Translation

The following document lays out the PRC government's priorities for the development of China's civilian space infrastructure through 2025. The plan recommends that China reduce its reliance on foreign civilian satellite technology, but also advocates that China continue to use international exchanges and technology transfer as means to catch up to more technologically advanced countries in space infrastructure.

Title
National Medium- to Long-Term Civilian Space Infrastructure Development Plan (2015-2025)
国家民用空间基础设施 中长期发展规划（2015-2025年）

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National Medium- to Long-Term Civilian Space Infrastructure Development Plan (2015-2025)

"Civilian space infrastructure" refers to integrated space-earth installations that use space resources mainly in order to provide a great number of users with remote sensing, communications, broadcasting, navigation, positioning, and other products and services. It is composed of space systems, surface systems, and other related systems that have complementary functions and that operate continuously and steadily. Civilian space infrastructure is both strategic infrastructure for modern informatized (信息化), intelligentized (智能化) society and an important method for propelling scientific development, transforming the mode of economic development, and thus achieving innovation-driven development. Is also an important support for national security. Accelerated construction of an autonomous and open (自主开放), safe and reliable national civilian space infrastructure that will operate continuously and steadily over the long term is a matter of great strategic significance to China's modernization.

This plan was drawn up pursuant to the *Outline of the 12th Five-Year Plan for Economic*

and Social Development in the People's Republic of China, the *National Plan for the Development of Strategic Emerging Industries during the "12th Five-Year Plan*," and other major civilian economic and social development needs and overall related requirements in order to comprehensively promote healthy and rapid development of national civilian space infrastructure and to develop space resources on a large-scale, operations-oriented (业务化), industrialized basis.

I. Current Status and Trends

(i) Global space infrastructure is rapidly upgrading to the next generation.

Global space infrastructure is now entering a new stage of systematized development and globalized services. The development of satellite remote sensing for observation of the entire earth and of multi-satellite network observation has gradually led to the formation of a comprehensive, multi-dimensional, global integrated observation capability that combines high, medium, and low resolutions. All types of satellite communication and broadcasting business operations are trending towards integration and developing in the direction of broadband multimedia. Deployment of the next generation of mobile communication satellite constellations is intensifying. In satellite-based navigation, the era of the single U.S.-dominated Global Positioning System (GPS) is coming to an end as we enter a new era of competitive development involving the four major global systems of the United States, Russia, China, and Europe and the two major regional systems of Japan and India. The global satellite and applications industry is growing rapidly. The annual growth rate has been above 10% since the beginning of this century. To develop and perfect autonomous space infrastructure is increasingly becoming the strategic choice among developed countries and regions for pursuing leadership in space, for seizing the commanding heights of economic and S&T competition, for developing emerging industries, and for protecting security and interests.

(ii) China's Space Infrastructure Is in a Critical Stage of Transformative Development.

After more than fifty years of construction, China's space infrastructure has basically developed into a complete aerospace industrial system. Its satellite development and launch capabilities now place it among the world's leaders. Its resource, marine, weather, environmental disaster mitigation and other remote sensing satellites already possess a certain level of operations-oriented service capability. The system for basic assurance for satellite communications, such as fixed communications and broadcasting, has already been built. The BeiDou satellite navigation system is already providing regional services, and satellite applications have become indispensable to innovative management, protecting resources and the environment, improving disaster mitigation capabilities, providing universal information services, and cultivating emerging industries. At the same time, China's space infrastructure is in a critical period of transformative development. Our technological capabilities are making the transition from a primary focus on catching up with advanced international technologies to being mainly about independent innovation (自主创新). Our service mode is shifting from a primary focus on experimental applications to a predominantly operational service model. Industrial applications used to rely mainly on foreign data and methods, but are now coming to

rely mainly on autonomous data (自主数据). Development mechanisms are undergoing a transition from government investments to an orientation towards diverse, commercial development. Grasping the transformative development opportunities and accelerating the construction of civilian space infrastructure are major strategic moves that will meet development needs, spur transformative upgrading, and foster high-end industry.

(iii) Economic and social development imposes pressing demands on space infrastructure construction.

As China's economy and society undergo rapid development and its aerospace technology continually progresses, every field and every sector is placing wider and more urgent demands on the building of an autonomous and open civilian space infrastructure. Satellite remote sensing applications in fields relating to national territory, oceans, mapping, environmental protection, civilian administration, meteorology, agriculture, forestry, water conservancy, earthquakes, traffic, statistics, public security, energy, housing, and urban and rural construction require diverse, precise, and highly time-sensitive observation. Satellite communication radio and television applications in fields such as television, radio, education, culture, medical treatment, communications, traffic, diplomacy, and disaster response require wide ranges, large capacities, and high levels of security. Fields such as public safety, traffic, transportation, disaster prevention and mitigation, mapping, prospecting, and disaster response require satellite navigation applications that are higher-precision and have more integrated innovative services.

