JPRS-CST-92-005
10 MARCH 1992

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'Torch Plan' To Focus on 10 Key Tasks During Eighth 5-Year Plan

92FE0282B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 16 Dec 91 p 1

[Article by reporter Yang Zhaobo [2799 0340 3134] and trainee Lang Guohua [6745 0948 5478]: "'Torch Plan' To Focus on 10 Work Items During Eighth 5-Year Plan"]

[Text] We learned from the State Science and Technology Commission that in order to achieve the index of a yearly value of output in China's high and new technology industry by 1995 to 60 billion yuan, China's "Torch Plan" will focus on 10 work items during the Eighth 5-Year Plan.

The information indicates that the content of these 10 work items is: 1) Expanding staffs, attracting more institutions of higher education, scientific research academies and institutes, and military industry enterprises into the "Torch Plan". 2) Expanding capital and, besides increasing the scale of loans, establishing a "Torch" risk fund. 3) Building high-tech industrial development zones into key base areas for the "Torch Plan". 4) For the next 2 years, concentrate on doing good work on the "Su-Xi-Chang" [Suzhou-Wuxi- Changzhou] and Zhu Jiang [Pearl River] Delta high-tech industry torch zone trial points. 5) Focus on permeating traditional industry with high-tech achievements, integrate the development of high-tech industry with upgrading of traditional industry. 6) Focus on supporting the formation of scales and the formation of climates in several high S&T industries and high-tech enterprises, take the route of forming blocs. 7) Conscientiously adhere to the relevant state documents concerning simplification of the procedures for personnel in high-tech enterprises to leave China several times, promote cooperation and exchanges with foreign countries in high-tech industry. 8) Strive to attract foreign capital into development zones. 9) Strengthen cooperation and exchanges between coastal and interior high-tech industry development zones. 10) Integrate high-tech in the interior of China with the requirements of enterprises in foreign countries, create an excellent financial and market environment. The "Torch Plan" should achieve 15 billion yuan in yearly value of output by 1993 and lay an excellent foundation for major development and the formation of a climate over the next 3 years to raise the "Torch Plan" up onto a new stage.

Song Jian on Science and Technology Development in China

92FE0064A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 16 Sep 91 pp 1-2

[Article by Song Jian [1345 0256]: "Develop Science and Technology, Vitalize China, A Review of and Prospects for China's S&T Activities"]

[Text] The Chinese nationality has made magnificent contributions to the development of mankind's S&T activities during its 5,000 year history and has only become very backward during the past 200 years or so. Beginning with the encroachment upon China by English imperialism in the Opium War in 1840, the Chinese nationality has undergone over 100 years of humiliation and resistance and countless martyrs have laid down their lives in heroic sacrifice for the existence and vitalization of the Chinese nationality and in the fight for science and democracy. None of the various attempts were successful. Only the socialist system illuminated the vigor of the Chinese nationality and opened up a broad path for establishing and developing modern S&T activities.

After the founding of New China in 1949, under the direction of Chairman Mao, Premier Zhou, Marshal Chen Yi, Marshal Nie Rongzhen, and other proletarian revolutionaries of the older generation and under the leadership of the older generation of scientists, China's modern S&T made outstanding achievements that have gained world recognition. This is especially true following the 3d Plenum of the 11th CPC Central Committee, when comrade Deng Xiaoping began with the strategic heights of world social, political, and economic development, integrated with the new situation of reform and opening up, profoundly revealed the social and historical status and role of S&T as the first forces of production, and clarified the basic principles, directions, and policies for the development of China's S&T. Since the 4th Plenum of the 13th CPC Central Committee, the central leadership collective centered around comrade Jiang Zemin has been extremely concerned about S&T work and is now leading our advance toward a new S&T revolution. We firmly believe that during the historical course toward achieving the second strategic objective in China's modernization and construction, China's S&T activities will inevitably make even greater advances and further display their enormous might in promoting economic construction and reform and opening up.

I.

Since the founding of New China, China's S&T activities have advanced by leaps and bounds and the status of S&T in socialist modernization and construction is becoming increasingly important and their role increasingly powerful.

First, an independent and complete scientific system has taken shape on a national scale and has trained and created a huge S&T staff.

