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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 sixty-first session, in 2024, 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.105/1307](#), para. 51).
2. In a note verbale dated 3 July 2024, the Office for Outer Space Affairs of the Secretariat invited Member States to submit their reports by 31 October 2024. 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]
[31 October 2024]

The Australian Government established the Australian Space Agency on 1 July 2018. The Agency advances the Government's objectives through the following five functions:

- Lead and coordinate space policy across government
- Shape and grow Australian space capability
- Lead international civil space partnerships to create opportunities for Australia and support foreign policy objectives
- Promote a responsible space sector through guidance and regulation
- Advance understanding of the contribution of space to a productive, resilient and sustainable Australia

The Australian Government is investing in space capabilities, services and technologies delivered by various Commonwealth agencies. The Government continues to support the country's space sector, with significant investments across a range of portfolios, including more than 3 billion Australian dollars (A\$) over the next 20 years in civil space capabilities, services and technologies.

The continued growth of the Australian space sector is also an enabler of the Government's objectives to:

- Build a Future Made in Australia to safeguard national prosperity
- Reignite productivity growth and business investment
- Transition to net zero
- Support workers in adapting to and adopting technology

The country's recent activities in the space sector include those set out below.

Partnering on space data to support life on Earth

On 22 March 2024, the Minister for Resources and Northern Australia announced that the Australian Government had agreed to join Landsat Next, the pioneering satellite programme led by the United States of America, which will map and observe the changing surface of the Earth. The data will support monitoring of the Earth's climate, water and environment and the management of natural disasters.

The agreement builds on the near 50-year collaboration by Australia in the Landsat programme through Geoscience Australia.

Australia will commit A\$207.4 million over four years and ongoing funding to the project with the aim of enhancing satellite ground station facilities in Alice Springs and achieving new advanced data-processing and analytics capabilities. The Landsat Next programme is planned for launch in 2031.

Delivering the Moon to Mars Initiative

The Moon to Mars Initiative supports Australian businesses and researchers in joining the National Aeronautics and Space Administration (NASA) 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 the country's ambitions to join the NASA 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
- Boost 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>). The 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 March 2024, more than US\$9 million in funding was awarded to 12 new space projects that will build capability in the Australian space sector, as well as respond to key challenges and opportunities such as climate change.

Strengthening space cooperation with the United States

The Technology Safeguards Agreement between Australia and the United States entered into force on 23 July 2024, following a recommendation from the Australian Parliament Joint Standing Committee on Treaties that the treaty be ratified.

The Agreement establishes the legal and technical framework for protecting sensitive United States space technology in Australia and enables United States companies to launch space technology (launch vehicles and spacecraft) from or return it to Australia.

The Agreement strengthens the country's long-standing partnership on space with the United States and will create new commercial opportunities for Australian space companies and associated supply chains.

Progressing Australian-Indian commercial space partnerships

On 30 April 2024, the Australian Government announced A\$18 million in funding for three collaborative space projects as part of the Australian Space Agency's International Space Investment India Projects programme, which is aimed at strengthening the space economy for the two partner nations. The funding comprises:

- A\$8.5 million for the Space Machines Company Space Mission for Australia-India's Technology, Research and Innovation (MAITRI), focusing on debris management and sustainability
- A\$5.8 million for LatConnect 60 to develop and build a low Earth orbit satellite in Australia to collect high-resolution data on carbon emissions
- A\$3.7 million for Skykraft to propose and validate a position, navigation and timing system to better connect large-scale constellations vital for Earth observation and weather forecasting

Launching high-power rocket SR75 from Australia

On 3 May 2024, German company HyImpulse successfully launched its high-power rocket SR75 from the Southern Launch Koonibba Test Range on the far west coast of South Australia. This was the first high-power rocket launch authorized under the Space (Launches and Returns) Act 2018. Under the Act, a “high power rocket” is a rocket that will not reach or exceed an altitude of 100 km above mean sea level and that exceeds the threshold(s) specified in the Space (Launches and Returns) (High Power Rocket) Rules 2019.

The rail used to support the launch of SR75 was developed by launch facility provider Southern Launch, which had received funding to develop a mobile launch rail for suborbital vehicles under the Moon to Mars Supply Chain Capability Grant programme.

Enhancing regulation of space activities

The Australian Space Agency undertook consultations on a second stage of reforms aimed at enhancing the regulation of space activities from 24 July to 14 August 2024. The proposed amendments to the Space (Launches and Returns) (General) Rules 2019 and the Space (Launches and Returns) (High Power Rocket) Rules will simplify parts of the legislative rules, enhancing the regulation of space activities and better achieving the object of the Space (Launches and Returns) Act. Some of the changes to improve the regulatory framework include removing the three-stage application process for a launch facility licence and adding further exceptions to the meaning of “accident” that exclude circumstances where there is no damage to third-party property.

