China's Space Activities in 2011

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Preface

Outer space is the common wealth of mankind. Exploration, development and utilization of outer space are an unremitting pursuit of mankind. Space activities around the world have been flourishing. Leading space-faring countries have formulated or modified their development strategies, plans and goals in this sphere. The position and role of space activities are becoming increasingly salient for each active country's overall development strategy, and their influence on human civilization and social progress is increasing.

The Chinese government makes the space industry an important part of the nation's overall development strategy, and adheres to exploration and utilization of outer space for peaceful purposes. Over the past few years, China's space industry has developed rapidly and China ranks among the world's leading countries in certain major areas of space technology. Space activities play an increasingly important role in China's economic and social development.

The next five years will be a crucial period for China in building a moderately prosperous society, deepening reform and opening-up, and accelerating the transformation of the country's pattern of economic development. This will bring new opportunities to China's space industry. China will center its work on its national strategic goals, strengthen its independent innovative capabilities, further open to the outside world and expand international cooperation. In so doing, China will do its best to make the country's space industry develop better and faster. At the same time, China will work together with the international community to maintain a peaceful and clean outer space and endeavor to make new contributions to the lofty cause of promoting world peace and development.

In order to help people around the world gain a better understanding of the Chinese space industry, we herewith offer a brief introduction to the major achievements China has made since 2006, its main tasks in the next five years, and its international exchanges and cooperation in this respect.

II. Progress Made Since 2006

Since 2006, China has made rapid progress in its space industry. Breakthroughs have been made in major space projects, including human spaceflight and lunar exploration; space technology has been generally upgraded remarkably; the economic and social benefits of space applications have been noticeably enhanced; and innovative achievements have been made in space science.

1. Space Transportation System

Since 2006, Long March rockets have accomplished 67 successful launches, sending 79 spacecraft into planned orbits and demonstrating noteworthy improvement in the reliability of China's launch vehicles. The Long March rocket series have been improved, and major progress has been made in the development of new-generation launch vehicles.

2. Man-made Earth Satellites

1) Earth observation satellites

China has developed Fengyun (Wind and Cloud), Haiyang (Ocean), Ziyuan (Resources), Yaogan (Remote-Sensing) and Tianhui (Space Mapping) satellite series, plus a constellation of small satellites for environmental and disaster monitoring and forecasting. Fengyun satellites are now capable of global, three-dimensional and multi-spectral quantitative observation. The Fengyun-2 geostationary Earth orbit (GEO) meteorological satellite succeeded in double satellite observation and in-orbit backup; while the Fengyun-3 polar orbit meteorological satellite succeeded in networking observation of morning and afternoon satellites. Ocean water color satellites have obtained their images of doubled width and their revisiting period reduced. The first Haiyang dynamics environmental satellite launched in August, 2011 is capable of all-weather and full-time microwave observation. The Ziyuan satellite series have seen their spatial resolution and image quality greatly enhanced. The small satellites for environmental and disaster monitoring and forecasting are now capable of disaster monitoring with medium-resolution, wide-coverage and high-revisit rate disaster monitoring. In 2010, China formally initiated the development of an important special project – a high-resolution Earth observation system.

2) Communications and broadcasting satellites

China has won successes in its high-capacity GEO satellite common platform, space-based data relays, tracking, telemetry and command (TT&C), and other key technologies, showing remarkable improvement in the technical performance of China's satellites and in voice, data, radio and television communications. The successful launch and stable operation of the Zhongxing-10 satellite demonstrated a significant increase in the power and capacity of China's communications and broadcasting satellites. Sim-

ilarly, the successful launch of the Tianlian (Space Chain)-1 data relay satellite demonstrated China's preliminary capability of both space-based data relays and space-based TT&C.

3) Navigation and positioning satellites

In February 2007, China successfully launched the fourth Beidou (Bid Dipper) navigation experiment satellite, further enhancing the performance of the Beidou navigation experiment system. China has comprehensively launched the building of a Beidou regional navigation system, consisting of five GEO satellites, five inclined geosynchronous orbit (IGSO) satellites and four medium-Earth-orbit (MEO) satellites. Since April 2007, China has launched 10 such satellites and has been able to provide trial services for Asia-Pacific users.

