



# General Assembly

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## Committee on the Peaceful Uses of Outer Space

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

#### Note by the Secretariat

#### Addendum

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## II. Replies received from Member States

### Canada

[Original: English]

[5 November 2013]

2013 was a very successful year for Canada, with the launch of the NEOSat, SAPHIRE, CASSIOPE and M3MSat satellites and with the announcement of the final phase in the development of Canada's RADARSAT Constellation Mission, planned for launch in 2018.

#### International Space Station

Canada continues to be an important partner in the world's largest international engineering undertaking, the International Space Station (ISS), and has renewed its commitment until 2020. Canada's contributions of an advanced robotics suite, namely Canadarm2, the Mobile Base System and the Canadian Space Agency's (CSA) robotic "handyman" Dextre, help maintain and resupply ISS. Canadarm2 is regularly used to capture Japanese and American space vehicles and to berth them to ISS, where they can be unloaded. In January 2013, Dextre marked a historic achievement by successfully refuelling a mock satellite outside the station. This robotic refuelling mission is a collaboration between the National Aeronautics and Space Administration (NASA) of the United States of America and CSA, and a pivotal advancement in the operational use of robotic technology for satellite servicing-saving and the prevention of space debris.

In December 2012, Canadian astronaut Chris Hadfield was launched aboard a Russian Soyuz en route to ISS, where he began his five-month expedition alongside astronauts and cosmonauts conducting scientific experiments, testing new technologies, berthing commercial resupply spacecraft with Canadarm2 and carrying out critical spacewalks. Hadfield served as an ISS flight engineer until March 2013, at which time he assumed the role of commander of ISS, the first Canadian ever to command a spacecraft. As well as overseeing daily operations of ISS, Hadfield was the systems lead for the Station's European and Japanese science modules, and collaborated in 130 science experiments from around the world. During his stay on ISS, Hadfield redefined the use and impact of social media and was very effective in transcending boundaries and inspiring people all around the planet.

Human health and medical science constitute Canadian priorities for the utilization of ISS, and Canadian researchers collaborate with their international partners in conducting experiments onboard the space station. There are many similarities between the effects of space flight on astronauts and changes associated with the normal process of aging on Earth. Looking for ways to translate the results of space studies into benefits for citizens, the Canadian-led Space Health and Aging Research (SHARE) initiative seeks to bring together expertise in space and in the aging process. The Canadian Space Agency and the Canadian Institutes of Health Research Institute of Aging hosted an international workshop in November 2013 that brought together space and aging health research agencies to discuss future collaboration in terrestrial and space activities.

### **Planetary exploration**

In August 2012, after a nine-month voyage, the NASA Mars Science Laboratory safely arrived at its final destination, marking the second time a Canadian science instrument, the Alpha Particle X-Ray Spectrometer (APXS), had landed on Mars. As one of 10 science instruments used throughout the mission, APXS supports scientists in determining the chemical composition of Martian rocks and soil to attempt to establish their geological history and alterations by water. Canada is completing the design of a science instrument for the Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer (OSIRIS-Rex) asteroid sample-return mission of NASA. The laser altimeter instrument will be capable of providing ranging data, global topographic mapping and local topographic maps of candidate sample sites for the mission. Canada also continues to develop advanced robotics technologies and terrestrial prototypes of landers and rovers in anticipation of its potential role in future international space exploration missions. The Canadian Space Agency engaged with members of the International Space Exploration Coordination Group and collaborated in the update of the Global Exploration Roadmap and in the related paper entitled “Benefits stemming from space exploration”, issued in August and September 2013, respectively.

