United Nations A/AC.105/977/Add.1

General Assembly

Distr.: General
8 December 2010
English
Original: English/Spanish

Committee on the Peaceful Uses of Outer Space

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

Note by the Secretariat

Addendum

II. Replies received from Member States

Belarus

[Original: English]
4 November 2010

The space activities in Belarus concentrate on the development of the Belarusian Earth remote sensing system, fundamental and applied research into space technologies under the National Space Programme, international space cooperation, the organization of conferences and exhibitions, and education and training.

The Belarusian Earth remote sensing system consists of space- and land-based segments. With regard to the space segment, an orbital complex is being created in cooperation with the Federal Space Agency of the Russian Federation. It will consist of two satellites for Earth remote sensing: the Russian satellite Canopus-B and the Belarusian satellite BKA. Both satellites are being produced in the Russian Federation and their special-purpose devices are being developed in Belarus. The satellites should be launched in 2011.

Regarding the land-based segment, a high-informative complex for receiving space information has been developed to ensure linkages with the existing Russian satellite Meteor–M and the anticipated satellites Canopus-B and BKA. Furthermore, a command-measuring station and flight control centre have been established. In-depth preliminary examinations of components of the Belarusian Earth remote sensing system have been conducted to evaluate their readiness for flight tests.

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The National Space Programme of Belarus for 2008-2012 includes the following 11 subprogrammes:

(a) Space research;

(b) Space systems and technologies;

(c) Development of the Belarusian space system for Earth remote sensing;

(d) Prospective Belarusian space vehicles;

(e) Ecological monitoring, hydro-meteorological observations and assessment of nature management efficiency;

(f) Application of space information in geodesy and cartography;

(g) Natural and technogenic monitoring of emergencies using space information;

(h) Assessment of the state of agricultural areas using space information;

(i) Development of professional aerospace education;

(j) Organization of a security support system for information space technologies;

(k) Application of space information in forestry.

In 2010, over 30 organizations have participated in the National Space Programme. The Programme is aimed at providing in-depth research into space, development of space-related scientific and special-purpose devices, and new technologies and tools for the application of Earth remote sensing data for a variety of purposes.

Belarusian scientists participate in international projects and conferences on space research and in the execution of joint space programmes and intergovernmental agreements. There is extensive cooperation with Russian enterprises and scientific centres. In addition to cooperation on satellite development, cooperation with the Russian Federation is carried out under the joint scientific-engineering programme Cosmos-NT for the period 2008-2011, entitled “Development of basic elements and technologies for the creation and use of orbital and land-based facilities of multifunctional space systems”.

Joint work under the Cosmos-NT programme includes:

(a) Development of technologies, hardware and software for providing consumers in Belarus and the Russian Federation with remote sensing data;

(b) Experimental modelling of a new-generation microsatellite;

(c) Building new materials for space applications and special satellite devices with improved characteristics.

Cooperation between Belarus and Ukraine in space matters has become more active lately. In 2009, the agreement on cooperation in space research and peaceful uses of space was signed by the Governments of the two countries. The main directions of prospective cooperation among Belarusian and Ukrainian enterprises in space research have been approved and the action plan for their implementation

has been prepared. Several bilateral agreements between enterprises of the two countries have also been signed.

Owing to the acceleration of space activities in Belarus, the training of specialists in the space field is a priority. A centre of aerospace education has been established at the Belarusian State University, which has equipment for collecting and processing data from small and meteorological satellites. The Belarusian State University also opened a new specialized department related to space technologies.

Space technologies in Belarus are promoted through the organization of international conferences and exhibitions, such as the international exhibition Aerospace Forum 2008. Furthermore, the Belarusian Space Congress is organized every other year, with the aim of developing new-generation space systems and technologies. At the Fourth Belarusian Space Congress, in 2009, 96 reports were presented by scientists from Belarus, Germany, the Russian Federation and Ukraine. Their topics included: prospective materials for space technologies; satellites and receiving/transmitting devices; Earth surface image processing; geoinformation systems and applications; Earth remote sensing facilities; satellite and land-based devices; ecology and extreme situation monitoring; space technologies and education; and applied space technologies. Such events are of high importance for further fruitful international cooperation aimed at developing new-generation space systems and technologies.