(iv) Coordinated construction of China's civilian space infrastructure brooks no delay.

Whether it is a major national strategy such as supporting energy resource development, food safety, upholding maritime rights and interests, or coping with global climate change; or a wide-area refined application in the service of an important field of the national economy such as national territory resources, disaster prevention and mitigation, environmental protection, agriculture, forestry, water conservancy, traffic, or transportation; or the urgent need for high-quality universal information services and information consumption in culture, education, medicine, or other important fields involving people's livelihoods, in every case the effort is highly reliant on the development of a continuously and steadily operating space infrastructure. As China moves rapidly forward with new industrialization, informatization, urbanization, and agricultural modernization, the need to accelerate coordinated construction of civilian space infrastructure, meet the important needs of national economic and social development, and elevate the new competitive advantages of China's aerospace industry has become increasingly urgent.

II. Guiding Ideology and Principles of Development

(i) Guiding ideology.

Let us comprehensively implement the spirit of the 18th Party Congress and of the Second, Third, and Fourth Plenums of the 18th Central Committee, and in accordance with the decisions and deployments of the Party Central Committee and the State Council, and with an

orientation towards the major needs of national economic and social development, let us seize the opportunities afforded by the world's new science and technology (S&T) revolution and industrial revolution. Furthermore, while avoiding redundantly planned construction, and while being guided by advanced overall planning and supported by technological innovation and powered by institutional reform, and having as our fundamental objectives the meeting of needs, the improvement of application performance, and the spurring of industrial development, and having as our main policy lines coordinated and intensive construction, systematized development, and highly efficient services, let us give equal weight to both continuity (继承) and development and provide both public welfare and commercial services; let us formulate complete and sound policies and regulations, innovate new modes of development, and lay a sound industrial foundation; let us accelerate construction of a national civilian space infrastructure system at an advanced international level and provide powerful support to China's modernization and to its sustainable economic and social development.

(ii) Principles of development.

1. Service applications, overall planning of development.

Insist on serving users and on providing overall planning that encompasses needs and capabilities, construction and applications, technology and industry, and current and long-term development; establish multi-application satellites, multi-satellite networks, coordination among multiple networks, and relevant mechanisms for data integration services; make full use of domestic and foreign resources, give priority to meeting strategic and common needs, reasonably meet leading and specialized needs, consolidate and strengthen backbone satellite operational systems, develop new operational systems as needed, and give major impetus to operations-oriented applications.

2. Innovation-driven, autonomous development.

Insist on independent innovation, strive to make breakthroughs in core and critical technologies, emphasize development of new technology, new systems, and new application modes, make the most of the supporting and guiding roles of S&T, achieve effective links between technological research and development (R&D) and business applications, push forward in an orderly way the construction and upgrading of national civilian space infrastructure, continually meet new needs, and create dominant development capabilities.

3. Space-earth coordination, synchronous development.

Insist on integrated space-earth development and synchronized planning, R&D, construction, and use of space systems and surface systems; optimize satellite payload configurations and constellation networking, design reasonable layouts of surface system station networks and data centers, reinforce application support service capabilities and business application capabilities, and raise overall system performance.

4. Government guidance, open development.

Insist on state top-level planning and overall coordinated management; formulate complete and sound national standards for satellite manufacturing and its applications and policies and regulations on satellite data sharing and market access; establish mechanisms for

sound construction, operation, sharing, and industrialization development of civilian space infrastructure. Give free rein to the decisive role of the market in the allocation of resources, form a diverse, open development pattern consisting of government guidance, cross-sectoral coordination, social participation, and international cooperation; actively push forward with commercialization and internationalization development.

III. Development Goals

Gradually build, stage-by-stage, a technologically advanced, independently controllable (自主可控) national civilian space infrastructure that has a reasonable layout and global coverage and that consists of the three main systems of satellite remote sensing, satellite communications and broadcasting, and satellite navigation and positioning; meet industrial and regional major application needs, and support China's modernization, national security, and livelihood improvement development requirements.

During the 12th Five-Year Plan [2011-2015] or soon thereafter, basically form a backbone framework for the national civilian space infrastructure, establish operational satellite development modes and service mechanisms, and draw up a data sharing policy.

During the 13th Five-Year Plan [2016-2020], build the three main systems: Satellite remote sensing, satellite communications and broadcasting, and satellite navigation and positioning; basically build the national civilian space infrastructure system, and provide continuous and stable business services. With the data sharing service mechanisms basically perfected, the complementary system of standards basically in place, and the commercial development mode basically established, it will have international service capabilities.

