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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. In the report on its fiftieth session, 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.105/1038, para. 25).
2. In a note verbale dated 16 July 2013, the Secretary-General invited Governments to submit their reports by 14 October 2013. The present note was prepared by the Secretariat on the basis of reports received from Member States in response to that invitation.

II. Replies received from Member States

Belarus

[Original: Russian]
[14 October 2013]

The Republic of Belarus is ready and willing to participate in the processes of international integration and cooperation for the peaceful uses of outer space. In April 2013, Belarus submitted a note verbale requesting membership in the Committee on the Peaceful Uses of Outer Space. At the fifty-sixth session of the Committee, from 12 to 21 June 2012, the issue was discussed with representatives of Belarus and was recommended for inclusion on the agenda of the General Assembly.

The policy of peaceful exploration and use of outer space fully meets the national interests of Belarus and is implemented in the National Space Programme.

The United Nations/Belarus Workshop on Space Technology Applications for Socioeconomic Benefits will be held in Minsk, from 11 to 15 November 2013.

With regard to international cooperation in the peaceful uses of outer space, Belarus is currently working closely with the States of the Commonwealth of Independent States (CIS).

Together with the Russian Federation, Belarus has developed and approved a Union State scientific and technical programme entitled “Development of space- and ground-based means for supplying customers in the Russian Federation and Belarus with Earth-remote sensing data” (“Monitoring-SG programme”). Cooperation has been under way to establish and distribute high-resolution Earth-remote sensing (ERS) satellite systems in Russian and international space information markets, gathered by the Belarusian space apparatus. Belarus and the Russian Federation have jointly created and successfully operate a constellation of ERS satellites with a two-metre resolution. Joint projects are being developed to create new, technically advanced ERS and the associated ground infrastructure.

The National Academy of Sciences of Belarus, which has the responsibility for implementing State policy on the exploration and peaceful uses of outer space, and the State Space Agency of Ukraine have agreed a memorandum of understanding for cooperation in using national ERS tools for civilian uses. In accordance with the

memorandum, Belarusian specialists were involved in the thirteenth Ukrainian Conference on Space Research, where the issue of using national ERS tools for the industries of the two countries was discussed.

An intergovernmental agreement between Belarus and Kazakhstan on the exploration and peaceful uses of outer space will be signed shortly.

In accordance with the instruction from the Executive Committee and the Interparliamentary Assembly of Member Nations of CIS, the National Academy of Sciences of Belarus has taken part in the following:

(a) A meeting of representatives of the executive authorities of CIS member States on cooperation in the space sector (Yevpatoria, Ukraine, in July 2013);

(b) A consultative meeting of experts on the preparation of the draft convention of the Commonwealth of Independent States on cooperation in the exploration and use of outer space for peaceful purposes (Saint Petersburg, Russian Federation, September 2013).

As part of the Interstate Programme on Innovative Cooperation of CIS member States for the period ending 2020, the Belarusian part of the International Global Monitoring Aerospace System (IGMASS) project has been fully developed using State expertise, and a multimedia service has been set up to warn of natural and man-made disasters.

Czech Republic

[Original: English]
[8 October 2013]

The Czech Republic, taking into account its location and size, considers international cooperation to be the most efficient way to support space science, space technology development and industrial cooperation. The Czech Republic has been mainly focusing its efforts towards its active involvement in the European structures, especially the European Union, the European Space Agency, the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and the European Southern Observatory (ESO).

The Czech Republic has had a long tradition in the utilization of space for scientific purposes. Mostly thanks to international cooperation, several scientific payloads and sensors were developed, as well as small scientific satellites. Those activities, taking into account the different economic and social context, were implemented mostly in scientific institutions with little industrial involvement and little economic consideration or sustainability.

Having approved the National Space Plan in 2010, the Government of the Czech Republic acknowledged the economic, social, political and security potential of the space activities and their importance for the national economy. In addition, the National Economic Council named space activities as one of the pillars of Czech competitiveness because their objective is to increase the international competitiveness of industry and excellence in science, research and development. Space exploration is no longer considered an end in itself, but rather an economic instrument for development and innovation. Therefore, the Czech Republic now

aims to multiply the economic effects of space activities and to explore their potential for a wide range of industrial sectors.

Concerning the further development of space activities, the Czech Republic shares the objectives of ESA, that is, pushing the frontiers of knowledge, increasing the competitiveness of industry and opening the wide range of opportunities of using space activities in various domains of human activities. The major part of Czech space activities is closely linked with ESA and the European Union.