4) Scientific satellites and technological test satellites

China has developed and launched several Shijian (Practice) satellites and small and micro satellites, providing supporting platforms for space environment exploration, space scientific test and new technology demonstration.

3. Human Spaceflight

From September 25 to 28, 2008, China successfully launched the Shenzhou-7 (Divine Ship-7) manned spaceship. China also became the third country in the world to master the key technology of astronaut space extravehicular activity, completing a space material test outside the spaceship and an experiment on deploying and accompanying flight of a small satellite. In September and November 2011, China successively launched the Tiangong-1 (Space Palace-1) and Shenzhou-8 spaceship, and accomplished their first space rendezvous and docking test, laying the foundation for the construction of future space laboratories and space stations.

4. Deep-space Exploration

On October 24, 2007, China successfully launched its first lunar probe, Chang'e-1, and achieved its objectives of "accurate orbital transfer and successful orbiting," also retrieving a great deal of scientific data and a complete map of the moon, and successfully implementing a controlled crash onto the lunar surface. The success of Chang'e-1 was another milestone for China's space industry, after man-made satellites and human spaceflight, signifying that China has become one of the countries capable of deep-space exploration.

On October 1, 2010, China successfully launched its second lunar probe, Chang'e-2, created a full higher-resolution map of the moon, and a high-definition image of Sinus Iridium, and completed several extended tests, including circling the Lagrangian Point L2, which laid the foundation for future deep-space exploration tasks.

5. Space Launch Sites

China has improved its three existing launch sites in Jiuquan, Xichang and Taiyuan, enhancing their comprehensive test capabilities and high-intensity launching capabilities. These sites have successfully launched manned spaceship, lunar probes and a variety of satellites. At present, China is building a new space launch site in Hainan to accommodate the launch of new-generation launch vehicles.

6. Space Telemetry, Tracking and Command (TT&C)

China has improved its TT&C ground stations and ships, and has established a very long baseline interferometry (VLBI) network comprising four observation stations and a data processing center, indicating that China has acquired space-based TT&C capabilities; it has also established a multi-functioning TT&C network featuring space and ground integration, complete sets of equipment and ability to complete various tasks. At present, China's TT&C network is expanding from the ground to space, and from geospace TT&C to deep-space TT&C. The network is able to not only satisfy satellite TT&C demands, but also support human spaceflight and deep-space exploration.

7. Space Applications

1) Applications of Earth observation satellites

   The fields and scope in which Earth observation satellites are used have been constantly expanding; these satellites' capabilities in providing business services have also been growing and an Earth observation satellite application system has initially taken shape. China has built four new satellite data-receiving stations, enhancing its ability to receive data from meteorological, ocean and land observation satellites. China has also established, based on comprehensive planning, the ground data processing system for Earth observation satellites, extending its ability in centralized data processing, data archiving, data distribution and services provision. China has established centers for environmental satellite application, satellite disaster-relief application, satellite mapping application and other application institutes for Earth observation satellites, promoting the spread and utility of Earth observation satellite data. China has improved calibration services of remote-sensing satellite radiation calibration fields, enhancing the quantitative application level of Earth observation satellites.

   Today, Earth observation satellite data has been widely used in various fields for economic and social development. Fengyun satellites have effectively monitored typhoons, floods, forest and grassland fires, droughts, sandstorms and other natural disasters; their weather forecasting and climate change monitoring capabilities have also been enhanced remarkably. The ocean satellite series have monitored China's maritime territory and the world's key waters, and their forecasting accuracy for sea ice, ocean temperatures and wind fields have increased greatly, and their time efficiency in monitoring dangerous sea conditions has also been notably enhanced. The resource satellite series have played an important role in efforts to investigate, monitor and manage the resources of land, minerals, agriculture, forestry, and water conservancy,

as well as geological disasters and city planning. Remote-sensing and Tianhui satellites have played an important role in scientific experiments, land censuses, mapping and other fields. The small satellites for environmental and disaster monitoring and forecasting have provided critical technical support for surface water quality and atmospheric environmental monitoring, major pollution events addressing, and major natural disaster monitoring, assessment and relief.

