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SPECIAL ISSUES

Laudable Space Development

October 8, 2006 marks the birthday of China's space industry established from scratch 50 years ago. In the past 5 decades, China's space industry has made a leaping development in three major areas: space technology, space applications, and space science.

During 5-decade long exploration, China has established step by step an innovative system and mechanism for space project management, and created a reliable R&D system, together with a high caliber innovation contingent. Chinese made missiles have become effective means for both strategic deterrence and defense/counter attack, constituting a solid iron barrier defending the national sovereignty and security. China's proprietary CZ launch vehicle series have extended a prosperous large family made up of 12 specifications in 4 major categories, able to send flying vehicles to their destined near-earth orbit, geosynchronous orbit, and geostationary orbit. As of September 2006, China has made 90 launches on a combined basis, or 48 successful launches since October 1996, with both safety and reliability proudly at an internationally advanced level. Some 70 Chinese made and launched satellites have found their applications in a wide range of areas, including economy, science and technology, culture and education, and defense, harvesting noticeable economic returns and social benefits.

Four unmanned and two manned spacecraft, independently developed by Chinese scientists, have made China the third country in the world having manned space activities. China is currently working on the socalled moon probe project, which will soon make China a noticeable part in exploring deep space, and allow China's space industry to climb up to a new height.

Enhanced Marine Technologies

Thanks to the development over the last half century, China's marine industry has been benefited by the emerging technologies in more than 20 technical domains, especially for marine environment, resources prospecting and development, and common marine engineering technologies. Recent years, in particular, have witnessed a string of breakthroughs achieved in marine science and technology, with the support of the National 863 Program, National 973 Program, National Natural Science Foundation, and National Key Technology Program. The development has narrowed down China's gaps with the countries enjoying advanced marine technologies.

To improve its monitoring techniques, China has launched its first marine satellite, and found solutions to numerous key technologies involving acoustic ocean current section measuring, high accuracy CTD section measuring, and radar based high frequency land wave sounding. Chinese scientists have rolled out advanced marine observation instruments and equipment that noticeably raised the technical level of China's marine industry, and the market competitiveness of home made marine instruments.

R&D efforts for marine biotechnology have resulted in rich findings promising fine application perspectives, including improved sea aquatic species, marine natural produces, and marine drugs. The fast development of China's ocean going ship building and container making technologies has secured China's position as the world's third largest ship builder.

Marine exploration and associated resource development also enjoys substantive progresses, especially in developing key technologies for deep sea oil and gas survey, gas hydrate survey, and oceanic mineral resources survey. The new technologies provide a powerful technical support for China's marine oil and gas survey, and for

provide a powerful technical support for China's marine oil and gas survey, and for oceanic mineral resources survey as well.

SUN Zhihui, Administrator of State Oceanography Bureau, told reporters that China would make the 7000-m deep manned submarine vehicle an R&D priority, with enhanced efforts for deep sea exploration technologies, and key technologies involving seawater desalination, in an attempt to realize the scale utilization of sea water resources.

New Targets for Super Wheat

In the future 15 years from 2006 to 2020, China will screen out 50 new super wheat varieties, in an attempt to raise the overall wheat yield of major wheat producing regions by 30%. The said objective was put forward at a national seminar on super wheat held not long ago.

In addition, it is proposed to raise the efficiency of water, fertilizer, and light by 15% on the existing basis, with the super wheat growing area reaching 500 million mu(1 mu= 0.0667 hectare). By 2020, the yield of demonstration plots shall produce an average yield of 800 kg at a hundred mu scale, 750 kg a thousand mu, and 700 kg 10,000 mu.

Institute of Crop Science, a part of the Chinese Academy of Sciences, is currently working on a feasibility report for breeding new super wheat varieties and associated demonstration. The study, based on an in-depth analysis of China's wheat breeding activities and associated industrial development, will become a guidance for China's wheat research in the coming 15 years. The establishment of a super wheat project under the umbrella of national R&D programs facilitates China's efforts for food security and a sustainable agriculture.