Before 1949, China could be called poor and blank. It had just 30-plus independent scientific research organs and fewer than 500 personnel engaged in S&T research, and its S&T activities were extremely backward. After more than 40 years of arduous effort, the situation in S&T activities has experienced earth-shaking changes like the people's republic as a whole. We have formed a scientific and technical system on a national scale with a complete set of fields and disciplines that is engaged in basic science, applied science, public welfare science, engineering and design, development research, scientific experimentation, and so on. According to statistics for 1990, China had 10.808 million S&T personnel in natural sciences fields in units under ownership by the whole people, which is 25.4 times as many as we had shortly after the nation was founded (1952). They include 5.1 million engineering technical personnel, equal to 47.2 percent, 551,000 agricultural technical personnel, equal to 5.1 percent, 2.72 million public health technical personnel, equal to 25.2 percent, 291,000 scientific research personnel, equal to 2.7 percent, and 2.146 million educational personnel, equal to 19.8 percent. In 1990, there were an average of 1,045 S&T personnel per 10,000 employees. Among the total number of S&T personnel, 47.9 percent have received a higher education, and there are 538,000 advanced S&T personnel, equal to 5.6 percent, and 245,500 middle-level S&T personnel, equal to 25.8 percent. This shows that there have been historical and gratifying changes both in quantitative and qualitative terms in China's S&T staff.

There has also been an unprecedented expansion in research and development organs. At the end of 1990, China had 5,819 independent scientific research and technological development organs (including S&T information and abstract organs) above the county level (not including the county level, the same holds true below) with 1.037 million employees, which includes 451,000 scientists and engineers, equal to 43.5 percent. Of our 5,819 research and development organs, 5,477 are in the natural sciences field and have 1.015 million employees and 436,000 scientists and engineers. There are 342 in the social sciences and humanities fields with 222,000 employees and 15,000 scientists and engineers. This S&T system covers nearly all the modern scientific and technical fields and has become a supporting system for our national economic, S&T, and social development.

There has also been significant reinforcement of technical development work in large and medium-sized enterprises. By the end of 1990, China's 13,475 large and medium-sized enterprises had 1.943 million engineering and technical personnel as S&T workers, equal to 6.5 percent of the total number of employees. They also had 771,000 people involved in technical development activities, including 314,000 scientists and engineers, equal to 40.7 percent. There were are average of 104 scientists and engineers per 10,000 employees. There are 7,289 large and medium-sized enterprises that have established 8,116 technical development organs with 333,000 S&T personnel, including 148,000 scientists and engineers, and they have an average of 18 scientists and engineers in each organ.

Institutions of higher education have consistently been a major force in China's S&T activities. By 1990, 79.5 percent of our scientific, engineering, agricultural, and medical specialized institutions of higher education (636 of them) had established S&T research and development systems that had 248,000 personnel engaged in research and development, equal to 34 percent of all of their educational and scientific research personnel. All of China's institutions of higher education have established 1,666 R&D organs, including 864 research institutes and 802 research offices. Classified by field, they include 256 in the sciences, equal to 15.4 percent, 691 in engineering and technical sciences, equal to 41.5 percent, 253 in agricultural sciences, equal to 15.2 percent, 424 in the medical sciences, equal to 25.4 percent, and 42 comprehensive multidisciplinary organs, equal to 2.5 percent.

The existing staffs in our scientific research and development organs are very ill-suited to the requirements of socialist modernization and construction and lag considerably behind overall levels in the developed nations. When assessed against the scales of Chinese history over the past 100 years, however, and when compared with the weak foundation during the early part of this century and shortly after our nation was founded, it cannot be said that we have made enormous and epoch-making advances.

Second, we have made many S&T achievements that have provided technical guarantees for socialist modernization.

China has already attained and approached advanced international levels in atomic energy technology, space technology, high-energy physics, biological science, computer science and technology, communications technology, and other incisive S&T fields. We successfully exploded our first atomic bomb on 16 October 1964. In September 1965, we were the first in the world to use artificial methods to synthesize biologically active bovine insulin. We successfully exploded our first hydrogen bomb on 17 June 1967. China launched its first artificial satellite on 24 April 1970. Our success with the "two bombs and one satellite" substantially increased our military strength and national strength and greatly improved China's international status. In November 1981, China was the first to complete the artificial synthesis of yeast alanine transfer-RNA, which was an indication that China continued to hold a vanguard status in the world in the area of research on the artificial synthesis of biomacromolecules. From 1970 to 1990, China successfully launched 30 artificial Earth satellites, including 12 that were successfully returned to the ground according to predetermined plans, and we became the fourth nation after the United States, Soviet Union, and France to grasp the technology of "multiple satellites on a single rocket". Moreover, we have made a series of achievements at advanced world levels in the successful launch of underwater-launched missiles, intercontinental carrier rockets, and the "Long March 2" large-thrust rocket, the successful collision in an electron-positron collider, the successful development of "Yinhe" [Silver River] supercomputers, and in important disciplines and fields including modern biological science, pharmacology and health, Earth science, chemistry, mathematics, and so on that indicate that China is now a scientific and technological superpower. During the past 40-plus years, we made several 100,000 S&T achievements, including 110,000 major S&T achievements from 1980 to October 1990 alone. They included nearly 10,000 that received state awards, and we implemented over 50,000 patents and extended a large number of important S&T achievements that raised technical levels and increased economic benefits in agriculture and traditional industry several-fold.