2) Applications of communications and broadcasting satellites

China has steadily promoted the applications of communications and broadcasting satellites, and has brought into being a market of certain scale. It has improved its satellite radio and TV network: in 2008 China established a satellite service platform to give every village access to direct broadcast and live telecasts. It also implemented satellite broadcasting and transmissions of China National Radio and China Central Television programs, and one channel program of provincial radio and TV stations, thus greatly increasing the radio and TV program coverage. China has strengthened development of its satellite tele-education broadband network and tele-medicine network, mitigating to some extent the problem of shortage of education and medical resources in remote and border areas. China has also strengthened its satellite capacity in emergency communications, providing important support for rescue and relief work and for major disaster management.

3) Applications of navigation and positioning satellites

China's applications of navigation and positioning satellites have embarked on the road of industrialized development, and are now developing at a high speed, and important progress has been made in developing navigation- and positioning-satellite applications. Through both domestic and foreign navigation and positioning satellites, China has been applying these technologies more broadly; as a result, the market for this industry has expanded rapidly. China strives to promote the application of its Beidou satellite navigation system, and the system has been used in transportation, sea fishing, hydrological monitoring, communications and timing service, power dispatching, and disaster reduction and relief.

8. Space Science

1) Sun-Earth space exploration

China has implemented the Double Star Program to explore the Earth's magnetosphere in concert with the Cluster Program of the European Space Agency (ESA), obtaining much new data and making important progress in space physics.

2) Lunar scientific research

Through lunar exploration projects, China has studied the morphology, structure, surface matter composition, microwave properties, and near-moon space environment, further enhancing its knowledge of the moon.

3) Experiments on microgravity science and space life science

Using the Shijian satellites and Shenzhou spaceship, China has carried out space experiments in life science, materials science, fluid mechanics and other fields under conditions of microgravity and strong radiation. It has also conducted experiments on crop breeding in space.

4) Space environment exploration and forecasting

Using Shenzhou and other spacecraft, China has explored the space environment's major parameters and effects, worked on space environmental monitoring and forecasting, and studied space environmental effects.

9. Space Debris

China has monitored space debris, and given early warnings against them, ensuring safe flight of Chang'e-1 and Chang'e-2 lunar probes, and Shenzhou-7 manned spaceship. China has steadily pushed forward its work on space debris mitigation, fully inactivating Long March rockets, and moving a few aging GEO satellites out of orbit. China has also worked on protecting manned spaceship from space debris.

III. Major Tasks for the Next Five Years

In the next five years, China will strengthen its basic capacities of the space industry, accelerate research on leading-edge technology, and continue to implement important space scientific and technological projects, including human spaceflight, lunar exploration, high-resolution Earth observation system, satellite navigation and positioning system, new-generation launch vehicles, and other priority projects in key fields. China will develop a comprehensive plan for construction of space infrastructure, promote its satellites and satellite applications industry, further conduct space science research, and push forward the comprehensive, coordinated and sustainable development of China's space industry.

1. Space Transportation System

China will build a stronger space transportation system, keep improving its launch vehicle series, and enhance their capabilities of entering space.

It will enhance the reliability and adaptability of launch vehicles in service, and develop new-generation launch vehicles and their upper stages, implement the first flight of the Long March-5, Long March-6 and Long March-7 launch vehicles. The Long March-5 will use non-toxic and pollution-free propellant, and will be capable of placing 25 tons of payload into the near-Earth orbit, or placing 14 tons of payload into the GEO orbit. The Long March-6 will be a new type of high-speed response launch vehicle, which will be capable of placing not less than 1 ton of payload into a sun-synchronous orbit at a height of 700 km. The Long March-7 will be capable of placing 5.5 tons of payload into a sun-synchronous orbit at a height of 700 km.

It will conduct special demonstrations and pre-research on key technologies for heavy-lift launch vehicles.