Consulting with the Australian space sector

The Space Regulation Advisory Collective (SRAC), an open network of over 250 non-government space sector representatives, encourages input on a range of current, emerging and potential issues to inform the regulatory function of the Australian Space Agency. On 28 February 2024, the Agency hosted an SRAC forum focusing on the regulation of space resource activities, which was attended by 42 representatives from non-government entities. The forum provided an opportunity to seek views on issues including the scope of future activities, environmental and socioeconomic considerations and international cooperation in scientific research and technological development.

The Australian Space Agency consulted with the space sector to seek input on a potential Australian sustainability of space activities policy in October and November 2024. The policy is aimed at supporting the long-term viability of the space sector so that current and future generations of Australians can continue to benefit from space services. The policy will be developed taking into consideration the economic, environmental and social issues and opportunities for the sustainability of civil space activities in Australia, as follows:

- Economic sustainability will focus on the growth and resilience of the sector through the adoption of sustainable business practices and processes
- Environmental sustainability will focus on how civil space activities could support the transition to net zero and a more circular economy
- Social sustainability will focus on how civil space activities could support the cohesiveness and fairness of society

The Agency sought feedback from industry, academia, the Government and the public on the policy vision and themes, the priority of each theme and the role of the Government and other stakeholders.

Promoting diversity in space

Katherine Bennell-Pegg became the first person to complete training as an astronaut under the Australian flag, following her graduation from basic astronaut training with the European Space Agency (ESA) on 22 April 2024. Katherine is now qualified to undertake long-duration missions to the International Space Station, and her achievement will inspire a new generation as Australia looks to develop a more diverse science, technology engineering and mathematics workforce.

Katherine's training has also unlocked unique insights and access for Australia in relation to space flight and space-based technology, including remote healthcare, food production and medical science. It has created potential new opportunities for Australian industry and researchers to collaborate with ESA and on major international missions.

Exploring how First Nations science, knowledge and culture can contribute to a uniquely Australian approach to space

In October 2023, the Australian Space Agency established a First Nations engagement function to explore how it can develop authentic, respectful and ethical relationships with First Nations peoples, businesses and communities, including to ensure that First Nations interests are a core consideration in civil space activities in Australia going forward. This work also involves building cultural intelligence in the Agency and across the Australian space sector, making it possible to draw on more than 60,000 years of wisdom, science and understanding of complex systems theories.

Bahrain

[Original: English]
[27 October 2024]

In 2024, the Kingdom of Bahrain reinforced its commitment to advancing space science by focusing on raising public awareness, building local expertise, fostering research and driving innovation. To develop a national space sector, the National Space Science Agency was established by royal decree in 2014 as the government entity responsible for overseeing space activities. Notably, the Agency has announced its third strategic plan cycle, spanning 2024 to 2028, to further these objectives.

1. Space segment

Light-1, representing the country's first presence in space and launched in collaboration with the United Arab Emirates, successfully completed re-entry, fully disintegrating and leaving no space debris. The satellite's mission yielded unique data on terrestrial gamma-ray flashes, marking the first time such phenomena had been detected in the Middle East. Moreover, Light-1 fostered the growth of the highly skilled Bahrain Space Team, members of which gained significant expertise in satellite design, development and operations.

(a) The Bahrain Space Team is currently working at full capacity to develop and launch Al Munther, the first fully Bahraini satellite, into space. The satellite is in its final stages of development, undergoing environmental testing, with launch planned in 2025. Al Munther will carry four payloads aimed at capacity-building, testing new Bahraini inventions in space and meeting national Earth observation requirements to support sustainable development. It is also considered to be the first satellite in the region to utilize artificial intelligence for onboard image processing;

(b) Development of the Aman payload, announced as the winner of the first round of the Payload Hosting Initiative of the Office for Outer Space Affairs and the Mohammed Bin Rashid Space Centre during the seventy-third International Astronautical Congress, held in 2022, is in its final stages. National Space Science

Agency engineers are collaboratively working with Mohammed Bin Rashid Space Centre engineers to test the payload and ensure successful functionality;

(c) The National Space Science Agency is collaborating with the Mohammed Bin Rashid Space Centre on the Rashid Rover 3 lunar mission by providing four navigation cameras to achieve the mission's navigation and scientific objectives. These four cameras are being developed in-house at the National Space Science Agency, showcasing the technical team's strong capabilities in creating payloads for deep space exploration missions;