The Czech Republic became the eighteenth ESA member State in November 2008. The Czech Republic confirmed its interest to support ESA activities in Naples in November 2012, where it subscribed to new ESA optional programmes and new phases of the ongoing programmes. The subscribed programmes concern, in particular, Earth observation, navigation and telecommunications, launchers, space exploration and space situational awareness, as well as general space technology development programmes.

The Czech Republic became a European Union member State in 2004 and thus participates in the European Union Galileo, European Geostationary Navigation Overlay Service (EGNOS) and Copernicus space programmes.

Concerning the organizational framework of the Czech space activities, it should be noted that no national space agency has been established in the Czech Republic thus far. However, the Czech Government decided in 2011 that the Ministry of Transport of the Czech Republic would coordinate all space activities in the Czech Republic. The Ministry of Transport is also responsible for Czech membership in ESA, European Union space policy and European programmes such as Galileo, as well as implementation of the National Space Plan and space applications. Other ministries are represented at a high level in the Ministry of Transport's Coordination Council for Space Activities.

The Czech Republic considers the decision of European Union member States in December 2010 to relocate the European GNSS Agency (GSA) to Prague, which eventually took place in September 2012, to be an important achievement in the field of European and international cooperation. GSA is responsible especially for security and marketing of EGNOS and Galileo and for implementation of the programmes and exploitation of the systems. The Czech Republic cooperates with GSA very closely, particularly in establishing a suitable environment for global navigation satellite systems application development.

Mexico

[Original: Spanish]

[22 October 2013]

International cooperation is a fundamental element of Mexican policy, which has the objective, among others, of strengthening international agreements between Governments on the exploration and peaceful uses of outer space. Part of this policy, which has been enshrined by the President of Mexico in the National Development Plan of the current Government, is to position Mexico as one of the leading actors in the international community.

Meanwhile, space activities currently take place within the framework of international cooperation. The high costs involved are thus worthwhile. This is evidenced by the International Space Station.

Agreements between Governments

Mexico is currently negotiating agreements, which it hopes to finalize shortly, with the Governments of Italy, Germany, the Russian Federation and Ukraine. In addition, talks have started on this subject with other Governments in Europe, Asia and Latin America. Various topics are discussed, but they are all related in some way to the exploration and peaceful uses of outer space and the development of joint projects.

Memorandums of understanding

The conclusion of agreements between Governments involves formal diplomatic procedures, but this presents some obstacles to the possibility of agreeing cooperation activities in the short term. It was therefore decided that the Mexican Space Agency, a public body of the Federal Government, should sign memorandums of understanding with the space agencies of Italy, Germany, Ukraine and the United Kingdom of Great Britain and Northern Ireland. Memorandums of understanding have also been signed on specific topics relating to human capital development and the development of a nanosatellite with the National Aeronautics and Space Administration (NASA) of the United States of America.

Regional cooperation

Mexico held a workshop in Bogotá, jointly with Colombia and the International Academy of Astronautics, on 29 and 30 October 2013. The main objective was to promote and encourage space activities among the countries of Latin America and the Caribbean, although some countries of the region, such as Argentina and Brazil, have achieved significant levels of development in this regard. With time, it will be possible to eliminate the existing disparities and develop more active participation in the region.

National space activity programme

The activities of the Mexican Space Agency are set out in the National Space Activity Programme, which is based on five strategic axes:

- (a) Human capital training in the field of space;
- (b) Scientific research and development of space technology;
- (c) Industrial development and competitiveness in the space sector;
- (d) International affairs, regulations and safety in space matters;
- (e) Funding, organization and information technologies in space matters.

The National Programme will need to meet short-, medium- and long-term objectives, in line with the strategy set out in the National Development Plan, under which international cooperation is a fundamental aspect of Mexican policy.

The Mexican Space Agency has also launched the Orbit Plan (*Plan de Orbita*), a road map of the Mexican space industry.

Both the National Space Activity Programme and the Orbit Plan may be found on the website of the Mexican Space Agency.

Norway

[Original: English]
[27 September 2013]

Norway has long traditions in space, due to a great extent to its northern latitude. The country has leading scientists in several space-related fields, and is an established user of satellite communication, satellite navigation and Earth observation. Norway also has an internationally competitive space industry. The following is a short summary of Norwegian space-related activities.

Space research

Norwegian space science is concentrated within relatively few areas. This concentration is necessary due to limited resources, both in funding and personnel. The main scientific activities are in middle and upper atmospheric physics and solar physics. Cosmology has also been a growing field in recent years.