2. Man-made Earth Satellites

China will build a space infrastructure frame composed of Earth observation satellites, communications and broadcasting satellites, plus navigation and positioning satellites, and will develop a preliminary long-term, sustained and stable service capability. China will develop new types of scientific satellites and technological test satellites.

1) Earth observation satellites

   China will improve its present meteorological, oceanic, and resource satellite series and its small satellites constellation for environmental and disaster monitoring and forecasting. It aims at developing and launching new-generation GEO meteorological satellites, stereo mapping satellites, radar satellites for environment and disaster monitoring, electromagnetic monitoring test satellites, and other new-type Earth observation satellites. It will work to make breakthroughs in key technologies for

interferometric synthetic-aperture radar and gravitational field measurement satellites. It will initiate a high-resolution Earth observation system as an important scientific and technological project and establish on the whole a stable all-weather, 24-hour, multi-spectral, various-resolution Earth observation system.

2) Communications and broadcasting satellites

China will improve satellites for fixed communications services, television and radio service satellites and data relay satellites; develop satellites for mobile communication service; and develop a platform of higher capacity and higher power for new-generation GEO communications and broadcasting satellites.

3) Navigation and positioning satellites

Based on "three-step" development plan – from experimental system to regional system and then to global system, China will continue building its Beidou satellite navigation system, implementing a regional Beidou satellite navigation system before 2012, whose navigation and positioning, timing and short-message services will cover the Asia-Pacific region. China aims at completing the global Beidou satellite navigation system by 2020, comprising five GEO satellites and 30 non-GEO satellites.

4) Scientific satellites and technological test satellites

China will develop and launch a Hard X-ray Modulation Telescope satellite, Shijian-9 new technology test satellite, and returnable satellites. It will begin to implement projects of quantum science test satellite and dark matter probing satellite.

3. Human Spaceflight

China will push forward human spaceflight projects and make new technological breakthroughs, creating a foundation for future human spaceflight.

It will launch the Shenzhou-9 and Shenzhou-10 spaceships and achieve unmanned or manned rendezvous and docking with the in-orbit Tiangong-1 vehicle.

China will launch space laboratories, manned spaceship and space freighters; make breakthroughs in and master space station key technologies, including astronauts' medium-term stay, regenerative life support and propellant refueling; conduct space applications to a certain extent and make technological preparations for the construction of space stations.

China will conduct studies on the preliminary plan for a human lunar landing.

4. Deep-space Exploration

China carries out deep-space exploration in stages, with limited goals.

Based on the idea of "three steps" – orbiting, landing and returning – for continuing lunar probe projects, China will launch orbiters for lunar soft landing, roving and surveying to implement the second stage of lunar exploration. In the third stage, China will start to conduct sampling the moon's surface matters and get those samples back to Earth.

China will conduct special project demonstration in deep-space exploration, and push forward its exploration of planets, asteroids and the sun of the solar system.

5. Space Launch Sites

China will enhance the reliability and automation level of launch site facilities and equipment, strengthen the comprehensive capability of launch of spacecraft, and satisfy the launch demands. It will also complete the construction of the Hainan space launch site and put it into service.

6. Space TT&C

China will improve its space TT&C network, build deep-space TT&C stations, develop advanced TT&C technologies, and enhance its TT&C capabilities in all respects to satisfy the demands for remote TT&C.

7. Space Applications

China will further improve its satellite application and service system, expand satellites application scope, and promote the national new strategic industries, to meet demands of national economic and social development.

1) Applications of Earth observation satellites

   China will improve its ground facilities for receiving, processing, distributing and applying satellite data, and will strengthen the development of calibration fields and other facilities. It will improve the sharing and comprehensive application of data retrieved from Earth observation satellites, make more self-obtained space data, and guide social resources to actively develop market-oriented data application services. It will implement application demonstration projects, and promote the wide utilization and industrialization of Earth observation satellites.

2) Applications of communications and broadcasting satellites

   China will strengthen the applications of communications and broadcasting satellites in public service and major industries of the national economy. It plans to expand value-added business in the satellite communication field, further commercialize satellite communication, and expand the industrial scale of the application of communications and broadcasting satellites.

