

CHINA'S SPACE ACTIVITIES: PRESENT AND FUTURE

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Space activities around the world have been flourishing during the first few years of the twenty-first century. The leading countries in the arena of spaceflight have formulated or readjusted their development strategies, plans and goals in this regard. The role of space activities in a country's overall development strategy is becoming increasingly salient, and their influence on human civilization and social progress is increasing.

China has set the strategic goal of building itself into a well-off society in an all-round way, in order to rank among the states with the best innovative capabilities during the first 20 years of the twenty-first century. The development of the space industry in China now faces new opportunities and increased requirements. In this new stage of development, China will adhere to the scientific outlook on development as guidance, centre its work on the national strategic goals, strengthen its innovative capabilities and do its best to make the state's space industry develop faster and better.

The aims of China's space activities are to explore outer space and enhance understanding of the Earth and the cosmos; utilize outer space for peaceful purposes; promote human civilization and social progress, and benefit the whole of mankind; meet the demands of economic growth, scientific and technological development, national security and social progress; and raise the scientific quality of the Chinese people, protect China's national interests and rights, and comprehensively build up the national strength.

From 2001 to 2005, China's space industry developed rapidly, making many achievements. A group of state-of-the-art research, development and testing bases has been built, and the system of research, design, production and testing has been further improved, markedly enhancing the state's basic capabilities in space science and technology. With breakthroughs in important key technologies, the overall level of China's space technology has been improved remarkably. Having made a historic breakthrough in manned spaceflight, China has embarked on a comprehensive lunar

exploration project. Various space systems have taken shape, the range of application has been further expanded, the benefits have been noticeably enhanced, and important achievements have been made in space science research in this regard.

SATELLITES

Over the past five years, China has independently developed and launched 22 different types of satellites, upgrading its overall level in this field markedly. On the basis of the four satellite series initially developed, China has developed two more satellite series, to bring the total to six—recoverable remote-sensing satellites, DFH (Dongfanghong, or “The East is Red”) telecommunications and broadcasting satellites, FY (Fengyun, or “Wind and Cloud”) meteorological satellites, SJ (Shijian, or “Practice”) scientific and technological research satellites, ZY (Ziyuan, or “Resources”) natural resource satellites, and Beidou (or “Plough”) navigation and positioning satellites. In addition, the oceanic satellite series will soon come into being. China has sped up the implementation of the plan to establish “a constellation of small satellites for environment and disaster monitoring and forecasting.” Research and development of the payloads for some new, high-performance satellites have been successful, and many satellites have begun regular operation. The Fengyun I and Fengyun II meteorological satellites have been listed by the World Meteorological Organization in the international satellite series for meteorological services. Important breakthroughs have been made in key technologies related to the common platform for geostationary satellites. Periodic achievements have been made in the research and development of large-capacity telecommunications and broadcasting satellites. Substantial progress has been made in the research, development and application of small satellites.

LAUNCH VEHICLES

Over the past five years, the “Long March” rockets independently developed by China have made 24 consecutive successful flights, and their major technological functions and reliability have been notably upgraded. From October 1996 to the end of 2005, these rockets have made 46 consecutive successful flights. Important breakthroughs have been made in key technologies of the next generation of launch vehicles. Research and development of the 120-ton-thrust oxygen–kerosene engine and the 50-ton-thrust oxygen–hydrogen engine are proceeding smoothly.

MANNED SPACEFLIGHT

On 20–21 November 1999, China launched and retrieved the first Shenzhou unmanned experimental spacecraft. It then launched three more not long afterward. On 15–16 October 2003, it launched and retrieved the Shenzhou V manned spacecraft, China's first of its kind. Having mastered the basic technologies of manned spaceflight, China became the third country in the world to develop manned spaceflight independently. From 12–17 October 2005, the Shenzhou VI manned spacecraft completed a five-day flight with two astronauts on-board. This was the first time for China to have men engage in experiments in outer space, another major achievement in the sphere of manned spaceflight. In addition, advanced studies and engineering work for the lunar project has been conducted, making important progress.