(d) The National Space Science Agency is partnering with the Egyptian Space Agency to design and develop a hyperspectral resolution camera for the orbiter of the Chang'e 7 lunar mission. This project will significantly enhance capacity for developing advanced optical systems, as the camera is intended to identify potential iced water locations at the Moon's south pole and to study lunar minerals;

(e) The National Space Science Agency is working with partners in the United Kingdom of Great Britain and Northern Ireland to design and develop a CO₂ payload for Earth observation. The purpose of this payload is to provide accurate point-source CO₂ concentration data, initially focusing on Bahrain and the Gulf region;

(f) The National Space Science Agency is participating in the artificial intelligence rideshare programme developed by StarVision and Oman Lens. Agency engineers are developing an artificial intelligence model to be uplinked to their joint satellite. This model will enhance optical images taken by the satellite by providing onboard cloud-masking capabilities;

(g) National Space Science Agency engineers are involved in the Arab 813 satellite project, which is aimed at providing hyperspectral data to study climate change in Arab countries.

2. Earth observation

(a) The National Space Science Agency Space Images and Data Analysis Laboratory completed several studies for Bahrain focusing on temperature differences before and after afforestation, chlorophyll analysis, gas concentration in the atmosphere, the detection of buildings, building sites and roads using artificial intelligence, the monitoring of waterbodies and the development of a super-resolution algorithm to enhance the resolution of space images;

(b) The National Space Science Agency signed the Space for Sustainability collaboration framework with the Mohammed Bin Rashid Space Centre, aimed at facilitating knowledge exchange between experts at the Agency and the Centre for the conduct of analytical studies related to Earth's sustainability;

(c) A three-day workshop was conducted in collaboration with the University of Leicester to support Bahraini stakeholders in the fields of agriculture and the environment.

3. Capacity-building

(a) The National Space Science Agency supported three of its employees in pursuing Ph.D. studies in space technology and applications in collaboration with the University of Strathclyde;

(b) The National Space Science Agency awarded master's degree scholarships to two of its employees to study space technology and applications in collaboration with United Arab Emirates University;

(c) National Space Science Agency engineers attended several training courses covering many aspects of the space sector in collaboration with the Communications, Space and Technology Commission of Saudi Arabia;

(d) The National Space Science Agency organized about 24 specialized training opportunities as part of its capacity-building programme, focusing mainly on satellite-building, operations, data and image processing and analysis;

(e) The National Space Science Agency held four specialized workshops for national stakeholders, engaging with various government entities, higher education institutions and defence sectors.

4. Awards and achievements

(a) The Chief Executive Office of the National Space Science Agency was awarded the “Global Space Leader” certificate and pin during the International Astronautical Congress 2024;

(b) The National Space Science Agency was awarded the “IAF Diversity Supporter” certificate during the International Astronautical Congress 2024;

(c) National Space Science Agency employees won the following international awards: “Best Presenter” award at the Middle East Space Conference in Oman; best national point of contact for the Space Generation Advisory Council; and the International Astronautical Federation (IAF) “Young Space Leaders” award and “Global Space Leaders” award;

(d) National Space Science Agency employees were appointed to the following positions: Second Vice-Chair of the Committee on the Peaceful Uses of Outer Space; Vice-President of IAF; member of the “20 Under 35” cohort list of Space and Satellite Professionals International; Leader of the Arab Space Pioneers Programme; and National Artificial Intelligence Adviser;

(e) A National Space Science Agency employee was received by the King in recognition of winning the Space Generation Congress-International Astronautical Congress 2023 Nebula Award;

(f) Two National Space Science Agency employees graduated from the Lamea national project;

(g) A National Space Science Agency employee graduated from the Prime Minister’s Fellowship Programme.

5. 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 mission. In 2024, the National Space Science Agency managed to present 28 research papers at well-known conferences and publish them in top-ranked journals, as well as recently participating in the International Astronautical Congress 2024, presenting 21 research papers;

(b) The National Space Science Agency mentored two students on their university graduation projects in chemical engineering and provided an internship opportunity to a student at the American University of Sharjah, leading to a research paper presented at the International Astronautical Congress 2024.