3) Applications of navigation and positioning satellites

China will build and improve ground TT&C segments and develop a system for monitoring and assessing performance of the global satellite navigation system, strengthen technological research, product development and standardization system of navigation and positioning satellites, enhance application level, promote position-based services, expand the industrial scope, and focus on promoting further use of the Beidou satellite navigation system in various fields of China's national economy.

8. Space Science

China will strengthen the development of its space science research system, upgrade the quality of space science research, and enhance popularization of space science knowledge in the whole nation.

By the implementation of lunar exploration projects, China will make in-situ analyses, morphological and structural surveys of the lunar surface in landing and roving areas, conduct environmental surveys of the lunar surface and make moon-based astronomical observations.

By using spacecraft, China will study the properties of black holes and physical laws under extreme conditions, explore properties of dark matter particles, and test basic theories of quantum mechanics. It will also conduct scientific experiments on microgravity and space life science, explore and forecast the space environment and study their effects.

9. Space Debris

China will continue to strengthen its work on space debris monitoring and mitigation and its work on spacecraft protection.

China will develop technologies for monitoring space debris and pre-warning of collision, and begin monitoring space debris and small near-Earth celestial bodies and collision pre-warning work. It will set up a design and assess system of space debris mitigation, and take measures to reduce space debris left by post-task spacecraft and launch vehicles. It will experiment with digital simulation of space debris collisions, and build a system to protect spacecraft from space debris.

IV. Development Policies and Measures

To ensure completion of the set goals and tasks, the Chinese government has formulated policies and measures to be taken for the development of China's space industry as follows:

- Making comprehensive plans for and prudently arrange space activities. To give priority to applied satellites and satellite applications, develop human spaceflight and deep-space exploration properly, and give active support to space science exploration.
- Strengthening innovation capability in space science and technology. To focus on implementing important space science and technological projects and to realize leapfrog development in space science and technology by way of making new breakthroughs in core technologies and resource integration. To actively build a space technology innovative system featuring integration of the space industry, academia and the research community, with space science and technology enterprises and research institutions as the main participants; to strengthen basic research in the space field and develop multiple advanced frontier technologies to increase sustainable innovative capacity in space science and technology.
- Vigorously promoting development of the satellite application industry. To make comprehensive plans and construct space infrastructure; promote public sharing of satellite application resources; foster enterprise clusters, industrial chains and market for satellite applications.
- Strengthening basic capability in space science, technology and industry. To strengthen construction of infrastructure for development, production and test for spacecraft and launch vehicles. To strengthen construction of key laboratories and engineering research centers for space science and technology. And to strengthen work on informatization, intellectual property rights and standardization of space activities.
- Strengthening legislative work. To actively carry out research on a national space law, gradually formulate and improve related laws, regulations and space industrial policies guiding and regulating space activities, and create a legislative environment favorable to the development of space activities.
- Guaranteeing the sustainable and steady financial investment for space activities. To gradually establish a diverse, multi-channel space funding system to ensure the investment sustainable and steady, especially to provide larger amounts for important space scientific and technological projects, applied satellite and satellite applications, frontier technologies and basic researches.
- Encouraging organizations and people in all walks of life to participate in space-related activities. To encourage scientific research institutes, enterprises, institutions of higher learning and social organizations, under the guidance of national space policies, giving full play to their advantages and taking an active part in space activities.
- Strengthening training of professionals for the space industry. To vigorously develop a favorable environment for the development of professional personnel, fostering leading figures in the space industry and forming a well-structured contingent of highly qualified personnel in the course of conducting the important projects and basic researches. To publicize space knowledge and culture, and attract more outstanding personnel into the space industry.

V. International Exchanges and Cooperation

The Chinese government holds that each and every country in the world enjoys equal rights to freely explore, develop and utilize outer space and its celestial bodies, and that all countries' outer space activities should be beneficial to economic development, the social progress of nations, and to the security, survival and development of mankind.

International space cooperation should adhere to the fundamental principles stated in the "Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries." China maintains that international exchanges and cooperation should be strengthened to promote inclusive space development on the basis of equality and mutual benefit, peaceful utilization and common development.