SATELLITE REMOTE-SENSING

The fields where, and degrees to which, satellite remote-sensing are used have been constantly expanded. Breakthroughs have been made in a large number of key application technologies, infrastructure facilities have been strengthened, the technological level and operational capabilities of the application systems have been notably improved, and a national satellite remote-sensing system has taken shape. China has built and improved the National Remote-Sensing Centre, the National Satellite Meteorology Centre, the China Resources Satellite Application Centre, the National Satellite Oceanic Application Centre, the China Remote-Sensing Satellite Ground Station, as well as satellite remote-sensing application and certification institutes for relevant state departments, provinces and cities. An optical remote-sensing satellite radiation calibration station has also been completed and put into operation. Many remote-sensing products and services are provided by using data obtained from observation of the Earth by both Chinese and foreign satellites. Remote-sensing application systems have been put into regular operation in many important fields, particularly in meteorology, mining, surveying, agriculture, forestry, land mapping, water conservancy, oceanography, environmental protection, disaster mitigation, transportation, and regional and urban planning. They are playing an important role in the nationwide land resources survey, in ecological construction and environmental protection, and as well as in major state projects, such as the South–North Water Diversion Project, the

Three Gorges Project and the Project to Transmit Natural Gas from West to East.

SATELLITE TELECOMMUNICATIONS AND BROADCASTING

Satellite telecommunications and broadcasting technologies are developing rapidly, their application is becoming more extensive and an application industry in this field has taken shape. By the end of 2005, China had more than 80 international and domestic telecommunications and broadcasting ground stations, and 34 satellite broadcasting and television link stations. Dozens of departments and some large corporations have established altogether some 100 satellite communication networks and more than 50,000 very small aperture terminals (VSATs) for satellite communications on a smaller scale. The development and application of satellite radio and television broadcasting services has increased the coverage and improved the quality of the programmes all over China, particularly in the vast countryside. Satellite telecommunications and broadcasting technologies play an irreplaceable role in the projects “to give every village access to broadcasting and TV” and “to give every village access to telephones”. A satellite tele-education broadband network and a satellite tele-medicine network have been established. As a member of the International Maritime Satellite Organization, China has established a maritime satellite communication network covering the whole world, ranking it among the most advanced states in the application of international mobile satellite communications.

DEVELOPMENT TARGETS

The major policies and measures for China’s space industry at present and in the near future are as follows:

- To make overall plans for the rational deployment of space assets. To give priority to the development of applied satellites and satellite applications, develop in a proper way manned spaceflight and deep-space exploration, and give active support to space science exploration.
- To muster strength in implementing key scientific and technological space projects, strengthen basic research and make plans for frontier technologies in advance. To muster superior forces to make leapfrogging development in space science and technology by making breakthroughs in core technologies and resources

integration. To increase the sustainable innovative ability of space science and technology through strengthening basic research in the space field and developing several frontier technologies in advance.

- To promote space application and accelerate the industrialization of space activities. To strengthen the development of space application technologies, promote resource sharing and expand the scope of applications. With an emphasis on telecommunications satellites, satellite telecommunications, satellite remote-sensing, satellite navigation and carrier rockets, to vigorously construct a comprehensive space industry covering satellite manufacturing, launching services, ground equipment production and operational services. To strengthen the spread, transformation and secondary development of space technology, and transform and upgrade the traditional industries.
- To attach importance to infrastructure construction for space science, technology and industry. To strengthen the building of infrastructure facilities for developing, producing and experimenting with spacecraft and carrier rockets. To give support to key laboratories and engineering research centres for space science and technology, and strengthen the work on intellectual property rights and standardization of space activities.
- To promote the building of a space technology innovation system. To guide the reform, restructuring, transformation and updating of space science, technology and industry, and accelerate the building of large world-class space corporations. To integrate production, education and research, with space science and technology enterprises and national scientific research institutes at the core.
- To improve the scientific management of space activities. To adapt to the progress of the socialist market economy, actively make innovations in the system and mechanisms of scientific management, improve the sense of quality and profit among personnel, apply systems engineering and other modern management tools to promote scientific management, increase system quality, minimize system risks and enhance comprehensive benefits.
- To strengthen legislation. To formulate laws, regulations and industrial policies for guiding and regulating space activities, increase the level of administration by law, and create a legislative environment favourable for the development of space activities.

- To guarantee funds for space activities. The Chinese government will increase input to the space industry, and at the same time encourage the establishment of a diverse, multi-channel space funding system, so as to guarantee the sustainable and stable development of the space industry.
- To encourage people of all walks of life to participate in space-related activities, including encouraging industrial enterprises, scientific research institutes, commercial corporations, institutions of higher learning and social organizations, under the guidance of national space policies, to give full play to their advantages, take an active part in space activities, and participate in international space-related exchanges and cooperation. To encourage satellite operation enterprises and application units to use Chinese satellites and satellite-application products.
- To strengthen the fostering of talented people for the space industry. To spare no effort for the education and cultivation of personnel, and give attention to whetting their sense of innovation through practice. In particular, it is necessary to pay more attention to fostering a rationally structured contingent of young and highly qualified space scientists and engineers. To make efforts to publicize space knowledge and culture, and attract more outstanding personnel into the space industry.