Canada

[Original: English]
9 November 2010

Introduction

The period 2009-2010 marked the beginning of a new era for the Canadian Space Programme. Government funding for the development of advanced robotic and space technologies has been increased and Canada is preparing to play a key role in future international space exploration missions. In March 2010, additional governmental financial support for the Radarsat Constellation Mission demonstrated the Government's priority of positioning Canada as a key player in advanced research and space technology development, while assuring the safety, sovereignty and security of Canada and Canadians, especially in the Arctic.

Participation in the International Space Station programme

Throughout 2009 and 2010, Canada contributed to international efforts to complete construction and increase scientific use of the International Space Station. Bob Thirsk was assigned to the International Space Station, becoming Canada's first astronaut to embark on a six-month mission aboard the Station. During his stay, he conducted many science and technology investigations, and was joined by another Canadian astronaut, Julie Payette, on mission STS-127, where she used Canadarm on the shuttle, Canadarm2 and the Japanese robotic arm to complete installation of the external science platform on the Kibo module. Canadian space adventurer and founder of Cirque du Soleil Guy Laliberté also joined Bob Thirsk on the International Space Station.

In September 2009, Canadarm2 was used to successfully capture an unpiloted, free-flying Japanese vehicle, HTV. This was the first Canadian cosmic catch for the robotic arm on the International Space Station. In 2010, the STS-132 mission marked the 26th shuttle assembly mission of Canadarm2 since its installation on the Station in 2001. In September 2010, Canada and the Station partners announced that Chris Hadfield would return to space in 2012 for a six-month mission in which he would assume the role of commander during the last two months of his stay on the Station.

In May 2009, nearly 25 years after the first Canadian astronaut flew into space, two new Canadian astronauts were announced. David Saint-Jacques and Jeremy Hansen were selected from over 5,000 applicants and are now training with other new recruits from the International Space Station international partners in Houston, United States of America, for future assignments. As the International Space Station nears completion, the partners are focused on completing its construction and rapidly expanding and promoting its use as a unique microgravity platform for science and industrial innovation and experiments. In March 2010, the heads of the International Space Station agencies reaffirmed the importance of fully exploiting the Station's scientific, engineering, utilization and education potential, agreeing that there were no identified technical constraints to continuing its operations beyond 2015 to at least 2020. The partners are currently working to certify on-orbit elements up to 2028.

The Canadian Space Agency (CSA) expressed its strong interest in continuing operations and use of the International Space Station to maximize the benefits of this important scientific outpost.

Space exploration

Long-term collaboration between Canada and the United States continues on a variety of projects, for example, with the National Aeronautics and Space Administration (NASA) Extreme Environment Mission Operations project. The 14th project was launched in May 2010, with Canadian astronaut Chris Hadfield taking the lead as the commander of the crew that conducted an extensive underwater mission in the Aquarius habitat off the coast of Florida. Such missions are often seen as preparation for astronauts who will later be selected to assume the role of commander of a major space mission.

In 2010, Canada announced a major contribution to the joint NASA/ESA 2016 Mars Mission. A joint United States-Canada science instrument, co-led by Canada and the Jet Propulsion Laboratory, known as the Mars Atmospheric Trace Molecule Occultation Spectrometer (MATMOS), will be launched as the prime instrument on board the ExoMars Trace Gas Orbiter, slated for launch in 2016. MATMOS will help scientists to solve the mystery of methane on Mars by confirming seasonal distribution patterns and providing new interpretations of the origin of methane and other trace gases on that planet.

In addition, activities continue in support of the CSA-supplied Alpha Particle X-Ray Spectrometer instrument, which will be a key contribution to the NASA Mars Science Laboratory to be launched in 2011. In the same year, the Canadian NEOSSat microsatellite will be launched to observe, for the first time, near-Earth

objects from a space-based platform and to provide key data on objects orbiting the Earth.

Earth observation

Canada actively contributes to international space projects in the field of Earth observation. Canadian scientists and researchers from three universities and two institutes contributed to the launch of the ESA Cryosat-2, in April 2010, by analysing and validating data. Cryosat-2 will significantly improve understanding of how the Earth's ice fields are changing and will contribute to our knowledge of variations in Arctic ice cover.

The Canadian small satellite mission, Scisat-1, now in its seventh year of continuous operation, continues to produce outstanding results on the concentration and distribution of more than 40 gases in the Earth's middle atmosphere. In addition, the Canadian instruments Measurements of Pollution in the Troposphere (MOPITT) on the NASA Terra platform and Osiris on the Swedish satellite Odin continue to provide important data on global concentrations of carbon monoxide in the Earth's lower atmosphere and distributions of ozone, nitrogen dioxide and aerosols in the stratosphere. The importance of these data sets lies in their precision and accuracy and in their continuity; MOPITT data have been available for over 10 years and Osiris data for almost as long.