Andøya is important for space science in Norway, with a launching site for scientific rockets, as well as the international Alomar facility, which uses Lidars to study the middle and upper atmosphere. At Tromsø and on Svalbard, European Incoherent Scatter Scientific Association (EISCAT) radars probe the nature of the ionosphere.

Norwegian solar scientists are active in several international space projects and are deeply involved in the ongoing Solar and Heliospheric Observatory (SOHO) project of the European Space Agency (ESA) and the National Aeronautics and Space Administration (NASA) of the United States of America, which will continue until 2014. The scientific data from the Japanese Hinode mission are downlinked to the Svalbard and Troll ground stations, and processed and distributed at a European data centre at the University of Oslo. Norwegian scientists are also involved in the new NASA solar mission, the Solar Dynamics Observatory, launched in 2010. The most recent solar mission, the Interface Region Imaging Spectrograph (IRIS) mission, was launched in June 2013, with a significant Norwegian contribution in data analysis and theoretical modelling of the solar atmosphere, in addition to providing a downlink for data via the Svalbard Satellite Station.

Scientists at the Norwegian Defence Research Establishment (FFI) and the universities of Oslo, Bergen and Tromsø participate in nearly 20 experiments conducted on board spacecraft, including research on particle currents, electric fields, X-ray radiation and dust. This includes the Cluster mission, a constellation of four satellites flying in formation around the Earth to provide a three-dimensional map of the magnetosphere. The University of Bergen is developing a camera for the Atmosphere-Space Interaction Monitor (ASIM) instrument, which will be mounted on the International Space Station. ASIM is designed to study the mysterious lightning phenomena high up in the Earth's atmosphere, called "sprites", "jets" and

“elves”. Norwegian space scientists also participate in international projects such as the Planck and Rosetta missions and the upcoming ESA missions: Euclid and Solar Orbiter.

The Norwegian Defence Research Establishment and the Norwegian Mapping Authority also actively contribute to the International Earth Rotation and Reference Systems Service through analysis of the Global Positioning System (GPS) and very-long-baseline interferometry measurements.

Additionally, Norway is involved in microgravity research. The University of Tromsø conducts research in dust formation in space and the upper atmosphere, and will take part in an experiment to produce this dust on board the International Space Station. The Norwegian University of Science and Technology (NTNU) is also conducting plant research on the International Space Station and also hosts the user support operation facility for one of the key experiments on board the Station.

Earth observation

Norway has for many years focused on the development of Earth observation applications for maritime and polar areas. National user needs have been the driving force, furthered by close cooperation with major users, research institutes and industry. An example is radar satellite images, which have become an essential tool for the management of Norway's vast maritime areas, especially in combination with Automatic Identification System (AIS) data. Radar satellites are also used in the study of permafrost melting and in the monitoring of areas in danger of rockslides and tsunamis. Norway is an active member of the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT).

Kongsberg Satellite Services (KSAT) operate satellite stations at Svalbard, Tromsø, Grimstad and Dubai, United Arab Emirates, in Singapore and South Africa, and at the Troll station in Antarctica. Those ground stations support a large number of both national and international satellites and offer near-real-time services. The stations have a very high level of reliability of services.

Industry

Norwegian industry is involved in, among other activities, the International Space Station, the Ariane 5 launchers, space telescopes and satellites for Earth observation, communication and navigation. Key companies within the Norwegian space industry are Telenor, Norspace and the Kongsberg Group. In 2011, the Norwegian space industry had a turnover of about 6 billion kroner, of which about 70 per cent was from exports.

Communications

Telecommunications account for the lion's share of the Norwegian space industry, generating two-thirds of the sector's annual turnover. Telenor is the principal company, with services and products for mobile satellite communications (Inmarsat), television broadcasting and, increasingly, satellite systems for multimedia and broadband. Several Norwegian companies are active in the market for maritime satellite communications.

Ship traffic and oil spill detection

Norway's first satellite for space-based AIS ship traffic monitoring, AISSat-1, was launched in 2010. It provided the first maps of annual ship traffic in the Arctic and is still in operation. The satellite has proved to be a great success. AISSat-2 is planned to be launched in December 2013.

Kongsberg Satellite Services provides satellite-based monitoring and rapid reports of illegal discharges and accidental oil spills at sea. The combination of the AISSat-1 ship identification and the detection of oil spills from radar satellites is a powerful tool to identify and catch polluters.