During the 14th Five-Year Plan [2021-2025], build a technologically advanced, highly efficient national civilian space infrastructure system that has global coverage and attains international advanced levels in terms of operationalization, marketization, and industrialization development. Never stop perfecting innovation-driven, demand-led, market-allocated mechanisms for sustained development, robustly support economic and social development, and effectively participate in internationalization development.

IV. Construct the Three Major Satellite Systems: Remote Sensing, Communications and Broadcasting, and Navigation and Positioning

By means of cross-series, cross-constellation satellite and data resource combining applications and multi-center coordinated services, provide multi-type, high-quality, stable, large-scale space information integrated service capabilities and support integrated applications for all industries.

(i) Satellite remote sensing system.

In accordance with the development visions of multi-use satellites, multi-satellite networking, and multi-network coordination, and based on the technical features and user demand features of observation tasks, emphasize development in the three series of land observation, marine observation, and atmospheric observation; build a remote sensing satellite system composed of seven constellations and three categories of special satellites, gradually

form comprehensive, highly-efficient global observation and data acquisition capabilities characterized by a reasonable configuration of high, medium, and low space resolutions and an optimized combination of multiple observation technologies. Carry out coordinated construction of remote sensing satellite receiving station networks, data centers, sharing network platforms, and common application support platforms, and create satellite remote sensing data global receiving and global service capabilities.

1. Building the space system.

This mainly includes the land observation satellite series, the marine observation satellite series, and the atmospheric observation satellite series.

(1) Land observation satellite series

With an orientation towards the medium and high space resolution remote sensing data needs of industry and market applications relating to national territory, environmental protection, disaster prevention and mitigation, water conservancy, agriculture, forestry, statistics, earthquakes, mapping, traffic, housing, urban and rural construction, and public health, while also taking into account marine and atmospheric observation needs, make full use of the technological foundation provided by resource satellites, environmental disaster mitigation small satellite constellations, high-resolution earth observation systems, and other major projects to further improve optical observation, microwave observation, and geophysical survey methods; build the three observation constellations of high-resolution optical, medium-resolution optical, and synthetic aperture radar (SAR); and, while centered on the needs of resource surveys, environmental observation, disaster prevention and mitigation, carbon source and sink surveys, geological surveys, water resource management, and agricultural condition monitoring for wide-swath and rapid coverage and integrated observation, build a medium-resolution optical satellite constellation reasonably configured in high and low orbits, implement global day-level rapid dynamic observation and national hour-level observation, develop geophysical survey satellites, and continually improve the quantitative application quality of land observation satellites.

High-resolution optical observation constellation. With a focus on the high-precision, high-revisit observation operational needs of industrial and market applications with regard to basic geographic information, land use, vegetation coverage, mineral exploitation, precision agriculture, urban construction, traffic and transportation, water conservancy facilities, ecological construction, environmental protection, water and soil conservation, disaster assessment, and emergency response in hot-spot regions, develop a polar-orbit, high-resolution optical satellite constellation, and achieve fine observation data acquisition capabilities on a global scale.

Medium-resolution optical observation constellation. With a focus on the needs of resource surveys, environmental observation, disaster prevention and mitigation, carbon source and sink surveys, geological surveys, water resource management, and agricultural condition monitoring for wide-swath and rapid coverage and integrated observation, build a medium-resolution optical satellite constellation reasonably configured in high and low orbits, and implement global day-level rapid dynamic observation and national hour-level observation.

SAR observation constellation. With a focus on the operational needs of industry and market applications for all-weather, 24-hour, multi-scale observation and high-precision deformation observation with regard to natural disaster monitoring, resource monitoring, environmental monitoring, agricultural monitoring, bridge and tunnel deformation monitoring, and acquisition of surface subsidence, basic geographic, and global change information, make the most of the SAR satellite's observation advantage under complex meteorological conditions, and build a satellite constellation that is combined with optical observation methods, and has a reasonable configuration of high and low orbits and a combination of multiple observation frequency bands, to create multi-band, multi-mode integrated observation capabilities.

Geophysical survey satellites. With a focus on geophysical environmental change monitoring needs in industries relating to earthquakes, disaster prevention and mitigation, national territory, mapping, and oceans, develop technologies such as electromagnetic monitoring and gravity gradient measurement, create a geophysical survey capability, and serve applications such as earthquake prediction research and the establishment of the Global Geodetic Reference Frame (GGRF).

(2) Marine observation satellite series.