In multilateral forums, Canada continues to support the work of the Group on Earth Observation, the Committee on Earth Observation Satellites and the World Meteorological Organization. In particular, at the Group on Earth Observation's sixth plenary session, held in November 2009, Canada endorsed the internationally agreed Data Sharing Principles.

Radarsat-1 and Radarsat-2 are two Earth observation satellites developed by Canada to monitor environmental changes and the planet's natural resources. From the beginning of its participation in the Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters (International Charter on Space and Major Disasters), Canada has provided images from Radarsat-1 and Radarsat-2, launched in 1995 and 2007, respectively, to assist countries with disaster relief and mitigation. In addition, through international agreements and collaborative programmes such as the Science and Operational Applications for Research Programme, satellite images are provided free of charge to assist the research efforts of international scientists. This Canadian programme has approved 192 research proposals since 2007. Through its participation in the Caribbean Satellite Disaster Project, Canada helps the authorities in that region to enhance their Earth observation-related know-how for coastal disaster management and emergency response by providing timely and accurate Radarsat-2 images.

Disaster management

Canada continues to support international initiatives in the area of disaster management. On 20 October, CSA and several other space agencies celebrated the tenth anniversary of the International Charter on Space and Major Disasters. CSA contributes to that multilateral cooperation endeavour through the operation and use of its space assets Radarsat-1 and Radarsat-2 to support international

humanitarian aid and rescue efforts, offering satellite images for all phases of disasters (mitigation, preparedness, response and recovery). Radarsat imagery has been delivered to national authorities and relief organizations responding to disasters around the world. For example, images were provided to help rescue and resettle people affected by the earthquake in Haiti in 2010 and to anticipate the rains that could produce a mosquito infestation and waves of malaria.

Search and rescue

Canada has also been active in another significant initiative aimed at helping people in distress through the use of space applications. Alongside France, the Union of Soviet Socialist Republics and the United States, Canada was one of the signatory parties to the memorandum of understanding for the establishment of the COSPAS-SARSAT International Satellite System for Search and Rescue in 1979. Canada has provided significant contributions to the initiative: it hosts the COSPAS-SARSAT secretariat in Montreal and has contributed 15 payloads on board the low-Earth orbiting satellite platforms provided by the United States. Canada has contributed over $100 million to the COSPAS-SARSAT system over the past 30 years. As of December 2008, the COSPAS-SARSAT system had provided assistance in the rescue of approximately 27,000 distressed persons in over 7,200 incidents around the world. Canada will continue to play a significant role in the COSPAS-SARSAT system and is currently exploring the possibility of providing payloads for the next generation of satellites involved in the programme.

Space astronomy

Canada is working in partnership with NASA and ESA on the James Webb Space Telescope by contributing key technologies that will accurately guide the telescope. Canada is designing and building one of the telescope's four science instrument packages, which contain two advanced components: a high-sensitivity camera, the Fine Guidance Sensor, and a Tunable Filter Imager. Scheduled for launch in 2014, the telescope will be placed at Lagrange Point 2, where it will serve thousands of astronomers worldwide for a planned lifetime of 10 years or more. Because of the contribution of the specialized instrument package by Canada, Canadian astronomers will be entitled to 5 per cent of the time on the space telescope.

The Microvariability and Oscillations of Stars (MOST) microsatellite, which is dedicated to asteroseismology, has been in operation for seven years and continues to measure and analyse variations in the light of stars, including light curves of transiting extrasolar planets, with unprecedented accuracy. In 2008 and 2009, CSA signed an agreement with NASA that allowed researchers from the United States to have some observation time on the MOST space telescope. In 2009 and 2010, up to one sixth of the science observation time was available to astronomers from the United States.

Canada has partnered with the Indian Space Research Organisation in the Astrosat space telescope project, which includes the Ultra-Violet Imaging Telescope (UVIT). Canadian researchers and industry contributed to the elaboration and building of the photon-counting detectors for UVIT, two ultraviolet imaging telescopes on the Astrosat space telescope of India, set for launch in 2011. Canadian

participation in Astrosat will entitle the UVIT team and other Canadian scientists to observation time on the satellite for the next few years.