Satellite navigation

With its vast land areas and territorial waters, low population density and subarctic to Arctic location, Norway benefits hugely from the GPS satellite navigation system.

Norway takes part in Galileo through its membership in ESA, as well as through cooperation agreements with the European Union.

Infrastructure

Norway's high latitude is a valuable asset for its space activities. Norway, particularly northern Norway and Svalbard, has geographical advantages when it comes to observation of the northern lights and communication with polar-orbiting satellites.

Rockets launched from the Andøya Rocket Range are well suited to studying phenomena related to Sun-Earth interactions, as Andøya lies under the middle of the magnetic belt around the North Pole, where auroral activity peaks. Scientists can use sounding rockets launched from Svalbard to study the interactions of the solar wind with the polar magnetic cusp near the magnetic north pole.

Northern Norway and Svalbard are well located for studying the processes taking place in near-Earth space above the Arctic. Those processes can provide indications of global climate changes. The Kjell Henriksen Observatory at Svalbard is one of the world's leading facilities for observation of the northern lights.

Polar-orbiting satellites pass near the North and South Poles 14 times a day. The SvalSat ground station on Svalbard is ideal for spacecraft control and for downloading data because the station can see all 14 daily orbits of the satellite. With the added capacity of the Troll ground station at Queen Maud Land in Antarctica, Norway possesses a pole-to-pole downlink capability.

Space debris

Norway contributes actively to space debris monitoring and takes part in the ESA programme on space situational awareness. The possible role of the EISCAT research radar system in that context is being explored.

Philippines

[Original: English]

[7 October 2013]

The following is a report of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA).

Activities of the Philippine Atmospheric, Geophysical and Astronomical Services Administration using space-based information and geospatial data

A project implemented by PAGASA that involves the use of space-based information and geospatial data is the “Enhancing risk analysis capacities for floods, tropical cyclones and severe wind for the Greater Metro Manila Area” project. The project is conducted in partnership with the Australian Agency for International Development (AusAID), for the period 2010 to 2013. Its main objective is to develop an understanding of the hazards (tropical cyclone severe winds, floods and earthquake) and the vulnerability and risks posed by these hazards to the Greater Metro Manila Area (GMMA).

In the first component, a statistical modelling of tropical cyclones will be undertaken to determine the regional level of severe wind hazard, providing information on the frequency and intensity of tropical cyclones affecting GMMA. An important input to the development of wind multipliers that will relate the regional wind hazard to the location-specific wind speed is the high quality elevation and land-use classification data sets derived from the post-processed high light detection and ranging (Lidar) data, an optical remote sensing technology that can measure the distance to, or other properties of, a target by illuminating the target with light or using pulses from a laser. Vulnerability models (which relate incident wind speed to level of building damage) will be refined through collaboration between the Philippine engineering community, Geoscience Australia engineers and other Philippine agencies, as appropriate. Hazard maps for severe wind for the entire country and for GMMA have been produced using the Tropical Cyclone Risk Model.

In the second component, which is flood risk modelling, flood hazard, vulnerability and risk maps will be developed for the Pasig-Marikina river basin using geospatial data. Animated results of hazard analysis using Lidar image/data sets are also one of the products of this component. Both hazard maps — tropical cyclone severe wind and flood maps — could be used in urban and/or land-use planning by local communities.

The PAGASA Hydrometeorology Division (HMD) is currently involved in space-based technology applications in three projects, as follows.

(a) *Applying remote sensing technology in river basin management in the Philippines*

The project “Applying remote sensing technology in river basin management in the Philippines” is a technical assistance project funded by the Asian Development Bank (ADB), in collaboration with Japan Aerospace Exploration Agency (JAXA), to formulate regional capacity development technical assistance to

support countries in Asia and the Pacific, applying space-based technologies and information and communications technology for improved river basin management.

The basic idea of the technical assistance project is to utilize the satellite-based rainfall data of the Global Satellite Mapping of Precipitation (GSMaP), in order to interpolate ground-based rainfall observations and improve the quality (accuracy, lead time, etc.) of forecasting, prediction and/or warning. As the result of discussions among PAGASA, ADB and JAXA, GSMaP data will be integrated into the current flood warning system of PAGASA as a pilot demonstration. The main components of this technical assistance project are the calibration of GSMaP and the integration of GSMaP data into the flood warning system. GSMaP consists of the hourly rainfall data with 4-hour time delay which cover the whole Philippines. The spatial resolution of GSMaP is 0.1 degrees x 0.1 degrees (in the Philippines, about 10 kilometres (km) x 10 km).