1. Fundamental Policies

The Chinese government has adopted the following fundamental policies with regard to developing international space exchanges and cooperation:

- Supporting activities regarding the peaceful use of outer space within the framework of the United Nations. Supporting all inter-governmental and non-governmental space organizations' activities that promote development of the space industry;
- Emphasizing regional space cooperation in the Asia-Pacific area, and supporting other regional space cooperation around the world;
- Reinforcing space cooperation with developing countries, and valuing space cooperation with developed countries;
- Encouraging and endorsing the efforts of domestic scientific research institutes, industrial enterprises, institutions of higher learning, and social organizations to develop international space exchanges and cooperation in diverse forms and at various levels under the guidance of relevant state policies, laws and regulations;
- Appropriately using both domestic and foreign markets and both types of resources, and actively participating in practical international space cooperation.

2. Major Events

Since 2006, China has implemented international space exchanges and cooperation in various forms. It has signed a number of cooperation agreements and memoranda on the peaceful utilization of outer space with a host of countries, space agencies and international organizations. China has taken part in relevant activities sponsored by the United Nations and other relevant international organizations and supported international space commercial cooperation. These measures have yielded positive results.

Bilateral cooperation

- China has established a long-term cooperation plan with Russia through the mechanism of the Space Cooperation Sub-committee under the Prime Ministers' Meeting between Russia and China. The two nations have signed a number of cooperation agreements on space science, deep-space exploration and other areas, and their national space administrations have opened representative offices mutually. In the field of human spaceflight, the two nations have also carried out many cooperation projects.
- China has undertaken extensive cooperation with Ukraine under the Space Cooperation Sub-committee mechanism of the Sino-Ukrainian Cooperation Commission, and the two sides have signed the "Sino-Ukrainian Space Cooperation Program."
- China and the European Space Agency (ESA) have signed the "Status Quo of China-Europe Space Cooperation and the Cooperation Plan Protocol" under the mechanism of the China-Europe Joint Commission on Space Cooperation. The two sides cooperated closely during the lunar exploration missions of Chang'e-1 and Chang'e-2, and signed the "Agreement on Mutual Support for the TT&C Network and Operation" in September 2011.
- China and Brazil, through the mechanism of the Space Cooperation Sub-committee of the Sino-Brazilian High-level Coordination Commission, have worked out a comprehensive bilateral space cooperation plan, actively promoted the research and development of the China-Brazil Earth resources satellites, continued to maintain data consistency of their Earth resources satellites and expanded the application of their data into regional and global application.
- China has signed a cooperation framework agreement on space and marine science and technology with France under the mechanism of the Sino-French Joint Commission on Space Cooperation, aiming at developing bilateral cooperation on astronomic satellite, ocean satellite and other satellite programs.
- China and Britain have established a joint laboratory on space science and technology, jointly organized a seminar on space science and technology, and conducted exchanges on lunar exploration, Earth observation, space science research and experiment, personnel training and other areas.
- China has signed a framework agreement with Germany on bilateral cooperation in the field of human spaceflight. Under the framework, the two countries have carried out a cooperative experiment project on the Shenzhou-8 concerning space life science.
- The director of the U.S. National Aeronautical and Space Administration (NASA) visited China and the two sides will continue to make dialogue regarding the space field.
- China has signed a memorandum of understanding on technological cooperation in the peaceful utilization and development of outer space with Venezuela, and the two nations have established a technology, industry and space sub-committee under the China-Venezuela Senior Mixed Committee. Under this framework, the two nations have promoted bilateral cooperation in communications satellites, remote-sensing satellites, satellite applications and other areas.
- China has signed the "Cooperation Agreement on the Application, Exchange and Distribution of Meteorological Satellite Data" with the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), to promote the sharing in and application of meteorological satellite data.
- China has actively promoted the extensive applications of Earth observation satellite data with various countries. China has given to many countries free receiving stations for meteorological satellite broadcasting systems and comprehensive systems for meteorological information analysis and processing. With China's help, a data receiving station of the Sino-Brazilian Earth Resources Satellite Program was established in

South Africa, and another station for receiving environmental and disaster data from Chinese satellites was set up in Thailand. China has provided related earth observation satellite data products to the above-mentioned countries.