Canada joins an international consortium led by ESA for the Herschel and Planck projects. With funding from CSA, several Canadian institutions and entrepreneurs contributed to the Herschel project by taking part in the development of two of its three science instruments: the Heterodyne Instrument for the Far Infrared and the Spectral and Photometric Imaging Receiver. Canada also contributed to the Low Frequency Instrument and the High Frequency Instrument of the Planck project, mainly through the development of sophisticated analysis software for studying the complex data streams from the satellite. These contributions allow Canadian researchers to join the teams of scientists who will analyse the data and answer fundamental questions about cosmic origins over several years.

Canada is collaborating with Japan on Astro-H, the sixth in a series of Japanese X-ray space observatory missions, to provide a laser-based metrology system designed to monitor the movement and position of the 12-metre extendable optical bench housing the Hard X-ray Imager, one of four on-board instruments. This technology is critical to the quality of the scientific data of the Hard X-ray Imager.

Space weather

Canada welcomed the development of the International Space Weather Initiative in 2010 and will continue to contribute to international efforts by providing data gathered by its ground- and space-based geospace monitoring network.

Canada is collaborating with the United States on two major projects, the Time History of Events and Macroscale Interactions during Substorms and the Resolute Bay Incoherent Scatter Radar, to better monitor the Earth's upper atmosphere and near-space environment and understand disruptions in communications, navigation and threats caused by space weather events. Canada is also contributing an instrument to each of the ESA Earth explorer constellation Swarm satellites, aimed at improving the measurement of electromagnetic energy flow to the ionosphere.

CSA, with the collaboration of a team of researchers and engineers from several Canadian and foreign universities and research institutes, as well as Canadian industry, is looking forward to launching the Enhanced Polar Outflow Probe payload onboard the small Canadian satellite Cassiope in 2011. The Probe will include a suite of eight scientific instruments to collect data about the effects of solar storms and their impact on radio communications, satellite navigation and other space-based technologies. Its resolution will surpass that of all other orbiting satellites. It will be capable of studying space phenomena in the upper atmosphere, where the solar wind interacts with the Earth's magnetic field.

Public health

At the international level, Canada has been actively involved in the Action Team on improving public health services of the Committee on the Peaceful Uses of Outer Space. Since 2008, Canada and India have co-chaired the Action Team and, although the mandate of the Action Team is coming to an end, Canada and its

national partners will continue to promote tele-health and tele-epidemiology applications.

Partnerships

Canada strengthened its collaboration with the United States by signing, in September 2009, an overarching Framework Agreement on Space Cooperation. The new treaty formalizes the collaboration of Canada with United States agencies such as NASA, the National Oceanic and Atmospheric Administration and the United States Geological Survey, and opens doors to further collaboration between scientists and space companies and at the bilateral level. Canada has also established the Space Cooperation Forum with the United States to foster collaboration on defence matters in spaced-related activities in areas such as Earth observation, satellite communications and space situational awareness.

In Europe, Canada is currently moving towards a renewal and extension of its partnership with ESA through the Canada-ESA Cooperation Agreement. As a cooperating State of ESA for more than 30 years, Canada has assisted in the development of flight heritage for key niche technologies related to Earth observation, telecommunications and navigation, and has pursued a number of initiatives supporting scientific research on the International Space Station, broader use of Earth observation applications through the ESA Tiger Initiative and the ESA Living Planet Programme.

Canada remains part of the Morse Arctic Coastal Initiative, which is jointly managed by CSA and ESA and focuses on the information needs of Arctic coastal users in government, non-governmental, municipal, industrial and scientific organizations. The Initiative places a particular emphasis on supporting the greater use of space-derived Earth observation data to meet the needs of users.

The way forward

The Canadian Government is making use of space-based assets, infrastructure and applications to meet its needs and mandates and to enhance programme delivery for citizens. A coordinated and integrated approach within Government is aligning the way CSA responds to the strategic priorities of Canada. In future, CSA will deliver its programmes through three key business lines: (a) space utilization, which is aimed at increasing the use of space data, information, applications and services to Government departments, especially in areas related to Earth observation, satellite communications and navigation; (b) space exploration, which drives scientific and technological excellence and prepares Canada to play a key role in future international space exploration missions; and (c) space science and technology, which will foster synergy and collaboration between CSA, academia and the space industry and partnerships with other space agencies to enhance the scientific and industrial capacity of Canada to meet the evolving priorities of the Canadian people.