Serve the main needs of China's maritime power strategy with respect to exploitation of ocean resources, environmental protection, disaster prevention and mitigation, protection of rights and interests, management of marine area uses, sea island and coast surveys, and polar ocean exploration while also giving consideration to land and atmospheric observation needs, develop multiple optical and microwave observation technologies, build an ocean water color and dynamics satellite constellation, develop ocean monitoring satellites, and continually improve the integrated observation capabilities of marine observation satellites.

Ocean water color satellite constellation. With a focus on the wide-swath and rapid coverage observation needs of marine resource exploitation, ecological monitoring, pollution control, and large-scale change monitoring applications with regard to key ocean color environmental factors such as seawater chlorophyll, suspended silt, soluble organic substances, red tides, and green tides, develop high-signal-to-noise-ratio visible and infrared multispectral and high-spectral technologies, and build an ocean water color satellite constellation consisting of morning and afternoon satellite networks to increase observation time sensitivity.

Ocean dynamics satellite constellation. With a focus on the high-precision acquisition needs of applications for marine disaster prevention and mitigation, resource exploitation, environmental protection, ocean fisheries, and maritime traffic and transportation with regard to key ocean dynamic environmental factors such as sea surface height, sea surface wind fields, waves, ocean temperature, and ocean salinity, develop microwave radiometer, scatterometer, altimeter, and other such technologies, and build an ocean dynamics satellite constellation.

Marine environment monitoring satellites. With a focus on the 24-hour, all-weather, near-real-time monitoring needs of applications for sea area environment monitoring, sea area use management, protection of maritime rights and interests, and disaster prevention and mitigation, develop high-orbit staring optics and high-orbit SAR technology, and combine them

with low-orbit SAR satellite constellation capabilities to achieve joint high and low-orbit optical and SAR observation.

(3) Atmospheric observation satellite series.

While oriented towards the atmospheric observation needs—while also taking into consideration marine and land observation needs—of each industry and public application with regard to meteorological forecasts, atmospheric environment monitoring, weather disaster monitoring, global climate monitoring, and efforts to cope with global climate change, develop complete and sound large-scale active and passive optics, active and passive microwaves, and other such detection capabilities; build two satellite constellations—one for weather and one for climate—while also building atmospheric composition detection satellites, and share relevant satellite data with the World Meteorological Organization to create complete atmospheric system observation capabilities.

Weather observation satellite constellation. With a focus on the needs of precise weather forecasting and weather disaster forecasting, develop high-orbit, high temporal resolution capabilities, and achieve minute-level weather observation capabilities for the national territory and surrounding areas by means of optical and microwave satellite networks.

Climate observation satellite constellation. With a focus on the normalization monitoring needs of climate change, weather disaster, and digital weather forecasts, develop global-coverage, multi-method integrated observation capabilities, and build a climate observation satellite constellation composed of morning and afternoon and dawn and dusk satellite networks.

Atmospheric composition detection satellites. With a focus on atmospheric particle, polluting gas, and greenhouse gas detection needs, develop high-spectral, laser, and polarized observation technologies.

2. Building the land system.

The surface system mainly includes a remote sensing satellite receiving station network, data centers, common application support platforms, and sharing network platforms. In accordance with the requirements of high-efficiency networking, coordinated operation, and integrated services, use existing resources of the surface system, carry out coordinated construction of the receiving station network and other surface facilities, actively expand to build overseas stations, implement multi-station coordinated operation, provide overall planning of land, marine, and weather satellite data center services, and comprehensively meet business needs in all fields.

(1) Receiving station network

Provide overall planning of related needs, and push forward with coordinated receiving of data from land, marine, and atmospheric observation satellites; while making full use of existing resources, build new geostationary and polar-orbit receiving antennae on Chinese territory and at the poles and mobile receiving facilities on the oceans, and achieve integrated reception of global data with multi-station coordination.

(2) Data centers.

Make full use of the existing foundation to build in a coordinated manner an infrastructure for managing remote sensing satellite tasks and for data processing, storage, and distribution services; implement mutual support, complementarity, and mutual backup among land, marine, and weather satellite data centers, and push forward with efficient use and sharing of satellite, data, and computing resources.

(3) Common application support platforms.

The common application support platforms include calibration and validation site networks and public support platforms for common technology research and development. Calibration and validation site networks coordinate all types of satellite and data product service requirements in launching construction and operations and implementing resource and data sharing. Calibration site networks combine several methods including on-board calibration, digital calibration, and cross-calibration to meet the calibration needs for various loads and performances. Validation site networks are tightly integrated with the observation systems of various industries and mainly rely on building testing sites and observation stations that are high-precision and have long-term data stability. Public support platforms for common technology research and development are mainly directed at standards and norms, data processing, shared services, testing and evaluation, simulation and verification, basic databases, and other such common technologies and entail building both open-architecture technology R&D support capabilities that integrate and share information, and common technology testing systems, in order to effectively spur common technology services and sharing.