- China has implemented international exchanges and cooperation with a number of countries in frequency coordination, compatibility and interoperability, applications and other international exchanges and cooperation in the area of satellite navigation systems.

Multilateral cooperation

- China has taken part in activities organized by the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) and its Scientific and Technical Sub-committee and Legal Sub-committee.
- China has signed relevant agreements with the United Nations on disaster management and emergency response based on the space-based information platform. A Beijing office of the program has been established. Through this office, China has provided drought risk-monitoring products to the "Horn of Africa," and contributes to the regional disaster mitigation effort by offering training, capacity building, data service, disaster emergency response, QDGS (Quick Draw Graphics System) and other services.
- China has cooperated with the space institutes of various countries through the mechanism of the "International Charter on Space and Major Disasters." Through this mechanism, satellite data support was provided to the Wenchuan earthquake, the forest fire in Australia and other major disaster relief work.
- In 2008, the Asia-Pacific Space Cooperation Organization (APSCO) was established with the joint effort of Asia-Pacific nations. Under the APSCO frame, the Chinese government actively participates in the cooperation and study of various projects, including the development of a space data-sharing platform, its demonstration and application; an Earth-based optic space target observation network; compatible navigation terminals. China assisted APSCO in the formulation and release of its policy on small satellite data in Asia-Pacific multilateral cooperation, and has promoted space cooperation in the Asia-Pacific region.
- China participates in activities organized by the International Committee on Global Navigation Satellite Systems, International Space Exploration Coordination Group, Inter-Agency Space Debris Coordination Committee, Group on Earth Observations, World Meteorological Organization and other inter-governmental international organizations. China has also developed multilateral exchanges and cooperation in satellite navigation, Earth observation and Earth science and research, disaster prevention and mitigation, deep-space exploration, space debris and other areas. China's Beidou satellite navigation system has become one of the world's four core system suppliers accredited by the International Committee on Global Navigation Satellite Systems, and will gradually provide regional and global navigation and positioning service as well as strengthened compatibility and interoperability with other satellite navigation systems. China will do its best to host the Seventh Meeting of the International Committee on Global Navigation Satellite Systems in 2012. The nation's independently developed space debris protective design system has also been incorporated into the protection manual of the Inter-Agency Space Debris Coordination Committee.
- China takes part in activities organized by the International Astronautical Federation, International Committee on Space Research, International Academy of Astronautics,

and other non-governmental international space organizations and academic institutes. It has also organized a series of international academic conferences, including the Global Lunar Conference, and has fostered discussion and exchanges in deep-space exploration, space debris and other issues.

Commercial activities

China actively promotes the participation of Chinese enterprises in international commercial activities in the space field. China has exported whole satellites and made in-orbit delivery of communications satellites to Nigeria, Venezuela and Pakistan; provided commercial launch services for the Palapa-D satellite of Indonesia and the W3C satellite of Eutelsat, and signed commercial satellite and ground system export contracts with Bolivia, Laos, Belarus and other countries.

3. Key Cooperation Areas

In the next five years, China's international space exchanges and cooperation will be mainly in the following areas:

- Scientific research on space astronomy, space physics, micro-gravity science, space life science, deep-space exploration, space debris and other areas.
- Applications of Earth observation satellites in environment and disaster monitoring, global climate change monitoring and forecasting, marine monitoring and other areas.
- Applications of communications satellites in broadcasting and television, long-distance education, telemedicine and other areas.
- Applied technological cooperation, research and development of terminal equipment, reinforced facility building, specific industrial services and other areas of satellite navigation systems.
- Technological cooperation on a space lab and a space station in China's human space-flight program; space science research and experiments and other areas.
- Space TT&C cooperation, support and others.
- Commercial satellite launch service, import and export of whole satellites, satellite parts and components, import and export of ground test equipment, and building and service of satellite ground TT&C and satellite application facilities as well as related services, etc.
- Personnel exchanges and training in the field of space.