6. Community initiatives, awareness and events

(a) The National Space Science Agency hosted the International Space Forum at the ministerial level – the first Arab and regional country to do so – in collaboration with IAF and the Italian Space Agency. One outcome of the Forum was the “Manama Page”, highlighting the rapid development of and increasing interest in the space sector in States of the Gulf Cooperation Council;

(b) The National Space Science Agency made more than 10 visits to schools, universities and entities, offering events including workshops and camps;

(c) The National Space Science Agency issued 49 space education articles, 108 press releases in local newspapers and six television and radio interviews;

(d) The National Space Science Agency organized some four events aimed at raising awareness among the public of the importance of space science and promoting space entrepreneurship in Bahrain, including by inviting guest speakers;

(e) The National Space Science Agency collaborated with the National Aeronautics and Space Administration of the United States of America for the annual space apps hackathon for the sixth year in a row, among a series of local events organized during World Space Week;

(f) The National Space Science Agency participated in the exhibition of the Bahrain International Airshow 2024, showcasing its current progress in the field of space technologies and applications. On the sidelines of the Airshow, the Agency:

(i) Organized the second edition of the space forum, with two main panels on space law and harnessing space to achieve the Sustainable Development Goals in the Middle East;

(ii) Organized many activities and competitions for public outreach in collaboration with Brilliant Remote Sensing Labs;

(iii) Announced the third Bahraini students' team to participate in the space camp in Alabama, United States, in 2025 in collaboration with Kallman Worldwide Inc.

7. International cooperation

(a) The National Space Science Agency has signed two memorandums of understanding with United Arab Emirates University and the China National Space Administration, a letter of intent with StarVision and Oman Lens, a collaboration framework with Kallman Worldwide Inc., a collaboration agreement with the University of Leicester and Geospatial Insight Ltd. and two collaboration agreements with the Mohammed Bin Rashid Space Centre for the Rashid Rover 3 and Space for Sustainability programmes;

(b) The National Space Science Agency became a member of the Space Climate Observatory, having signed the Space Climate Observatory international charter during the International Astronautical Congress 2024;

(c) Following signature of the Artemis Accords, the National Space Science Agency is an active member in all Artemis working groups;

(d) The National Space Science Agency participated in 79 space-related conferences, symposiums and events, being a speaker at many of them.

Egypt

[Original: English]
[21 October 2024]

The Egyptian Space Agency made a remarkable achievement in its national space programme, focusing on the development of satellite technology, international collaboration and capacity-building. Two milestones include the successful launches of the NEXSAT-1 and MISRAT-2 satellites, both of which represent the country's capabilities in space technology and Earth observation. The milestones showcase the commitment of the Agency to advancing space technology and enhancing its national capabilities. With a focus on innovation, collaboration and education, the Agency undertook many projects and initiatives that position Egypt as a key player in the region and Africa.

The MISRAT-2 satellite was launched in November 2023. The satellite focuses on remote sensing, with high-resolution imaging technology to support various sectors, including agriculture and water management. MISRAT-2 is aimed at providing data to support water resource management, particularly in the context of climate change

and increasing demand for water. The data generated by MISRAT-2 are gathered on a daily basis, with the main focus being on monitoring Egyptian territory and coastlines.

The NEXSAT-1 satellite, launched in February 2024, is an Earth observation satellite designed to enhance monitoring of environmental changes and natural resources. NEXSAT-1 is equipped with optical sensors that provide medium-resolution imagery, with applications in agriculture, urban planning and disaster management. The satellite has provided support for achieving the national strategy for sustainable development through its data, in conjunction with MISRSAT-2 satellite data. The successful launch of NEXSAT-1 not only underscores the technical capabilities of the Egyptian Space Agency but also marks a significant leap in the demonstration of satellite technology.

The Egyptian Space Agency has established a special portal to share its satellite with other partners worldwide; through the portal, users can access data and order satellite images.

In December 2023, the Egyptian Space Agency hosted the European-African Space Training Programme, an event that brought together experts, policymakers and stakeholders from across the African continent to learn about space technology in Africa. The event served as a platform for sharing ideas, fostering collaboration and addressing challenges faced by African nations in the space sector. Topics ranged from satellite applications to the role of space in sustainable development, emphasizing the importance of collective efforts to harness space technology for the continent's advancement.

In addition to satellite launches and international cooperation, the Egyptian Space Agency has placed a strong emphasis on education and capacity-building. Recognizing the critical need for a workforce in the space sector, the Agency has launched many educational initiatives aimed at inspiring young minds. Programmes targeting students from the primary to university levels are designed to foster interest in the science, technology, engineering and mathematics fields. Workshops, internships and scholarship opportunities are being offered to prepare the next generation with the skills required for careers in space science and technology.