To date, the aide-memoire is being finalized for signing by ADB. As a result of several meetings in 2011 and 2012, PAGASA has provided 10-year historical rainfall data to JAXA, while JAXA has provided the corresponding GSMaP data to PAGASA. Both JAXA and PAGASA are simultaneously doing the calibration of GSMaP data while waiting for the official commencement of the project with the signing of the aide-memoire.

The project will be piloted in the Cagayan river basin, the largest river basin in the Philippines and one of the PAGASA-monitored telemetered river basins. A mission composed of ADB, JAXA and PAGASA has been dispatched in Tuguegarao to present the project to the Office of Civil Defence (OCD) Region 1, the provincial government of Cagayan and the Northern Luzon PAGASA Regional Service Division.

(b) *Supporting investments in water-related disaster management project*

The Philippine in-country component of project TA7276 is currently being executed by ADB and implemented by the International Centre for Water Hazard and Risk Management (ICHARM), with the implementation period of nine months, from April to December 2012, after revision of the partnership agreement between ADB and ICHARM. Two PAGASA HMD technical staff have recently undergone the first series of training sessions in Japan, from July to August 2012, on the use of Integrated Flood Analysis System (IFAS) software, a satellite-based flood warning system for supplementary system and capacity development in the field of flood forecasting. IFAS was developed by ICHARM, the implementing agency of ongoing technical assistance. In the project "Supporting investments in water-related disaster management" (TA7276), IFAS is being applied in the Cagayan and Pampanga river basins.

After the initial meeting with PAGASA in February 2012, when the first mission was dispatched to the Philippines, ICHARM and ADB prepared a detailed workplan and implementation arrangements ensuring the effectiveness of the Philippine in-country component of TA7276. The project officially started in April 2012 and was completed in December 2012.

Another mission, composed of ADB, ICHARM and PAGASA, was dispatched to the Cagayan and Pampanga river basins in June 2012. A seminar/workshop on the application of IFAS for the Pampanga river basin was conducted in Manila

on 26-28 September 2012, and a second seminar/workshop, on the application of IFAS for the Cagayan river basin was held in Tuguegarao on 2-4 October 2012. PAGASA is responsible for all coordination in the Philippines in support for the project.

(c) *Validation of GSMaP rainfall data on the Cagayan river basin project*

Prior to the above activities, the project “Validation of GSMaP rainfall data on the Cagayan river basin” was implemented from November 2011 to 2012. That project was aimed at assessing the performance of the hourly GSMaP precipitation data in the Philippines by comparing the amount of rainfall in the five rainfall stations in the Cagayan river basin (the Tuguegarao, Tumauini, Pangal, Gamu and Maris telemetered rainfall stations) The GSMaP rainfall data currently used by the JAXA Precipitation Measuring Mission science team has a 0.1 degree x 0.1 degree resolution (approximately 10 km). The GSMaP rainfall data are generally a product of different passive radiometer data available globally (e.g. TRIMM/TMI, Aqua/AMSR-E, ADEOS-II/AMSR, DMSP/SSMI) and brightness temperature data, merged from all available geostationary satellites (GOES-8 and GOES-10, METEOSAT-7 and METEOSAT-5, and GMS) using the Kalman filter technique.

Using the GrADS software, the equivalent point GSMaP rainfall data were derived and used to compare with those of ground rainfall stations using the least square method. The correlation coefficients (r) were derived in daily, monthly and seasonal periods to describe the performance of the GSMaP data with different temporal characteristics, for the period 2009-2011.

Initially, for the daily period, the correlation coefficients for three years were very low, especially for rainfall amounts less than 10 mm/hr, while the frequency of “no rain” recorded was higher. Furthermore, for the monthly and seasonal periods, the correlation coefficient was higher, especially for the month where there was a higher amount of rainfall. The initial result of this project provides a first assessment of GSMaP rainfall data and will provide more methods to enhance the comparison of those data. This will also be done for other ground rainfall stations for the additional validation of GSMaP data.

Harnessing geographic information systems and remote sensing technologies for improved governance and agricultural productivity

A project entitled “Harnessing geographic information systems (GIS) and remote sensing technologies for improved governance and agricultural productivity” is being undertaken by the Commission on Higher Education (CHED) in cooperation with Mariano Marcos State University (MMSU). Part of the project was a series of trainings (April and October 2012) with a focus on remote sensing, GIS and system modelling, with PAGASA researchers participating. The main objective of the training is to build a pool of regional experts in those fields who will collaborate with MMSU to harness geospatial and remote sensing technology and system modelling as a platform for addressing climate change issues and improving crop productivity through precision farming. At the end of the training, participants should conduct joint case studies with MMSU in their respective regions. All case studies will be presented in a two-day symposium, which will be sponsored by MMSU after a year of project implementation.