### **Space-based astronomy**

Canada continues its participation in the James Webb Space Telescope, a major space observatory with a planned launch in 2018. The James Webb Space Telescope is a partnership between NASA, the European Space Agency (ESA) and CSA. Canada provides the Fine Guidance Sensor, a critical element of the mission used for extremely precise pointing of the telescope, and the Near-Infrared Imager and Slitless Spectrograph, a scientific instrument with unique capabilities for finding the most distant objects and discovering and characterizing planets in other solar systems. The sensor and the spectrograph were delivered to NASA in 2012 and are now being integrated into the telescope’s Integrated Science Instruments Module. As part of this module, the two instruments will complete their first cryogenic test campaign by the end of 2013. Canada also continued its work with Japanese Aerospace Exploration Agency (JAXA) on the ASTRO-H astronomy satellite, to be launched in 2015, contributing a laser-based metrology system to measure and calibrate distortions of a 6 metre mast, on which the hard X-ray telescope is deployed, to a level of accuracy equivalent to the width of a human hair.

### **Space weather**

The Canadian satellite CASSIOPE was successfully launched in September 2013. The Enhanced Polar Outflow Probe (e-POP) scientific instrument observes the Earth’s ionosphere to study space weather effects and how atomic oxygen escapes Earth’s gravity via the magnetic poles during solar storms. While the e-POP mission is driven mainly by the University of Calgary, it involves collaboration with other Canadian universities, JAXA and the United States Naval Research Laboratory. Canada also contributes to the Swarm constellation mission of ESA, providing six Canadian Electric Field Instruments (C-EFIs). The four-year mission, scheduled for launch in the final quarter of 2013, consists of three satellites in near-polar orbit, whose objective is to accurately survey the Earth’s geomagnetic field and its evolution over time. Each satellite will carry

two C-EFIs to measure the electric field around the spacecraft to enable the decomposition of the magnetic field into its various sources. Canada continues its collaboration with NASA on the Time History of Events and Macroscale Interactions during Substorms (THEMIS) mission. The constellation of three satellites in highly elliptical orbits crosses magnetic areas with sensors located in Canada, the United States and Denmark. This trajectory aims to observe events such as magnetic reconnections and their effects. The THEMIS mission has been extended until December 2016, and CSA will continue to fund the participation of Canadian scientists.

### **Earth observation**

Since its inception in 2000, the International Charter on Space and Major Disasters has been joined by 12 other space agencies, and has been activated for 386 disasters in 110 countries (as at the end of August 2013). From January to October 2013, the Charter was activated 26 times for disasters in 22 countries for which CSA provided specialized imaging. The Government Operations Centre of Public Safety Canada activated the Charter following the Lac Mégantic (Quebec) train derailment and explosion on 6 July 2013. Given the nature of the disaster, all of the Charter's high resolution satellites (Pleiades, Formosat-2, RapidEye, DMC, Resourcesat-2, Kompsat-2, Kanopus-V, Landsat-7 and -8, Worldview-1 and QuickBird-2) were repeatedly tasked with obtaining cloud-free imagery of the site and with providing an overview of the damage caused by the accident. Canada thanks all members of the Charter that responded to its request and provided images.

In 2013, CSA continued to provide RADARSAT-2 imagery to Canadian and foreign researchers through the Science and Operational Applications Research (SOAR) programme. Through the programme, CSA supports a large number of international research and development initiatives. The SOAR Africa programme, launched in April 2011 with four ongoing projects, was created specifically to focus on the use of RADARSAT-2 data for basic and applied research and development activities to enhance the capacities of African organizations in the use of Earth observation data. In collaboration with ESA and with the National Authority of Remote Sensing and Space Sciences in Cairo, SOAR-Africa facilitates RADARSAT data access by African users, making the best use of Earth observation technology: improving the collection of water information, enhancing knowledge of the water cycle and advancing the monitoring of water resources for effective adaptation and mitigation measures against the impacts of climate change in Africa. The SOAR framework has also been used to support research and development activities. In August 2013, a bilateral agreement was renewed with ESA, providing researchers from Canada and ESA member States with valuable data from RADARSAT-2 and ESA missions to conduct research and development projects. Similar bilateral agreements were implemented with the German Aerospace Centre (DLR) in June 2012, and also with the Italian Space Agency (ASI) in September 2013, providing COSMOS-SkyMed and RADARSAT-2 data to Italian and Canadian researchers.