(4) Sharing network platforms.

Build sharing network platforms that effectively connect three major data centers and application systems at all levels, promptly publish satellite status and subscriber observation needs, efficiently use all types of computing and data resources, broadly share application products and technologies, and provide business-oriented service support for the public.

(ii) Satellite Communication and Broadcasting System.

While maintaining an orientation towards industry and market applications and taking the commercialized model as the mainstay, ensure that public welfare development needs are met; mainly develop fixed communications and broadcasting satellites and mobile communications and broadcasting satellites, synchronously build ground facilities such as tracking, telemetry and command (TT&C) stations, gateway stations, uplink stations, and calibration sites; create operational services capabilities for broadband communications, fixed communications, live television broadcasting, mobile communications, and mobile multimedia broadcasting; gradually build a satellite communications and broadcasting system that covers the world's most important regions and that is integrated with ground communications networks, serve the Broadband China (宽带中国) and globalization strategies, and push forward with building international transmission capabilities.

1. Building the space system.

Develop fixed and mobile communication and broadcasting satellite series.

(1) Fixed communications and broadcasting satellite series.

Build three types of satellites: Fixed communications, live television broadcasting, and broadband communications; provide fixed communications and broadcasting services for the national territory, surrounding areas, and key regions of the world.

Fixed communications satellites. With a focus on the needs of such industries as telecommunications, broadcast television, and oil, accelerate development of a fixed communications satellite system that builds on the foundation of existing in-orbit satellites, and continually improve the business capabilities of fixed communications.

Live television broadcasting satellites. To bring live radio and television broadcasting to viewers, steadily develop a live television broadcasting system on the foundation of existing satellites.

Broadband communications satellites. To achieve two-way communications services in such fields as remote education, remote medical treatment, disaster prevention and mitigation information services, rural and agricultural informatization, and internationalization development, develop a broadband communications satellite system that is capable of providing satellite radio, film, television, and digital distribution services.

(2) Mobile communications and broadcasting satellite series.

Build two types of satellites: Mobile communications and mobile multimedia broadcasting; basically achieve global coverage for mobile communications operations and national territory coverage for mobile multimedia broadcasting operations.

Mobile communications satellites. Build a mobile communications satellite system first on a regional basis and then on a global basis. Build a regional mobile communications satellite system, and launch speech and information services for industries and individuals. On this foundation, build a global mobile communications satellite system, and thus basically achieve global mobile communications coverage.

Mobile multimedia broadcasting satellites. Develop a mobile multimedia broadcasting satellite system in order to implement mobile multimedia broadcasting for such fields as telecommunications, radio and television, traffic and transportation, and emergency relief.

In addition, develop a data collection satellite system (DCSS) technology verification system.

2. Building the land system.

In accordance with space system development needs, and relying on existing station network resources, update and rebuild all types of ground facilities as necessary and synchronously construct ground facilities such as TT&C stations, gateway stations, uplink stations, and calibration sites so that satellite systems perform to their full potential.

(iii) Satellite navigation and positioning system.

Construction of the satellite navigation space system and ground system has already been incorporated into the overall planning, organization, and implementation of the National S&T Key Project for the Chinese Second-Generation Satellite Navigation System. By 2020, build

the BeiDou global satellite navigation system consisting of 35 satellites, and create a global service capability with better than 10-meter positioning precision and 20-nanosecond timing precision.

In accordance with the development goals and tasks set in the *Medium- and Long-Term Development Plan for the National Satellite Navigation Industry*, and in combination with the National S&T Key Project for the Chinese Second Generation Satellite Navigation System, actively enhance the ground application service capability of the BeiDou system. Carry out coordinated deployment of the BeiDou satellite navigation ground-based augmentation system, integrate existing multimodal continuously operating reference station network resources, build a national-level multimodal continuously operating reference station network, improve system augmentation service performance, and possess positioning service capabilities for China and surrounding regions at the real-time meter/decimeter level, the specialized centimeter (专业厘米) level, and the post-event millimeter level. Comprehensively integrate geographic information, remote sensing data, and basic information relating to buildings, traffic, disaster prevention and mitigation, water conservancy, weather, the environment, and regional boundaries, and establish a nationwide, high-precision position data integrated service system. Build auxiliary positioning systems to achieve outdoor and indoor seamless positioning in key regions and at specific sites.

