Outer Space on topics that touch on both aviation and commercial space. The commission adopted this proposal and is working to develop a joint effort by ICAO and the Office for Outer Space Affairs to support discussions on the intersection of civil aviation and commercial space.

FAA kicked off negotiations on the first ever commercial space transportation licensing agreement, the bilateral commercial space transportation agreement. When finalized, this agreement will help streamline licensing and reduce duplication for operators launching in a State other than their own.