Canada pursued its participation in the international Arctic Spatial Data Infrastructure, along with the mapping agencies of Denmark, the Faroe Islands, Greenland, Finland, Iceland, Norway, the Russian Federation, Sweden and the

United States. The Arctic Spatial Data Infrastructure has been endorsed by the Arctic Council and is envisioned as an online suite of resources that improves sharing, access and use of geospatial information spanning the entire circumpolar region. Currently in the conceptualization phase, the project will enter the operational phase in 2014. The Arctic Spatial Data Infrastructure provides a geographic reference foundation to help inform sound decision-making and policymaking related to responsible resource development, emergency management and environmental issues.

The Canadian Space Agency took over as chair of the International Committee on Earth Observation Satellites (CEOS) for 2013. Under Canada's leadership, the November 2013 CEOS plenary adopted a new governance and a renewed mission statement, which states that CEOS will coordinate international civil space-based Earth observation programmes and promote the exchange of data to optimize societal benefits and inform decisions for securing a prosperous and sustainable future for humankind. Through CEOS, the space agencies support more effective decision-making in key areas such as disaster risk management, agricultural productivity, monitoring and management of the world's forested regions, climate monitoring and research and data democratization.

Canada leads the Group on Earth Observations (GEO) Joint Experiment for Crop Assessment and Monitoring (JECAM), which is a network of more than 25 agricultural monitoring research sites working towards developing a convergence of approaches, monitoring and reporting protocols and best practices for a variety of global agricultural systems. Experiments under JECAM facilitate the adoption of international standards for information products and reporting towards the development of a global "system of systems" for agricultural crop assessment and monitoring. Beyond JECAM, in 2011 the Group of Twenty (G20) launched the GEO Global Agricultural Monitoring (GEOGLAM) initiative to help improve open access to authoritative accurate production information and thereby reduce market volatility. The objective of GEOGLAM is to coordinate satellite monitoring observation systems in different regions of the world in order to enhance crop production projections and weather forecasting data. The outcome is improved and more harmonized global systems of systems taking advantage of new satellite assets and a higher level of international coordination. The initiative is already providing global monthly outlook assessments to the Agricultural Market Information System, and thereby having an impact on access to open and accurate market information and near-real-time reporting for global food security. Canada was one of the lead nations in the development and implementation of GEOGLAM. Agriculture and Agri-Food Canada leads the research and development component of the initiative, while CSA contributes RADARSAT-2 data. The Canadian Space Agency also provides RADARSAT-2 data in support of another GEO global monitoring initiative, the Global Forest Observation Initiative.

### **Cooperation agreement**

A formal cooperation framework agreement between CSA and DLR to further develop cooperative activities for peaceful purposes in the areas of Earth observation, satellite operations, space exploration and space technology development was signed in September 2013. The framework is a culmination of a long heritage of cooperation spanning over 40 years between Canada and Germany

under the scientific and technology cooperation agreement signed in 1971. In May 2013, Japan and Canada held their first joint meeting on space cooperation, and signed an implementing arrangement concerning mutual cooperation in satellite disaster monitoring. This joint meeting is based on the memorandum for promotion of space cooperation between Japan and Canada signed in March 2012.

Canada's participation in the Earth Observation programmes of ESA remains the most important focus of its collaboration. Through the Earth Observation Envelope Programme of ESA, Canadian scientists are actively contributing to the calibration and validation of data from CryoSat-2, launched in April 2010. Canada is also exploiting near-real-time data from the Soil Moisture and Ocean Salinity (SMOS) mission to improve its numerical weather prediction model. The SMOS mission is aimed at better understanding the role soil moisture and ocean salinity play in regulating the water cycle. New Canadian investments were also made in other ESA programmes such as the Automated Identification System initiative, as part of the Advanced Research in Telecommunications Systems programme of ESA, to develop industry-led solutions to monitoring ships in seaways, along coastlines and in oceans from space. Ongoing and new investments made by CSA in ESA space exploration programmes are intended to further position Canadian expertise in space robotics while providing Canadian scientists with access to terrestrial and orbiting platforms for space life science experiments.