V. Advance Deployment of Scientific Research Tasks.

While oriented towards the future, aiming at international cutting-edge technology, and focused on critical development bottlenecks, carry out advance deployment of scientific research tasks, effectively link them to related national S&T plans, develop new technologies, innovate new institutions, build new systems, raise the main technical indices to advanced international levels, continually improve independent innovation capability, support upgrading of national civilian space infrastructure, and foster and guide new demand.

(i) Scientific research tasks concerning remote sensing satellites.

Keeping centered on application needs, give priority to launching research and verification trials for remote sensing satellite data processing technology and business application technology, and carry out early finalization of processing algorithms for basic and advanced products based on remote sensing data; master satellite platform technology that has long service life, high stability, high positioning accuracy, large load capacity, and powerful agility, and make breakthroughs in payload technologies such as high-resolution, high-precision, high-reliability, and integrated detection; raise satellite performance and quantitative application levels. Innovate observation systems and technologies, and fill technological gaps in high-orbit microwave observation, laser measurement, gravity measurement, interference measurement, ocean salinity detection, and high-precision atmospheric composition detection.

(ii) Scientific research tasks concerning communications and broadcasting satellites.

With a focus on new business relating to fixed communications broadcasting and mobile communications broadcasting and the need to improve satellite performance, develop advanced satellite platform technology that is high-power and large-capacity and has a long

service life, develop advanced payloads such as high-power, large-antenna, multibeam, and frequency reuse payloads, comprehensively raise satellite performance, fill technology gaps in broadband communications, mobile multimedia broadcasting, and other such areas, and spur upgrading of broadband and mobile communications technology. Launch research and verification in advanced technologies such as laser communications, quantum communications, and satellite information security and anti-interference.

(iii) Research into space-ground integrated technology.

Launch an effort to tackle key problems relating to integrated technology in space-ground integrated systems, key technology of ground systems, and common application technology, strengthen the effort to build up system design, simulation, and evaluation capabilities, implement synchronized and coordinated development of space-ground integration, and increase the application benefits of space infrastructure.

VI. Vigorously Push Forward with Major Applications

Encourage each user ministry (用户部门) to combine use of satellites and data resources in different constellations and different series according to its own operational needs and specific application goals, to build an integrated satellite application system in its own field, and to achieve continuous acquisition and integrated application of multisource information. Actively move forward with demonstrations of integrated remote sensing, communications, and navigation applications in the multiple dimensions of industry, region, industrialization, internationalization, and S&T development, strengthen cross-domain resource sharing and integrated information service capabilities, accelerate the integration of the internet of things, cloud computing, big data, and other new technologies and applications, spur sustainable development of the satellite applications industry, and raise the quality of new informatization technology applications.

(i) Integrated applications for resources, the environment, and ecological protection.

To address major needs relating to resource exploitation, food security, environmental security, ecological protection, climate change, maritime strategy, and global strategy, launch demonstrations of integrated applications in such areas as national territory, mapping, energy, traffic, oceans, environmental protection, weather, agriculture, disaster mitigation, statistics, water conservancy, and forestry; provide prompt, accurate and stable space information services for dynamic monitoring, early warning, evaluations, management, and other core operational services relating to resources and the environment; support macro-level decision-making, and safeguard the strategic security of resources, energy, food, oceans, and ecology.

(ii) Integrated applications for disaster prevention and mitigation and emergency response.

With an orientation towards disaster prevention and mitigation and emergency needs, with a focus on major tasks such as exceptionally large natural disaster monitoring and warning, emergency response, integrated evaluation, and post-disaster reconstruction, and in light of

needs related to civil administration, earthquakes, weather, oceans, energy, traffic and transportation, urban and municipal infrastructure, water conservancy, agriculture, statistics, national territory, forestry, and environmental protection, launch demonstrations of integrated applications for typical disaster areas such as in the case of frequent earthquake disaster zones, geological disasters in the cloudy and rainy mountainous southwestern region, droughts and cold waves in northwestern and northern China, forest and grassland disasters, frequent flood disaster zones, urban disasters, southeastern coast typhoons and torrential downpours, red tides, and huge waves; promote the establishment of natural disaster monitoring and assessment in urban and rural areas, emergency command information and communication services, and integrated disaster prevention and mitigation space information service platforms, and provide disaster rapid response based on temporal and spatial information and location services and information services for operational coordination and emergency management decision-making.

(iii) Integrated applications for social management, public services, and safe production.

Launch demonstrations of integrated applications that are oriented towards safe production and stable functioning in the economy and in society and that are centered on refined management (精细化管理) of society, particularly with regard to the safe functioning of municipal utilities, traffic, energy, communications, civil administration, agriculture, forestry, water conservancy, and other infrastructure matters and to responses to sudden public health incidents; expand space infrastructure applications in dynamic monitoring, warning, and refined management for key targets, and support effective improvements to the level of social management.