In terms of infrastructure development, the Egyptian Space Agency is working on expanding its ground facilities and research centres. These are aimed at supporting satellite operations, data analysis (data centres) and research activities. The Agency has initiated plans to establish new laboratories that will enhance its research capabilities and foster collaboration with academic institutions both inside and outside Egypt.

In addition, the Egyptian Space Agency is exploring the potential for developing national satellite technologies. Research and development initiatives are being undertaken to create satellites tailored to the country's specific needs, such as remote sensing applications and communication systems. This approach is not only aimed at reducing dependency on foreign technology but also encourages innovation and economic growth by fostering start-ups and encouraging space incubators.

As part of its long-term vision, the Egyptian Space Agency is also considering the exploration of space beyond Earth. While still in the early stages, projects for lunar missions are being developed with international partners.

Greece

[Original: English]
[31 October 2024]

Greece is implementing – in collaboration with the European Space Agency – an ambitious space programme that includes the construction of 13 satellites of various types covering applications from natural disaster monitoring to security and environmental protection. In an effort to realize the vision of an autonomous and

innovative space ecosystem and to strengthen European and international cooperation in the field of space, Greece supports the creation of a European satellite constellation for Earth observation, similar to the country's investment in satellite telecommunications. This initiative will allow collective responses to challenges such as climate change and security. The small fleet of Greek satellites includes: (a) seven microsatellites with optical payloads and capabilities for very high-resolution imaging; (b) four dedicated thermal microsatellites with sensors that monitor thermal emissions and can detect fire fronts under thick smoke or at night; and (c) two high-resolution synthetic aperture radar microsatellites that can observe the ground and sea surface under thick clouds and in the dark. As a country, Greece continues to invest in advanced technologies to develop the national space programme, including optical, thermal and radar technologies, enhancing the country's ability to monitor and respond to natural disasters and other critical situations. The national strategy for space also includes the development of satellite system production lines and subsystems in Greece with the aim of achieving autonomy and creating a sustainable space ecosystem, enhancing national expertise in space technologies. By implementing the Earth observation governmental hub, with a total budget of 17 million euros, Greece will be able to collect, store, process and distribute high-precision geospatial data, contributing to areas such as Earth monitoring and security.

Greek collaboration with European programmes, such as Copernicus, enhances the country's national contribution in critical areas, such as environmental observation and the study of natural disasters. These initiatives lay the foundation for the development of innovative and tailored solutions.

Apart from its purely operational space and ground assets, Greece is investing in a set of experimental satellites (CubeSats) with the main objective of gaining experience from in-orbit validation through a proof-of-concept process, enhancing the collective capabilities of the Greek space ecosystem and laying the groundwork for the future development of fully operational space missions. At the same time, the construction of three Greek observatories for optical and quantum communications with satellites, with a total budget of 8 million euros, highlights the country's commitment to actively participating in the research and development of cutting-edge technologies, promoting innovation at the European and international levels.

The programme also includes an investment of 5 million euros to create a national assembly, integration and testing facility for space systems, with the aim of making Greece a regional hub for satellite environmental testing. Last but not least, Greece is investing in the creation of a tracking radar (the Hellenic Space Debris Tracking Radar) to enhance its space situational awareness capabilities. The radar will constitute one of the most important assets for space situational awareness in Europe as it will provide the much-needed capability to track debris as small as 2.5 cm in low Earth orbit in the Eastern Mediterranean region. These projects will ensure the infrastructure and capabilities required to support both national and international missions.

Japan

[Original: English]
[31 October 2024]

International Space Station

Japan has been an active participant in the International Space Station (ISS) programme for the peaceful uses of outer space since its inception. ISS is the largest international science and technology cooperation program ever attempted in the new frontier of space. Participants in the ISS programme seek to advance the use of outer space for the benefit of all on Earth. In November 2022, Japan announced its participation in the extension of the operation of ISS until 2030. From August 2023 to March 2024, Japanese astronaut Furukawa Satoshi completed a long-duration

mission aboard ISS. Japanese astronaut Yui Kimiya will begin a long-duration mission aboard ISS in 2025.

One of the notable contributions of Japan to the ISS program is the Japanese Experiment Module “Kibo”. Japan has been promoting the utilization of Kibo to maximize its benefits. For example, various experiments have been conducted aboard Kibo, including materials and physical science, medical science, life science and capacity-building.