### **Capacity-building**

In September 2013, CSA and the French Space Agency, the Centre national d'études spatiales (CNES), successfully completed their maiden stratospheric research balloon flights from the new stratospheric balloon launching facility in Canada. These flights were the first to take place under a new France-Canada collaboration agreement signed in September 2012. The campaign, held throughout the summer, successfully qualified the new Canadian launch site and the CNES new balloon system, as well as all the associated procedures required to operate such heavy balloons safely in Canadian skies. In addition, two Canadian tech-demo payloads flew flawlessly at altitudes ranging from 34 to 42 km. Such low-cost, recurrent flights in near-space environments will enhance future Canadian space capacity by supporting our nation's scientists and engineers through a new platform to test technologies, perform science experiments and train undergraduate and graduate students in the field of space science and technology.

### **Cuba**

[Original: Spanish]  
[5 November 2013]

The annual objectives of Cuban space activities have been satisfactorily met despite the country's difficult economic situation.

Below is a brief account of the results obtained by Cuba in 2013 in the development of space research and the effective use of applications based on that research, aimed at the peaceful use of outer space.

### **Space meteorology**

The Institute of Meteorology of the Ministry of Science, Technology and the Environment uses the data gathered by meteorological satellites primarily for studying and forecasting hurricanes and is continuing to develop the use of those data in the various forecasts produced by the Institute.

Given the situation encountered this year concerning the phenomenon of dust from the Sahara, various information has been given to the media to raise public awareness, inter alia, of the impact of that phenomenon during the current cyclone season.

Particular attention has been given to agrometeorology and to the improvement of the use of space technology.

One of the main applications of space technology is the detection of forest fires.

The seventh congress of the Cuban Meteorology Society will be held this year, its programme including presentations on various related activities.

The Higher Institute of Technologies and Applied Sciences offers a degree course in meteorology, providing training for careers in space technology.

The Institute has developed computer tools to apply a methodology for calculating the radio relay link between meteorological satellites in polar orbit.

The Institute has developed and improved the technology of a receiving Earth station for meteorological satellites in polar orbit.

### **Remote sensing of the Earth**

The Environment Agency is continuing to develop advanced research projects on climate change and natural and man-made dangers, vulnerabilities and risks through its various institutions. The use of remote sensing data is central to this research.

The Institute of Tropical Geography is continuing to develop the space data and metadata structure, offering training courses to other institutions that work with the technologies involved, including the Institute of Geophysics and Astronomy (IGA). It is also continuing to develop the use of remote sensing in environmental research.

Cartography using satellite images to optimize the use of land for agricultural purposes has been improved during the year, mostly as part of the "Environmental bases for local sustainability of food production" project, which involves the participation of experts from IGA. That project will greatly benefit the Cuban people by contributing directly to the achievement of sustainable agriculture through the comprehensive analysis of cartographic information, which will provide experts and decision makers with a more informed basis for achieving the optimal use of land.

GeoCuba has developed methods for the use and interpretation of global positioning system (GPS) data in situations in which technological limitations are encountered, in astronomical calculations for geodetic purposes and in meteorological applications.

The National Seismology Research Centre uses space technology in its research with a view to improving regional and local studies of seismically active areas.

### **Space sciences**

The Geomagnetic Observatory and the Havana Radio Astronomy Station of IGA (which is part of the Ministry of Science, Technology and the Environment) continue to carry out regular observations and share their data with the international scientific community.