(iv) Integrated cross-domain applications for new urbanization and regional sustainable development.

To address the operational management and social service needs of urban housing construction, energy, traffic, civil administration, environmental protection, and other sectors, launch integrated satellite applications for new urbanization layouts, "smart cities," "smart energy," "smart traffic," and "digital disaster mitigation"; launch regional integrated satellite applications with an emphasis on western region sustainable development and universal service needs; launch cross-regional, integrated cross-domain applications oriented towards the needs of region-specific ecological and environmental protection, urbanization, development and use of renewable resources, and sharing of educational and medical resources in, for example, the Beijing-Tianjin-Hebei region, the Yangtze River Delta, and the Pearl River Delta.

(v) Integrated applications for mass information consumption and industrialization.

To promote mass services in and consumption of Chinese space information as well as its industrialization and commercialization, adopt an orientation towards the multidimensional needs of the masses for space information in making full use of satellite remote sensing, satellite communications and broadcasting, and satellite navigation and resources; innovate

new commercial models; uncover, foster, and reveal information consumption application services relating to mass travel, positioning services, communications, culture, medical treatment, education, disaster mitigation, and statistics. Expand satellite communication and broadcasting services in regions, such as the central and western regions, where ground communications infrastructure is limited, and launch integrated applications for information that benefits the people.

(vi) Integrated applications for global observation and earth system science.

Meet globalization development needs, strengthen international cooperation, make full use of related international cooperation mechanisms, give impetus to virtual satellite constellation applications and global exploration programs, launch pioneering research, monitoring, and applications in cutting-edge earth systems fields such as global change, disaster prevention and mitigation, humans and nature, geophysics, the space environment, and the carbon cycle; increase independent innovation capabilities and international influence, and make contributions to the sustainable development of humanity.

(vii) Internationalization services and applications

Serve China's "Go Global" ("走出去") and "Belt and Road"[1] strategies, and build a global, comprehensive information services platform that integrates satellite remote sensing, satellite communications and broadcasting, satellite navigation, and geographic information into a single whole; provide services for global mapping, global ocean observation, global asset management, monitoring of food safety and important agricultural product production, environmental monitoring, forestry and mineral resource monitoring, water resource monitoring, logistics management, and safety and emergency management. By means of broadly implemented international cooperation, build a BeiDou global wide-area augmentation system, improve system service performance, and improve BeiDou's international competitiveness. Cooperatively develop space infrastructure application products and services oriented towards comprehensive disaster mitigation, emergency response, resource management, and intelligent transportation; energetically expand international markets, and actively support and promote international sharing and services relating to satellite remote sensing data within the Group on Earth Observations (GEO) framework.

VII. Policy Measures

(i) Improve policy systems.

Research and formulate the relevant policies for standardizing management, construction, operation, and applications of national civilian space infrastructure and policies for national satellite remote sensing data, establish and perfect policy measures for government procurement of commercial satellite remote sensing data and services, gradually develop civilian satellite remote sensing data with a space resolution superior to 0.5 m, and spur open sharing and efficient use of satellite data. Perfect industrialization policies for live

[1] Translator's note: The "Belt and Road" ("一带一路") refers to the Silk Road Economic Belt and the 21st Century Maritime Silk Road.

satellite television broadcasting. Formulate policies and standards to apply the BeiDou satellite navigation system and the technologies and products compatible thereto. Establish mechanisms for coordinated requesting and reserving of civilian satellite frequencies and orbit resources.

(ii) Promote diversified investment and industrialization applications.

Support private capital (民间资本) investment in satellite R&D and system building to boost development. Support all types of enterprises in launching the development of value-added products and the dissemination of operational services and industrialization applications, and form a positive development pattern in which basic public services, diversified professional services, and mass consumption services complement each other.

(iii) Expand fiscal, tax, and financial policy support.

Establish continuous, stable fiscal input mechanisms on a foundation of consolidated policy resources and full use of existing resource channels, support the building of operational satellite systems, the development of scientific research satellites, the research and development of common key technologies, and the building of support platforms for major common applications, and support and guide the demonstration of major applications for industries and regions. Encourage financial institutions to innovate new forms of financial support, and expand credit support for space infrastructure construction and applications. Perfect and implement tax support policies to encourage innovation.

(iv) Strengthen innovation as a driver.