Canada plans to increase its maritime and coastal surveillance capabilities with the Radarsat Constellation Mission, which consists of three small Earth observation satellites. This Constellation may also contain a module capable of enhancing ship detection by detecting signals emitted by large ocean-going vessels using the automatic identification system. Planning continues for the construction and

deployment of a two-satellite polar communications and weather mission, which is intended to vastly improve detection of weather systems and assure the preparation of detailed weather forecasts, in addition to penetrating the northern Arctic to supply dedicated telecommunications services. The polar communications and weather mission is planned to launch two satellites in 2016. International collaboration, partnership and participation in those missions are currently being explored.

Jordan

[Original: English]
23 November 2010

Space activities at the Royal Jordanian Geographic Centre

The Royal Jordanian Geographic Centre was established in 1975 as a national agency responsible for aerial and land surveying and producing various topographic, operational and thematic maps. It mainly deals with the applications of remote sensing techniques using different satellite images and provides the public and private sectors with geo-referenced and processed satellite images. As the Centre does not own a satellite receiving station and has no satellite system building programmes, it depends heavily on various agencies that provide satellite images of different types and resolutions.

The Centre is active in the use of remote sensing technologies in risk assessment and disaster management and in the utilization of space-based data to advance socio-economic development.

Space technology and applications have played an important role in addressing most water-related issues, ranging from lack of water and the consequent impact on populations and food production to excess water causing floods and damage, all of which present a significant threat to the sustainable development of human societies. As a result, the Centre has conducted a pilot project to utilize remote sensing techniques in analysing the flash floods that occurred in the Aqaba area in 2005. It was also involved in determining suitable groundwater recharge zones using remote sensing and geographic information system techniques.

Furthermore, the Centre is currently involved in building a geo-database through feature extraction of high-resolution ortho-rectified satellite images for Image Map City production, which could be of use for decision makers, planners and project managers. In addition, the aerial photos are used to produce orthophoto maps at different scales. The photos are also used to extract the digital terrain model of Jordan.

Finally, Jordan has established a permanent global positioning system station to monitor the tectonic movements along the Dead Sea transform system.

Spain

[Original: Spanish]
8 November 2010

Report on the space activities of Spain in 2009

On 4 June, the Minister for Science and Innovation, Cristina Garmendia, inaugurated the Micro-Ecological Life Support System Alternative pilot plant, the first European life support system in space. At the inauguration event, the Minister was accompanied by Jean-Jacques Dordain, Director General of ESA, Maurici Lucena, then Chairman of the ESA Council and Director General of the Centre for the Development of Industrial Technology, and other key figures.

On 2 November, the ESA Soil Moisture and Ocean Salinity satellite was launched from the Plesetsk space station in the Russian Federation. This new ESA Earth observation mission is designed to measure soil moisture and ocean salinity and is the most important achievement of the Spanish space sector in recent years. Spain invested a total of 70 million euros in the satellite, and its design and construction involved more than 20 European companies. The end product is a highly sophisticated instrument that represents the state of the art in interferometric radiometry. The images produced by the satellite are already being used by scientists to gain a better understanding of the climate.

A contract for the development of the space segment of the Spanish Earth observation satellite Seosat/Ingenio was signed on 20 October. The optical satellite Ingenio will make it possible to capture some 600 photographic images per day of any point on Earth.

The Space Situational Awareness programme, which was launched in 2008, is an ESA initiative aimed at establishing a space monitoring system to protect and ensure the operation of European satellites. Spain is the main participant in the programme, providing 33 per cent of its funding. In March 2009, the Space Situational Awareness committee met for the first time at ESA. That meeting marked the beginning of the programme's industrial activities.

The most notable event in 2009 with regard to Spanish space infrastructure was the recognition of the European Space Astronomy Centre, located in Villafranca del Castillo, Madrid, as an ESA establishment with the same status as the Agency's other establishments.

In 2009, Spain signed an agreement with the Russian Federation to contribute a high-performance ultraviolet camera to the international World Space Observatory-Ultraviolet mission led by the Russian Federation. That contribution comes in addition to an earlier agreement under which Spain undertook to contribute to the ground segment, in which it is playing an important role. The agreement is firm evidence of the cooperation between Spain and the Russian Federation in the exploration of space for scientific purposes.