Cooperation between IGA and the Institute of Geophysics of the National Autonomous University of Mexico has been strengthened, which has helped to produce valuable results in radio interferometry observations for the interplanetary scintillation array of the Mexican Array Radio Telescope (MEXART).

An early warning system that detects electrical storms has been installed at IGA.

The work of the Schumann Resonances Station has attracted great interest with respect to the study of the Sun's magnetic field.

A junior staff member of IGA has defended his master's degree thesis on space geophysics.

The Institute is continuing to work with the Astronomy Research Centre in the Bolivarian Republic of Venezuela, where a student is finishing his doctoral thesis.

The Institute is continuing to work with the International Centre for Theoretical Physics in Trieste, Italy, where a specialist is being trained in GPS systems and their use in ionospheric studies and in improving global GPS total electron content models.

The Institute has held numerous presentations, conferences and talks for specialists and the general public in scientific, cultural and education centres.

The Institute continues to provide both methodological and technical support to the Astronomy Circle at the Ernesto Che Guevara Central Pioneers' Palace of Havana.

The Planetarium and Cultural Centre for Science and Technology has been established, having been developed by the Office of the Havana City Historian with the support of IGA.

### **World Space Week**

The tenth workshop on Outer Space and its Peaceful Uses was held in Havana on 7 and 8 October as one of the activities to celebrate World Space Week.

The events took place in the Rosa Elena Simeón Planetarium of the Office of the Havana City Historian, where 37 presentations were given by 33 representatives of 11 institutions.



The main topics were:

- (a) Astronomy;
- (b) Global positioning systems (GPS and the Global Navigation Satellite System (GLONASS));
- (c) The ionosphere;
- (d) Forest fires;
- (e) Agricultural applications;
- (f) Cartography;
- (g) Geodesy;
- (h) The application of space technologies in seismology;
- (i) Space law;
- (j) Health applications;
- (k) Meteorology.

The participating organizations were:

- (a) Sugar Cane Research Institute;
- (b) Institute of Geophysics and Astronomy;
- (c) Institute of Tropical Geography;
- (d) Institute of Meteorology;
- (e) Higher Institute for Technologies and Applied Sciences;
- (f) National Museum of Natural History;
- (g) Science and Technology Unit of GeoCuba — Research and Consultancy;
- (h) Institute of Civil Aeronautics of Cuba;
- (i) National Seismology Research Centre;
- (j) Institute of Cybernetics, Mathematics and Physics;
- (k) National Office for Hydrography and Geodesy.

Several interviews were given to the National Information Agency, Havana Radio (of the Office of the Havana City Historian), Radio Taíno and others.

Two IGA experts gave interviews to Orfilio Peláez, which were published in the newspaper *Granma* on Saturday 5 October.

The tenth national space workshop was featured in the “Science and technology” section of the programme *Revista Buenos Días* on Tele Rebelde, a channel owned by the television company Televisión Cubana (TVC), and also on *Antena*, another TVC programme, on the education channel. Both features were presented by Mara Roque, a journalist.

A detailed article about World Space Week, which is considered the most important event worldwide on the use of space and on space technology, was

published on the inside cover of the October edition of *Programa Cultural*, a magazine edited by the Office of the Havana City Historian.

A further article on the event, entitled “Outer space and its peaceful uses under discussion”, was published on page 8 of *Juventud Rebelde*, a newspaper aimed at young people, on 8 October.

The event was also advertised on the website of IGA ([www.iga.cu](http://www.iga.cu)), under the “News” section, with a link to the event programme.

Activities between IGA and the Pioneers’ Palace Astronomy Circle were intensified during World Space Week.

The Institute is preparing to work with GLONASS as a geodesy and astronomy station for work within the Russian global positioning system under the guidance of the National Office for Hydrography and Geodesy. Other organizations will also make use of the System.

A drawing competition for children was held at the Planetarium in Old Havana under the theme “Space in your hands”. More than 100 primary-school children from the various provinces participated.