Accelerate the establishment and improvement of technological innovation systems, strengthen construction of innovation platforms such as key laboratories and engineering centers, and improve capabilities with regard to original innovation (原始创新), integration of innovations, and introduction, digestion, absorption, and re-innovation (引进消化吸收再创新). Strengthen innovation with regard to space-ground integrated satellite technology and application models; tackle key problems in common technology through advance deployment of national S&T plans; give a strong push to innovation development in key fields and critical links such as critical core components, payloads, and applied technologies, encourage open competition, improve autonomous development (自主发展) capabilities, promote rapid application of high-quality technology and products, spur in-depth integration satellites and operational applications, and raise service quality. Accelerate the establishment and perfection of a system of technical standards relating to the fields of satellite development, terminal devices, data products, and information services.

(v) Encourage internationalization development.

Research and formulate specific measures for internationalization development, and spur the development and utilization of foreign and domestic resources and foreign and domestic markets. Strengthen international coordination work, and actively participate in relevant international organizations and in setting important international rules and standards. Actively expand channels of international cooperation, and strengthen international

cooperation in the fields of technical R&D, satellite development, system building, and data applications. Encourage and support the building of integrated service platforms for international cooperation, strongly promote the export of satellites, data, and their application services, and improve internationalization service capabilities and application benefits.

VIII. Organization of Implementation

(i) Clearly define the division of responsibilities.

The National Development and Reform Commission (NDRC), the Ministry of Finance, and the State Administration for Science, Technology and Industry for National Defense (SASTIND) join with the ministries and units concerned in researching the division of responsibilities for implementing each task in civilian space infrastructure plans, establishing responsibility mechanisms for the division of labor among all the ministries, organizing and coordinating for major problems in planning and implementation, strengthening the constraining effects of plans, and preventing redundant planning of investment and construction. NDRC and the Ministry of Finance are responsible for implementing operational satellite funding channels and assuring the implementation of operational satellite system development tasks. The Ministry of Finance and SASTIND organize the optimization and perfection of scientific resource satellite investment mechanisms to ensure implementation of scientific research missions. For remote sensing satellites which mainly rely on state investment, NDRC and SASTIND join with the ministries concerned to research and establish a management-user committee responsibility system in which major users are represented for full absorption and adoption of relevant user needs, participation in system demonstrations, construction, operations, management, and benefit assessments, and promotion of efficient use of application satellites. The relevant application departments are responsible for incorporating application system construction and operations into operational development planning and in engaging in advance deployment to an appropriate degree.

(ii) Implementing investment entities.

NDRC, the Ministry of Finance, and SASTIND join with the ministries concerned to research and implement the appropriate investment entities based on the nature of planning tasks. The construction and operation of scientific research and public welfare-type satellites and ground systems rely mainly on state investment; combined public welfare and commercial projects rely on a combination of state investment and investment from society (社会投资); commercial projects rely mainly on investment from society. Accelerate implementation of practicing entities and project corporate entities, encourage and support credentialed enterprises in investing in the construction of satellites within the plan, and actively give impetus to for-profit operation services of public welfare-type satellites.

(iii) Accelerate project construction.

SASTIND, in accordance with plan deployments, joins with the ministries concerned in effectively linking up with national S&T major projects and other relevant plans to accelerate scientific research satellite project initiation and development, strengthen performance

assessment, and promptly launch business applications. NDRC joins with the ministries concerned in pressing forward with operational satellite building tasks during the 12th Five-Year Plan and the 13th Five-Year Plan to assure continuous operation of the backbone operations system and to effect priority deployment of application satellites characterized by thriving operation-oriented demand and mature application technologies and based on operations-oriented applications. NDRC joins with the ministries concerned in strengthening space-ground integrated coordination and overall planning, synchronous launching of ground system construction and typical application demonstrations, and assuring coordinated development of operational satellites and their applications. NDRC and SASTIND join with the ministries concerned in accelerating materialization of the China Land Observation Satellite Data Center (中国陆地观测卫星数据中心), promoting coordinated operation of land, marine, and weather satellite data centers, and spurring resource sharing. NDRC joins with the ministries concerned in accelerating coordinated building of a common application support platform and actively spurring the building and development of application systems for all industries.

(iv) Strengthening supervision and evaluation.

NDRC, the Ministry of Finance, and SASTIND lead the research on, and the establishment of, mechanisms for supervision, assessment, and performance evaluation of the national civilian space infrastructure; periodically launch tracking analysis, supervision, and inspection, launch third-party assessments of planning, execution, and application benefits at appropriate times, promptly research and solve new situations and problems that arise in planning and implementation, and promptly report major problems to the State Council. During planning and implementation, NDRC, the Ministry of Finance, and SASTIND organize more thorough demonstrations of subsequent tasks, further optimize work schemes for subsequent tasks based on technological progress, development needs, and space resource statuses in light of planning, execution, and evaluation, and adjust the implementation of construction tasks.