Seismological Data Sharing Platform

A seismological data sharing platform, an important part of the national efforts for scientific data sharing, opened on September 28, 2006. The platform was initiated to share scientific data in 2002, under the philosophy of large science. It takes more than 3 years to complete the construction of the website. The platform makes the second scientific data sharing website in the country, following the one for sharing meteorological data.

According to a briefing, the new data sharing platform has housed observational data collected by more than 400 regular stations, and historical literatures, covering earthquake, geomagnetism, geoelectricity, geomorphology, gravity, and underground flows. All the data are presented in an international accepted format, for the convenience of retrieval. So far the website has cumulated core seismological data up to a volume of 500G. In the one-year trial operation, the website has won the registration of more than a thousand subscribers. In the past, researchers had to spend 70% of their available time collecting data, and now the spared time can be employed to do more researches. Seismological data, which cannot be regenerated in nature, provide strong evidences for seismological predictions and Earth studies. They are also very useful for a range of economic applications, including land use, resources, meteorology, mapping, urban construction, environmental protection, and water resources.

INTERNATIONAL COOPERATION

China-US Nanotechnology Cooperation

During his recent visit to China, Robert Cresanti, Under Secretary of Commerce for Technology, United States Department of Commerce and his party held talks on September 26, 2006 with SHANG Yong, Vice Minister of Science and Technology, and BAI Chunli, Vice President of the Chinese Academy of Sciences, discussing commercial applications of nanotechnology in China. The two parties jointly inked a Memorandum of Understanding on bilateral cooperation in the field of nanotechnology, and agreed to work together in the future to expand commercial channels for nanotechnology collaboration.

Mr. Robert Cresanti and his party visited the nanotechnology lab at the Tsinghua University. The advanced equipment and fruitful findings impressed Mr. Robert Cresanti so much that he said although he had been informed of the world leading position of Chinese scientists in nanotechnology related studies, and their wisdom, enthusiasm, and organizing capability, the prospering development of the lab has gone beyond his expectation.

In his later talk with Chairman of Standardization Administration of China on nanotechnology standards, Mr. Robert Cresanti expressed wishes to allow American experts to be part of China's efforts for developing technical standards for nanotechnology.

Mr. Robert Cresanti also visited nanotechnology labs in Tianjin, Shanghai, and Hangzhou, and discussed fund raising issues with parties concerned.

RESEARCH AND DEVELOPMENT

Enhanced IC Making Capability

"100nm plasma lithography and large angle plasma injector", a major special project under the National 863 Program for IC manufacturing equipment, passed an approval

under the National 863 Program for IC manufacturing equipment, passed an approval check on September 28, 2006.

During the 10th Five-year period (2001-2005), the Chinese Ministry of Science and Technology has made IC manufacturing equipment a major special project financed by the National 863 Program, in an effort to meet the nation's strategic needs for the core IC making equipment. "100nm plasma lithography and large angle plasma injector", implemented under the sponsorship of the Beijing municipal government, has worked out the prototypes that has been put on trial operation for a year at a production line. The test is made fully in line with internationally accepted standards. Test results show that Chinese made lithography process and injector have produced technical indicators, including design, hardware performance, and manufacturing techniques, up to their international counterparts for 130-100nm process.

The successful development of the equipment has narrowed down China's gaps with high end IC manufacturing technologies by 5 generations. The more important is that the technical level reached by the equipment has kept abreast with the upgraded mainstream IC manufacturing technologies in the country, which makes China's IC industry using home made equipment from 180nm to 130 and 90nm within two to three years possible.

World Largest Plant Seeds Bank

China has created an advanced crop germplasm preserving system, made up of a long term preserving bank, a backup bank, and a medium term preserving bank, the first and only of its kind in the world. The system is equipped with a well developed technical system for protecting the integrity of preserved seeds. The preserving system has kept 380,000 seeds for 180 plants on a long term basis, the largest of its kind in the world.