The various activities were supported by several of the country’s institutions and organizations, notably the Office of the Havana City Historian, in particular its planetarium, the Environment Agency and the Ministry of Science, Technology and the Environment.

## **Republic of Korea**

[Original: English]  
[29 October 2013]

### **Space policy**

The Republic of Korea established the second Space Development Basic Plan in 2011, which mandates the Government to establish and update a national space plan every five years. The Plan sets the vision and objectives of the national space programme for 2012-2016. The second Plan focuses on achieving technological self-reliance, establishing systems to promote space applications and services, increasing private participation to build up the space industry, strengthening the workforce base and supporting infrastructure, improving national space management systems and diversifying international cooperation activities.

### **Satellite programmes**

Currently, the Republic of Korea operates a geostationary satellite and Korea Multi-Purposes Satellite (KOMPSAT) series.

Successfully launched in June 2010 from the Guiana Space Centre in Kourou, French Guiana, the Communication, Ocean and Meteorological Satellite (COMS) has been operating normally since April 2011. Capable of making eight observations of the ocean around the Korean peninsula per day, COMS carries the Meteorological Imager and the Geostationary Ocean Color Imager.

A new geostationary satellite programme, GEO-KOMPSAT-2, is currently under way, on the basis of the COMS mission, and comprises two satellites: GEO-KOMPSAT-2A for meteorological missions and GEO-KOMPSAT-2B for ocean monitoring and environmental monitoring.

As for the Korea Multi-Purpose Satellites, KOMPSAT-2, 3 and 5 are under operation. The KOMPSAT-2 satellite carries a multispectral camera capable of capturing 1-metre resolution panchromatic images, and KOMPSAT-3 carries a high-resolution electro-optical camera of 0.7 m. The KOMPSAT-3 satellite provides high-resolution images for geographical information systems (GIS) and other environmental, agricultural and oceanographic monitoring applications. Most recently, as a part of the KOMPSAT series, KOMPSAT-5 was launched in August 2013. With the Republic of Korea's first synthetic aperture radar, KOMPSAT-5 will serve the geographical information system, ocean monitoring, land management, and disaster and environment monitoring (GOLDEN) mission on the Korean peninsula.

The KOMPSAT-3A satellite, to be launched in 2014, will carry an infrared sensor and electro-optical instrument for Earth observation.

Science and Technology Satellite-2C (STSAT-2C) was launched by KSLV-1 (Korea Space Launch Vehicle-1) at the Naro Space Centre on 30 January 2013. Equipped with a laser retro-array, a space radiation effects monitor and femto-second laser oscillator, among other things, STSAT-2C aims to demonstrate the operation of space science instruments and perform a new space technology demonstration on orbit.

In addition, the development of the STSAT-3 (Science and Technology Satellite-3), with a hyperspectral camera and an infrared camera for space and Earth observation, was completed and will be launched in late 2013.

### **Launch vehicles**

Following the successful development of sounding rockets (KSR-I, KSR-II, KSR-III) for scientific research, the Republic of Korea successfully launched the KSLV-I (Korea Space Launch Vehicle-I) on 30 January 2013 from the Naro Space Centre, which is located in Oenaro Island, in the southern area of the Republic of Korea. Carried out in cooperation with the Russian Federation for 10 years, KSLV-I finished by placing STSAT-2C into a lower Earth orbit after failing twice in 2009 and 2010.

On the basis of a great deal of knowledge accumulated from long-term research and development for KSLV-I, the Republic of Korea has been performing research and development for KSLV-II since 2010. The purpose of the KSLV-II programme is to develop an indigenous launch vehicle by 2020 or earlier that is capable of launching an application satellite of 1.5 ton class into a 600-800 km sun-synchronous orbit.