The Chinese government continues to strengthen its administration and policy making concerning space activities. The China National Space Administration (CNSA) is the country's governmental organization responsible for the management of space activities for civilian use and international space cooperation with other countries, and responsible for implementing corresponding governmental functions.

The Chinese government holds that outer space is the commonwealth of all mankind, and each and every state in the world enjoys equal rights to freely explore, develop and utilize outer space and celestial bodies; and that all states' outer space activities should be beneficial to the economic development and social progress of nations, to the security, subsistence and development of mankind, and to friendly cooperation among people of different countries.

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 space exchanges and cooperation should be strengthened on the basis of equality and mutual benefit, peaceful utilization and common development.

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

- Adhering to the principle of independence and taking the initiative in our own hands, carrying out active and practical international cooperation in consideration of the overall, rational utilization of domestic and international markets and resources to meet the needs of the national drive for modernization.
- Supporting activities regarding the peaceful use of outer space within the framework of the United Nations. Supporting all inter-governmental activities for promoting the development of space technology, space applications and space science, as well as those conducted by non-governmental space organizations.
- Attaching importance to space cooperation in the Asia-Pacific region, 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, as well as social organizations, to develop international space exchanges and cooperation in different forms and at different levels under the guidance of relevant state policies, laws and regulations.

Over the past five years, China has developed bilateral space cooperation with a host of countries. It has successively signed 16 international space cooperation agreements and memorandums with 13 countries, space agencies and international organizations. China has propelled multilateral cooperation in space technology and its applications in the Asia-Pacific region and is in the process of establishing a space cooperation institution for the region. China has joined relevant activities sponsored by the United Nations and other relevant international organizations, and has supported

international commercial space activities. These measures have yielded positive results.

China continues to promote the Asia–Pacific Region Multilateral Cooperation in Small Multi-Mission Satellites Project, engaging in research and manufacturing with Bangladesh, Iran, Mongolia, Pakistan, the Republic of Korea and Thailand.

China takes a positive part in activities organized by the UN Committee on the Peaceful Uses of Outer Space (COPUOS) and its Scientific and Technical Subcommittee and Legal Subcommittee. China has acceded to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies; the Agreement on the Rescue and Return of Astronauts, and on the Return of Objects Launched into Outer Space; the Convention on International Liability for Damage Caused by Space Objects; and the Convention on the Registration of Objects Launched into Outer Space; China strictly fulfils its responsibilities and obligations. China actively participates in the relevant activities organized by COPUOS to implement the recommendations made by the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III). In particular, China, alongside Canada and France as co-chairs, has propelled the work of the space-system-based disaster mitigation and disaster management of the Action Team (AT-7) joined by 40 member states of COPUOS and 15 international organizations, and has actively taken part in the work of an ad hoc expert group to study the possibility of creating a coordination mechanism for disaster mitigation and management. China has acceded to a disaster mitigation mechanism consisting of space organizations from different countries in light of the Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters. In cooperation with the UN, China has hosted basic space science workshops and a workshop on tele-health development in Asia and the Pacific. China has also hosted, in collaboration with the Multilateral Cooperation Secretariat of the Asia–Pacific Space Cooperation Organization and the UN Economic and Social Commission for Asia and the Pacific, training courses and symposiums on space technology applications, and has provided financial support for these activities. China has also taken part in a programme promoting the application of outer space for sustainable development in Asia and the Pacific, organized and implemented by the UN Economic and Social Commission for Asia and the Pacific.

China has actively participated in activities organized by the Inter-Agency Space Debris Coordination Committee, started the Space Debris Action Plan, and strengthened international exchanges and cooperation in the field of space debris research. It has participated in the relevant activities organized by the Committee on Earth Observation Satellites (CEOS), and hosted the eighteenth CEOS plenary and twentieth anniversary activities in Beijing in November 2004. In May 2005, China officially became a member of the ad hoc inter-governmental Group on Earth Observations (GEO), and an executive committee member as well. In July 2006, China held in Beijing the thirty-sixth Committee on Space Research (COSPAR) Scientific Assembly and the eighth International Lunar Exploration Working Group (ILEWG) International Conference on the Exploration and Utilization of the Moon. In addition, China has taken part in the relevant activities of the International Telecommunications Union, World Meteorological Organization, International Astronautical Federation and the Committee on Space Research.