One of the resource speakers is the Department of Science and Technology (DOST) Balik Scientist Josefino C. Comiso, a senior scientist of the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center in Greenbelt, United States of America. One of his activities as DOST Balik Scientist is to strengthen institutional capacities in remote sensing for climate change studies and for precision agriculture.

PAGASA, as partner in this endeavour, will conduct a study entitled “Drought monitoring using remote sensing data in Iloilo Province”. The objective of the study is to develop a tool that would monitor drought using remote sensing data such as the Moderate Resolution Imaging Spectroradiometer (MODIS). MODIS data, together with other GIS software, will be used to study occurrences of droughts in the Philippines, particularly in Iloilo.

Expert team to discuss satellite data and technology applications for agriculture

A team of Japanese experts (from JAXA and NEC, PASCO and Melco) have visited PAGASA/DOST and other agencies to discuss satellite data and technology applications for Philippine agriculture. This is in connection with the project entitled “Disaster management network (DMS-Net) for the ASEAN region”, proposed by Japan. The Ministry of Economy, Trade and Industry of Japan developed a high-performance small satellite, as well as an integrated mobile ground station. In addition, JAXA will launch ALOS-2 in 2013. The Japanese satellites for DMS-Net can carry out various applications using high-resolution optical instruments and high-resolution synthetic aperture radar, which can penetrate cloudy areas, thus enhancing observation capabilities for disaster and land management.

Switzerland

[Original: French]
[14 October 2013]

History

Switzerland has long been internationally active in space affairs. It played a major role in the early stages of international European cooperation, first by organizing the first intergovernmental conference on space, in Geneva in 1960, then through its involvement in setting up the European Space Agency (ESA) in 1975 and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) in 1986. Switzerland is a very active founding member of the International Telecommunication Union (ITU) and the World Meteorological Organization (WMO) and takes part in global initiatives such as the Group on Earth Observations (GEO). Before even joining the United Nations (in 2002), Switzerland had followed the work of the United Nations on space since 1999. An observer to the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) and the Committee on Peaceful Uses of Outer Space (COPUOS) since that time, it became a member of the Committee in 2008.

Industry

Domestically, Switzerland has mainly conducted its space activity through ESA, without developing a national programme or space agency of its own. This way of working has not, however, prevented Swiss research institutes and businesses from being very active and from developing specialized skills in niche areas; the production by Swiss industry of nose cones for the Ariane rockets, structural and electronic parts of the European laboratory, the Columbus Orbital Facility (COF) (part of the International Space Station), parts of the fuselage of the European cargo vehicles (automated transfer vehicles) and high-precision atomic clocks for satellites from the Galileo European navigation and positioning system can all be cited as examples.

Research institutions

Swiss higher education institutions, federal research institutes and technical schools also make significant contributions to international projects, particularly through ESA. Examples of this contribution include the Rosina mass spectrometer for studying the Rosetta comet, the BELA altimeter for the BepiColombo mission and the inertia sensor in the LISA Technology Package for the LISA Pathfinder mission. Some Swiss institutions take part in collaborations outside Europe, such as in the POLAR project with China, the SXS instrument for the ASTRO mission with Japan, two lunar missions with the Russian Federation and the InSIGHT mission with the United States of America.

Details of Swiss activity in space research are published every two years in the report for the Committee on Space Research (COSPAR). These reports are available at <http://spaceresearch.scnatweb.ch/publications.html>.

In addition, Swiss institutions are very committed internationally to the implementation of the Global Climate Observing System (GCOS), as well as other initiatives integrating satellite data into climate monitoring, such as the ESA Climate Change Initiative (CCI) and the EUMETSAT Satellite Application Facility on Climate Monitoring.

Lastly, the Swiss Space Center was created in early 2012 with the aim of bringing together all those involved in the space sector from the scientific community and industry. The centre is housed at the Swiss Federal Institute of Technology in Lausanne (EPFL), which, with its sister institution in Zurich, provides the hub of the centre. A new training course for aerospace engineers has been created.