### **Space science**

The Republic of Korea has cooperated with NASA in solar and space physics (heliophysics) and space weather research since 2010. As an effective result of such cooperation, in May 2012 the Korea Astronomy and Space Science Institute (KASI)

successfully built a 7-meter parabolic antenna to receive space weather data from the Radiation Belt Storm Probes (RBSP) mission. The RBSP mission, as part of the NASA Living With a Star geospace programme, is designed to help us understand the Sun's influence on the Earth and near-Earth space by studying the planet's radiation belts on various scales of space and time. The Institute utilizes RBSP real-time data for forecasting space weather to protect national space assets from severe space environments. In new research, a team of space scientists from the University of California at Los Angeles and KASI have successfully modelled and explained the unprecedented behaviour of a third radiation ring, newly discovered by RBSP, showing that the trapping mechanism for the extremely energetic particles that make up this ring is different from those typically observed in particles in the Van Allen radiation belt.

### **Near-Earth objects**

As of October 2013, more than 10,000 near-Earth objects (NEOs) have been catalogued by the Minor Planet Center; however, only a small fraction of them have been registered for their physical and mineralogical properties. In order to provide an effective solution to the pressing demand from the planetary science community regarding NEO characterization, KASI decided to allocate 12 per cent of the telescope time of the Korea Micro-lensing Telescope Network (KMTNet) for NEO survey and photometric studies of the population. The Network consists of three identical 1.6 m aperture telescopes with a large field of view. They will be located in Chile, South Africa and Australia. Based on round-the-clock surveys utilizing this planned network, the orbits, sizes, shapes, spin status and approximate surface mineralogy of NEOs will be investigated in an effective manner. The first telescope will be installed in January 2014 in Chile, and the whole network is expected to be online by mid-2014.

### **Space debris**

The Korea Aerospace Research Institute (KARI) developed the prototype of a space debris collision risk management (KARISMA) system in 2013. The prototype of the KARISMA system has been tested and validated by means of comparison study with NASA and ESA. When the validation of the KARISMA system is over, it will be used for the KARI mission control centre in order to support the mission operations of the Republic of Korea's satellites, such as KOMPSAT-2, 3, 5 and COMS. Meanwhile, KARI will begin to study a rendezvous and docking system that can be applied to develop a prototype of an active removal system. For the next three years, the active removal system will be developed and tested under the environment of a test-bed on the ground.

Since 2010, KASI has been developing an optical wide-field patrol (OWL) system for monitoring Korean space assets with a wide-field optical telescope network all over the world. The system consists of a 50 cm aperture telescope with a large field of view, fast tracking mount, chopper and large-format charge-coupled device. A prototype of the telescope has been successfully tested at a test-bed site on the KASI campus, and the first telescope system will be installed at the end of 2013 in Mongolia. The fully autonomously operating OWL Network will be completed by 2016 in five different foreign sites.

**International cooperation**

The Republic of Korea has been continuing its best efforts to share various benefits from space technology, in particular with developing countries.

In line with these efforts, KARI has been implementing an international space training programme for two weeks annually since 2010. KARI held its fourth training programme in May 2013, with 27 participants from 14 countries (Czech Republic, Indonesia, Iraq, Malaysia, Mongolia, Nepal, Nigeria, Philippines, Pakistan, Romania, Sri Lanka, Thailand, Turkey and Viet Nam). The programme offered courses in satellite systems, such as system engineering, spacecraft subsystems and payloads, satellite assembly and integration, satellite operation, remote sensing and application, and space communication, as well as in space policy and space science, including hands-on training on ground system operation.

The Korea Aerospace Research Institute, a member of the International Charter on Space and Major Disasters, makes its satellite data available for the purpose of disaster management, such as disaster relief and rehabilitation. As of October 2013, it had provided disaster-affected countries with satellite footage captured by KOMPSAT-2 on a total of 74 occasions, including the provision of new footage on 46 occasions and archived footage on 28 occasions. Examples in 2013 include the flooding in Mozambique, Senegal, the Sudan, and the United States, the tsunami in Madagascar, the train explosion in Canada and the earthquake in China.

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