Kibo also allows Japan to help build capacity in developing and emerging countries as is the only module on ISS equipped with both a robotic arm and an airlock. This unique capability clears the way for various outboard projects, such as the deployment of small satellites. The Japan Aerospace Exploration Agency (JAXA) and the Office for Outer Space Affairs have been collaborating on the KiboCUBE programme, which offers developing and emerging countries the opportunity to deploy CubeSats from Kibo. So far, satellites from Guatemala, Indonesia, Kenya, Mauritius and the Republic of Moldova have been deployed from Kibo through this programme. In June 2023, JAXA and the Office for Outer Space Affairs extended the KiboCUBE programme for three more rounds, and the joint team from Côte d’Ivoire and the United Republic of Tanzania has been selected as the awardee for the eighth round.

In 2019, JAXA launched a new educational programme called the “Kibo Robot Programming Challenge” in collaboration with the National Aeronautics and Space Administration (NASA) and held the fourth series of the competition in 2023. Many countries participated in the fourth series, with a total of 1,685 students in 421 teams from over 12 countries and subregions in the Asia-Pacific region attending. Furthermore, for this fourth series, students from States Members of the United Nations had the opportunity to participate through the Office for Outer Space Affairs international slot, created in collaboration with the Office for Outer Space Affairs.

Space transportation

JAXA is developing the H3 Launch Vehicle, the Japanese heavy-lift launch vehicle, and is currently conducting several launches. Test Flight No. 2, representing a return to flight after the failure of Test Flight No. 1, was successfully launched in February 2024 with a dummy payload and two small satellites. Flight No. 3 was launched in July 2024 with DAICHI-4 (ALOS-4) on board and was the first successful orbit insertion of a large satellite by the H3 Launch Vehicle. The H3 Launch Vehicle is expected to play a key role in the transportation of HTV-X, which is the new uncrewed cargo transfer spacecraft currently under development for resupply missions to ISS. In addition, JAXA is developing the Epsilon S Launch Vehicle based on the technical achievements of the former Epsilon Launch Vehicle.

Space exploration and science

Space exploration

Collaboration with international partners is a key component of Japanese space exploration missions. In October 2020, Japan signed the Artemis Accords, an important political commitment for the governance of civil space exploration and the peaceful uses of outer space, as one of the first signatories. As part of the Artemis programme, Japan is participating in the Gateway lunar station and signed an implementing arrangement in cooperation with NASA on the Moon-orbiting space station, Gateway, in November 2022. Under this arrangement, Japan is expected to provide the habitation capability and logistics resupply services for Gateway using technology acquired through the operation of ISS.

In the area of lunar surface exploration, JAXA launched the Smart Lander for Investigating the Moon (SLIM) in 2023, which successfully demonstrated its pinpoint landing technology. SLIM survived three lunar nights and remained operational, demonstrating results that surpassed initial goals. SLIM was deactivated in accordance

with Japanese domestic laws and regulations, as well as international guidelines, after concluding its operation in August 2024.

JAXA is also collaborating with the Indian Space Research Organisation, the European Space Agency (ESA) and NASA on the Lunar Polar Exploration Mission, which is scheduled to be launched in the Japanese fiscal year 2025. This mission is aimed at exploring potential resources such as water ice in the lunar polar region to investigate the feasibility of future resource utilization. Moreover, JAXA is conducting joint research with Japanese private companies to develop a crewed pressurized rover as a means of mobility and as a habitat to support sustainable lunar surface exploration in the 2030s and beyond.

With regard to Mars exploration, JAXA plans to launch the Martian Moons Exploration mission in the Japanese fiscal year 2026. The mission is aimed at investigating Mars and its moons, Phobos and Deimos, and collecting samples from Phobos. It is the next sample-return project following the successful mission of Hayabusa 2, which explored the C-type asteroid Ryugu and returned samples to Earth in December 2020. As an international collaborative mission, NASA, the National Centre for Space Studies (CNES), the German Aerospace Center (DLR) and ESA will contribute to the Martian Moons Exploration mission.

Space science

JAXA continues to plan and execute various space science missions with its international partners. BepiColombo, the ESA-JAXA joint mission to explore Mercury, was successfully launched in 2018 and is scheduled to reach Mercury in December 2026.

In September 2023, JAXA launched the X-Ray Imaging and Spectroscopy Mission (XRISM), a collaborative mission with NASA and ESA to investigate X-ray objects in the universe with high-throughput imaging and high-resolution spectroscopy. In September 2024, the initial scientific results of the initial performance verification observations, which were carried out over a period of about six months, were published.

JAXA is also developing a project called Demonstration and Experiment of Space Technology for Interplanetary Voyage with Phaethon Flyby and Dust Science (DESTINY+).