International centres

Several international research or data processing centres are based in Switzerland involving the support or close cooperation of Swiss research institutes. One such example is the ISDC Data Centre for Astrophysics in Versoix supported by the University of Geneva's Observatory, which hosts the scientific data centre for the ESA International Gamma-Ray Astrophysics Laboratory (INTEGRAL) and takes part in other ESA missions such as Planck and Gaia. The Davos Physical Meteorological Observatory (PMOD) hosts the World Radiation Center, which is responsible for the regular calibration of the entire global network of measuring instruments. Active in various international projects, the Observatory contributes,

for example, to developing instruments for the Extreme Ultraviolet Imager (EUI) and the Spectral Imaging of the Coronal Environment (SPICE) for the Solar Orbiter mission, a joint project between ESA and the National Aeronautics and Space Administration (NASA) of the United States.

Recent developments

Recent years have seen significant progress in the development of national skills. Swiss higher education institutions have built the first two Swiss satellites, which are picosatellites for scientific research. The coordination of the first SwissCube is being managed by EPFL and that of the second, TIsat-1, by the University of Applied Sciences and Arts of Southern Switzerland (SUPSI). They were placed in orbit in 2009 and 2010, respectively, by the Indian PSLV launch vehicle. These projects greatly support the training of engineers and the development of new technological skills. With respect to space debris, EPFL is carrying out research and development as part of its Clean-mE programme. Its CleanSpace One project, a robotic mission, aims to track the SwissCube and take it out of orbit in such a way that the two objects are destroyed when they return to the atmosphere. Furthermore, the Zimmerwald Observatory (University of Bern) has begun a low-Earth orbit observation programme to study the rotation of large space debris using light curve data.

In addition, the satellite project Characterising Exoplanets Satellite (CHEOPS) run by the University of Bern was, in late 2012, chosen by ESA as an “S-class” mission, with a launch planned for 2017. Several Swiss universities and businesses are involved in the project, which aims to discover and study Earth-like planets beyond our solar system. Running a space project on such a scale is a first for Switzerland.

In Europe, Switzerland assumed the presidency of the ESA Ministerial Council, along with Luxembourg in November 2012. By committing substantial budgets despite the financial crisis, ministers of member States reaffirmed at that meeting the importance of the space sector for competitiveness and economic growth. Switzerland, which shares that conviction, will continue to press during its presidency for the strengthening of the European space programme, innovation in Europe and international collaboration, which has become central to ambitious space programmes.

Thailand

[Original: English]
[18 October 2013]

For Thailand, 2013 was another year of opportunities in initiating new activities and continuing ongoing programmes for the peaceful uses of outer space for the benefit of Thai people and the international community. The major activities are in the area of Earth observation system and infrastructure development, communication satellites, applications and solutions, space-related business, capacity-building and international cooperation.

Significantly, the cooperation and coordination at both the regional and international levels are indispensable and a key mechanism in promoting and using space technology and its relevant applications. In 2013, Thailand conducted and participated in the international projects and activities as follows.

**Activities under the Association of Southeast Asian Nations (ASEAN)
Subcommittee on Space Technology and Applications**

(a) *Workshop on the Association of Southeast Asian Nations (ASEAN) Earth Observation Satellite*

Thailand plays an important role in the Association of Southeast Asian Nations (ASEAN), the Subcommittee on Space Technology and Applications (SCOSA) by organizing the Workshop on the ASEAN Earth Observation Satellite (ASEAN EOS) held at Buddy Hotel, Nonthaburi Province, Thailand, on 25 and 26 April 2013. The Workshop was attended by the representatives of Brunei Darussalam; Indonesia; Japan; the Lao People's Democratic Republic; Malaysia; Singapore; Taiwan Province of China; Thailand; Viet Nam; and the Republic of Korea; as well as the ASEAN Secretariat.

The Workshop aimed to reach conclusions on the necessity and possibility of the establishment of ASEAN EOS. As a result, the meeting agreed to seek other alternative solutions that could equally address the objectives of ASEAN EOS, such as the establishment of an ASEAN EOS virtual constellation consisting of the existing satellites of ASEAN member States, with the arrangement of a data-sharing mechanism.

(b) *Synthetic Aperture Radar (SAR) Applications Workshop: Rice Crop Monitoring and Production Prediction*

The Synthetic Aperture Radar (SAR) Applications Workshop: Rice Crop Monitoring and Production Prediction was held at the Geoinformatics and Space Technology Development Agency (GISTDA) in Bangkok on 20-23 May 2013. Participants from Indonesia, the Philippines, Singapore, Thailand and Viet Nam attended the Workshop.