China has kept crop germplasm conservation a major project in different five-year plans, in an attempt to ensure the security of seeds resources. Institute of Crop Germplasm Resources, a part of the Chinese Academy of Agricultural Sciences, has achieved substantive progresses in preserving plant seeds, taking advantage of the theories and new techniques for plant growth, development, genetics, and evolutions, through many-year cross-disciplinary and inter-agency efforts. For example, researchers have worked out the techniques to address the quick test of the vitalities of six plant seeds that are not easy to sprout, such as wild soybean, using super low temperature process.

In addition, researchers have sorted out newly mutated seeds, new varieties, and rare, precious and fine quality species from some 180 plant seeds. They have collected more than 6,000 wild soybean varieties, or 90% of the world total, which makes China a center for wild soybean diversities. In the course of collecting some 5000 wild paddy varieties, researchers had discovered eight places growing wild paddy rice for the first time in Dongxiang of Jiangxi Province, and Chaling and Jiangyong of Hunan Province, which corrects the international definition that common wild paddy rice has a northern limit up to 25 degrees north latitude. The discovery of wild paddy rice in Dongxiang, in particular, has extended the limit further to 28°14' north, or 3°14' further northwards, securing the unique growing environment of China's common wild paddy rice in the world.

Unique Breeding System for Dwarf Wheat

Research team headed by LIU Binghua, a research fellow with Institute of Crop Science, part of the Chinese Academy of Agricultural Sciences, has created a world leading technical platform for rotational screening of dwarf-male-sterile wheat, using China's unique genetic resources and Aibian 1, a dwarf-male-sterile material. The platform is able to work extensively on recombination and optimization of diverse wheat genes, and produce a large quantity of new wheat varieties in a row, raised breeding efficiency by ten times.

Through ten rounds of screening, a string of new varieties, including LUNXUAN 981, LUNXUAN 987, and LUNXUAN 201, have come out. Of them, LUNXUAN 987 has produced a yield on top of other varieties attending the national wheat experiment, for a yield increase of 14.8%, compared with dominant species Jingdong 8 and Jing 411. It also made a record of 715 kg per mu(1 mu= 0.0667 hectare) in another wheat experiment organized in 2004. It expects to be the first alternative replacement for winter wheat grown in north China.

Rotational screening of dwarf-male-sterile wheat makes repeated recombination and continuous optimization of several dozen or even a thousand kin genes possible. As a result, dwarf-male-sterile wheat becomes a workshop for producing new wheat varieties on a massive scale, raising breeding efficiency by a hundred times, compared with conventional methods, and staging a revolutionary breakthrough for China's wheat seeds breeding.

In the upcoming years, China will continue to work on more and better dwarf-male-sterile varieties, and to improve the breeding system, through concerted efforts. Chinese scientists will also establish a dwarf-male-sterile wheat breeding network for major growing areas, in an effort to share the data and information, and accelerate the application of research findings. Molecular technology will also be used in breeding dwarf-male-sterile wheat. A technical platform will be established for the purpose. Other innovations are also encouraged to keep up China's strength in the area.

Space Seeds Grow on Ground

ZHANG Yunchuan, Chairman of State Commission of Science, Technology and Industry for National Defense, made an official delivery of the satellite born plant seeds to DU Qinglin, Minister of Agriculture, at a ceremony held on September 26, 2006, for delivering to users the crop seeds that have been a payload on China's first space breeding satellite named "Practice 8". The event heralds the successful completion of the mission from satellite design/development, to launch, and further to retrieval. It also announces the full-fledged operation of ground screening and growing of space born plant seeds.

According to experts, 2,020 plants seeds in 9 categories, including paddy rice, wheat, corn, cotton/hemp, edible oil plants, vegetables, trees/fruit/flowers, microbe strains, and others, have returned to Earth intact, fully up to the technological requirements for delivery. As a user, the Ministry of Agriculture will take care of the rest part of the efforts, including screening, growing, and diffusion. Researchers will also study the biological effects of diverse space environment elements, using ground simulation devices, in an attempt to work out possible approaches for simulating space environment on the ground, and study the effects of space environment elements on plant seeds, so as to raise the efficiency of space based plant seeds breeding.

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