Remote sensing

Earth observation satellites can observe not only Japan but the entire globe. Utilizing the capabilities of such satellites, data are transferred to Japan and around the world for various purposes, from monitoring daily changes, such as weather forecasting and disaster management, to predicting future climate change.

The objective of JAXA is to provide solutions and services to the world to contribute to addressing global societal challenges such as climate change, disasters, water resources, food insecurity and biodiversity and to achieving the Sustainable Development Goals by utilizing the space-based data collected by Earth observation satellites.

The land-observing DAICHI-series satellites developed by JAXA also contribute to a diverse range of fields, including crustal deformation across the country, disaster conditions, global environmental change and the oceans. DAICHI-4 (ALOS-4) was successfully launched using the H3 Launch Vehicle. With further improved observation performance compared with its predecessor, DAICHI-2 (ALOS-2), ALOS-4 is both high-resolution and achieves a broader observation swath and contributes to monitoring disaster-hit areas, forests and sea ice.

The Earth Cloud, Aerosol and Radiation Explorer (EarthCARE) mission, the first joint mission between Europe and Japan to develop a single Earth observation satellite, was successfully launched in May 2024. The Cloud Profiling Radar, developed by JAXA and the National Institute of Information and Communications Technology, conducted its first observations in June 2024. The Radar succeeded in taking the

world's first measurement of vertical cloud motion from space. The data will contribute to advancing climate models, leading to more accurate projections of the future global environment.

JAXA is also promoting international cooperation in the utilization of satellite data to increase global understanding of environmental changes caused by human activities. In 2020, JAXA, together with ESA and NASA, established the Earth Observing Dashboard, a website that integrates indicators derived from Earth observation data from the three organizations to visualize the impact of the coronavirus disease (COVID-19) and track changes in air and water quality, greenhouse gases, economic activity and agriculture. In 2022, the scope of the Earth Observing Dashboard was expanded to global environmental change with additional indicators and stories. In 2023, the International Astronautical Federation (IAF) awarded the "IAF Special Award for Space for Climate Protection" to this effort, in recognition of the fact that the space sector can have a positive impact on climate change measures.

Space-based positioning, navigation and timing system

Japan has built a space-based positioning, navigation and timing system called the Quasi-Zenith Satellite System. The System has been operating as a four-satellite constellation since November 2018. The three satellites are always visible from locations in the Asia-Oceania region. Japan is also planning to establish a seven-satellite constellation to maintain and improve capabilities for sustained positioning and plans to launch satellites sequentially, starting in 2025. Japan has also provided a high-accuracy augmentation service known as Multi-GNSS Advanced Orbit and Clock Augmentation – Precise Point Positioning (MADOCA-PPP) since 2024 and plans to provide an emergency warning satellite service for the Asia-Oceania region from 2025, as well as operational services.

Space weather

With the increasing number of space operations, it is important to monitor solar activity and the space environment holistically for the safety and sustainability of outer space activities. The National Institute of Information and Communications Technology has continuously contributed to the formulation of an international space weather framework, including the first round-table meeting of the International Space Weather Coordination Forum in November 2023 at the World Meteorological Organization headquarters in Geneva.

Asia-Pacific Regional Space Agency Forum

The Asia-Pacific Regional Space Agency Forum (APRSAF) was established in 1993 to promote space activities in the Asia-Pacific region. Each year, APRSAF brings together space agencies, governmental bodies and international organizations, such as the United Nations agencies, as well as companies, universities and research institutes from approximately 40 countries and regions. It is the largest space-related conference in the Asia-Pacific region.

Japan and Australia will host the thirtieth session of APRSAF in Perth from 26 to 29 November 2024, under the theme "Collaborating to build a sustainable and responsible regional space sector". In 2025, Japan and the Philippines will co-host the thirty-first session of APRSAF.

The National Space Legislation Initiative, under the auspices of APRSAF, provides a regional opportunity to contribute to these goals. Under this initiative, a second report was submitted to the sixty-sixth session of the Committee on the Peaceful Uses of Outer Space, held in 2023, by 12 countries, namely, Australia, India, Indonesia, Japan, Malaysia, New Zealand, the Philippines, the Republic of Korea, Singapore, Thailand, Türkiye and Viet Nam. Currently, Member States are working together towards the submission of the joint report to the Committee on the Peaceful Uses of Outer Space in 2025.

Norway

[Original: English]
[28 October 2024]

Norway currently has 14 satellites in orbit, three of which were launched in 2024.