The objectives of the Workshop were to make a presentation on the C-band and X-band SAR technologies, and had hands-on demonstrations of the use of SAR for agriculture, disasters and land subsidence by MDA (Canada), e-GEOS (Italy) and GISTDA (Thailand).

(c) *The second ASEAN Workshop on Ground Station Experts Exchange*

The second ASEAN Workshop on Ground Station Experts Exchange will be held at the GISTDA Space Renovation Park in Si Racha, Chonburi Province, Thailand, on 28 and 29 November 2013. The objectives of the Workshop are to share experiences with and discuss ground station operation, as well as developing common open-source processing software and other ground station networking (sharing of facilities and a virtual constellation).

(d) *Establishment of the ASEAN-China Remote Sensing Satellite Data-Sharing and Service Platform*

A project of ASEAN and China aims to construct a remote sensing satellite data service platform in ASEAN member States and provide applications based on Chinese satellite data in the fields of agriculture assessment, environmental surveys, disaster monitoring, prevention and management, city planning and management, mapping and other fields.

Thailand participated in this project as a data application terminal, to apply Chinese remote sensing satellite data resources, develop the suitable applications, and distribute these data and products for applications in Thailand.

Activities under the Asia-Pacific Space Cooperation Organization

(a) *Research on the atmospheric effects on Ka band rain attenuation modelling project*

Thailand is the leading country in the research project on the atmospheric effects on Ka band rain attenuation modelling. The objective of this Asia-Pacific Space Cooperation Organization (APSCO) research project is to study the effects of rain on signal power attenuation from Ka band Earth-space communications through geostationary satellites by analysing data from the received Ka band beacon signal in order to evaluate and validate existing rain attenuation models. The result of this project may enhance Ka band usage for satellite communications, especially in regions with heavy rainfall. The project is scheduled to commence in early 2014.

(b) *Development of the Asia-Pacific Ground-based Optical Satellite Observation System in Thailand*

The Asia-Pacific Ground-based Optical Satellite Observation System (APOSOS) has the aim of developing a regional or even global satellite tracking system basically composed of optical trackers. The system will be used to track objects of interest or space debris for the safety of spacecraft and operational satellites. The Ministry of Information and Communication Technology of Thailand has signed a memorandum of understanding with the Royal Thai Air Force to develop the necessary skills and expertise needed for tracking objects of interest and space debris. The training programmes will result in the forming of an expert group in such needed areas.

Other international cooperation and activities on space research and development

(a) *Space Krenovation Park*

Collaboration with other government officials, the private sector and educational institutes, as well as the development of the business sector and entrepreneurship, are essential in creating innovation in the field of space technology. Therefore, Thailand has conceptualized the new space innovation park, Space Krenovation Park (SKP), operating based on the concept of clustering, co-creation and connectivity. SKP, located in Si Racha, Chonburi Province, Thailand, is the open innovation platform aiming to increase the level of Thailand competitiveness through space and geoinformatic innovation. With the driving force of THEOS-1 and the new programme, THEOS-2, the facility's capacity will be

based on the cluster approach, with industry, academia and other institutions. Joint venture with the leading research and development institutions will also give pace to those facilities. Thailand also aims to extend and deepen its research and development capabilities in key research areas to gain both social and economic benefits.

Presently, there are 10 potential partners from all over the world joining together with SKP, Thailand, to create and deliver values and benefits from space.

(b) *First Committee on Space Research Symposium*

Thailand and the Committee on Space Research (COSPAR) have jointly organized the “First COSPAR Symposium: Planetary Systems of Our Sun and Other Stars and the Future of Space Astronomy”, to be held in Bangkok on 11-15 November 2013 and have organized a four-day capacity-building workshop to be held on 4-8 November 2013, back-to-back with the Symposium. The Symposium was the first of a new series of events initiated by COSPAR, aimed at promoting astronomy and space research at the regional level, particularly in emerging countries. Approximately 300 participants from around the world will attend the Symposium.

Lastly, Thailand also has bilateral substantive collaborations on space-related activities and projects with several countries such as China, France, India, Italy, Japan, Kazakhstan, the Lao People’s Democratic Republic, Myanmar, the Republic of Korea, Sweden, Viet Nam and the United States of America.

In conclusion, Thailand, among other States members of the Committee on the Peaceful Uses of Outer Space, affirms its commitment to further cooperating in the activities of the Committee to strengthen its work for the peaceful uses of space.