The Arctic Satellite Broadband Mission is a partnership between Space Norway, the Norwegian Armed Forces, Inmarsat and the United States Space Force. It consists of two satellites and was launched on 11 August 2024. The Mission will provide broadband coverage in the Arctic, north of the sixty-fifth parallel north.

One of the payloads on the Mission is a Norwegian-developed radiation monitor. It will map the radiation environment in the unique orbits that the satellite is travelling through, increasing knowledge of the space weather radiation environment affecting space infrastructure and enabling better mitigation measures.

Hypso-2 is a hyperspectral satellite for ocean observation. The CubeSat enables scientists to detect the presence of algae and to distinguish between healthy and harmful blooms. This information is crucial for safeguarding marine ecosystems and mitigating potential health risks posed by harmful algae. Hypso-2 was launched on 16 August 2024.

Looking further ahead, a new generation of Norwegian small satellites for maritime surveillance are on their way, for both commercial and government use. In this regard, the Norwegian Space Agency, in cooperation with national users, has established the Arctic Surveillance Program, which will be developed in close concert with national industries.

The majority of Norwegian space activities are being carried out through the country's participation in the space programmes of the European Space Agency, the European Organisation for the Exploitation of Meteorological Satellites and the European Union. Norway also has bilateral agreements with several other nations relating to space research and applications.

The European Space Agency Arctic Phi-Lab has been established in Tromsø. The Arctic Phi-Lab will foster innovative research and the development of satellite-based technologies, products and services with an Arctic focus.

At the beginning of 2024, Norway established civil responsibility for space surveillance and tracking and space traffic management at the Norwegian Space Agency. The arrangement will be evaluated after a three-year period. The arrangement entails ensuring that national needs are met in relation to space surveillance and tracking and space traffic management, as well as the handling of warnings at the national level, including in emergency response settings.

Through Norway's International Climate and Forest Initiative, Norway has provided the world with free access to high-resolution satellite images covering the entire tropical forest belt. This access has been a game changer in efforts to support countries in stopping the destruction of the tropical forests. Norway is currently undertaking a procurement process with the aim of continuing to provide this access when the current contract concludes next year.

In September 2023, the Blue Justice Ocean Surveillance Programme was launched. Through the Programme, governmental agencies can access satellite data from the digital platform for cooperation, Blue Justice Community, from the Norwegian Coastal Administration. Blue Justice marked its fifth anniversary in June with a four-day training workshop held in Oslo, and attended by representatives from 27 different Blue Justice countries. In connection with the presentation of the national budget for 2025, the Prime Minister of Norway indicated his support for making the International Blue Justice Tracking Center a world leader in the fight against illegal fishing.

The Norwegian Space Agency hosted the International Space University Executive Space Course, which was co-organized with the University, in May 2024.

Poland

[Original: English]
[30 October 2024]

International cooperation plays an important role in the development of the country's space sector. Poland continues to build its national space capabilities through European and international collaboration, especially in relation to the European Space Agency, the European Union Agency for the Space Programme and the community of Artemis Accords signatories. Major space-related events happened in Poland over the last year, evidencing the continuous efforts of Polish entities to enhance space-flight capabilities and take further technological steps in the exploration of outer space.

National activities related to space-flight capabilities

In July 2024, Polish suborbital rocket ILR-33 BURSZTYN 2K was launched from the Andøya Space Sub-Orbital launch site in Norway and reached a historical ceiling of 101 km. ILR-33 BURSZTYN 2K was developed by engineers from the Łukasiewicz Aviation Institute and remains the world's first suborbital rocket to use one of the most environmentally friendly propellants, comprising more than 98 per cent hydrogen peroxide. This solution, developed by Polish engineers, may also be used on satellite platforms and other long-duration space missions in the spirit of long-term sustainable space exploration.

National satellite development and launch

Intuition-1 is a commercial nanosatellite mission designed by Polish company KP Labs to observe the Earth through a hyperspectral instrument and an onboard computing unit capable of processing data using neural networks (artificial intelligence) in orbit. The nanosatellite was launched in November 2023 as a technology demonstrator aimed at proving that the use of artificial intelligence to process hyperspectral data already in orbit positively affects the efficiency of the remote sensing process.

In August 2024, Eagle Eye, the country's largest and most advanced satellite, was successfully launched into Earth orbit from Vandenberg Base in California, United States of America, aboard the SpaceX Falcon 9 rocket. The satellite was developed as a collaborative effort by two Polish companies, Creotech Instruments and Scanway, as well as by the Space Research Centre of the Polish Academy of Sciences. EagleEye, based on the HyperSat platform developed by Creotech Instruments, is a result of the development of national capabilities in designing small satellites.