Because of the extension and application of S&T achievements in agriculture, on which our many 100 million people depend for their existence, we have made a broad range of achievements that have received world recognition. During the mid-1950's, China successfully bred the world's first improved short-stalk paddy rice variety that increased yields by 50 to 150 kilograms per mu. In the 1970's, China was also the first in the world to successfully develop a male infertile strain, holding strain, and recovery strain for long-grained nonglutinous paddy rice, achieving a matchup of three strains, and bred several types of high-yield hybrid combination paddy rice that increased yields by more than 50 kilograms per mu. Considerable advances have also been made in the application of S&T in areas including chemical fertilizer, machinery, plant protection, disease and pest prevention, forestry, animal husbandry, aquaculture, and others. In agricultural production, the proportions of electrification, mechanization, and semi-mechanization have increased every year and the "green and white revolution" is unfolding, and the utilization rate for advanced and applied technology has increased substantially. Estimates are that S&T now account for more than 35 percent of increased output in agriculture. Overall, agricultural production is moving toward a development path integrating traditional technology and modern technology that has increased total grain output from 170 million tons in 1949 to 435 million tons in 1990 and meat output from 2.2 million tons to 25.04 million tons. There have also been 10-fold increases in output of cotton, oil crops, fruit, aquaculture, and other agricultural and sideline products. Advances and popularization of agricultural S&T have basically solved the food and clothing problems of our rural areas with their population of 800 million. This is a magnificent feat both in the history of China as well as on a world scale.

Our principle is reliance on our own efforts. We relied mainly on our own research, development, design, and manufacturing capabilities to establish an independent and relatively complete industrial system. Under the guidance of an original petroleum geology and oilfield development theory created by Chinese scientists, we have discovered and established Daqing and several other new petroleum base areas, ceased being an oil-poor nation, and increased yearly petroleum output 460-fold from 300,000 tons prior to Liberation to 138 million tons in 1990. We have also gained a basic understanding of modern production technology and manufacturing technology for complete sets of equipment for coal, minerals, electric power, communication, light industry, communications, machine building and electronics, metallurgy, chemical industry, and other major basic industrial realms. Qinshan Nuclear Power Plant, the first nuclear power plant developed by China itself, will soon be going into operation. We had already made breakthroughs with blast furnace smelting technology for high-titanium content vanadium-titanomagnetite as early as the mid-1960's which solved problems with comprehensive utilization of large polymetallic paragenetic minerals. Subsequently, we also resolved problems with the technology for extracting vanadium and niobium from melted iron, which enabled China to change from an vanadium-importing country to an exporting one. We did our own development and production of a 300,000-ton synthetic ammonia and 240,000-ton urea single-unit machine, a 1.7 meter hot continuous rolling machine, 10 to 30 million ton large-scale open-cut coal mine equipment sets, and 500 kV high-voltage power transmission equipment, which can not only satisfy our domestic production requirements but can also be exported.

Over the past 40-plus years, China has made a multitude of glorious achievements in S&T activities that are too numerous to mention individually. The past situation of markets full of "foreign goods" has long since passed. Our achievements over just 40 years fully illustrate that the socialist system is the fundamental guarantee for changing China's poverty and backwardness. Science and technology, this first force of production, are powerful pillars in building socialism.

Third, The invigoration of China's S&T has become a propulsive force in socioeconomic development.

Based on the guiding principle that "economic construction must rely on S&T, S&T work must be oriented toward economic construction", we have focused on the spirit of the "CPC Central Committee Decision Concerning Reform of the S&T System" in carrying out a series of reforms since 1985. The overly rigid single and unified management system has been changed, we have begun solving the problem of the detachment of S&T from the economy, and operational mechanisms that integrated planned management with market regulation have begun to form. These have further liberated the forces of production and promoted the course of society as a whole in S&T progress.

In the area of the management system, we have implemented the contractual responsibility system and management by categories, a bid solicitation system for optimized integration of scientific research with the factors of production, a recruitment system, and several other reforms that have brought vitality to scientific research organs. Reform of the allocation system has changed the situation in which funding for scientific research organs depended solely on the state providing everything and there was a lack of self- development vitality. Many technology-development type scientific research organs have changed operational mechanisms and left their closed state in taking the initiative to move toward the primary battlefields of economic construction, reinforced the integration of large and medium-sized enterprises, entered and expanded the economy in a variety of ways, and developed from a purely scientific research type toward technological entities that integrate scientific research, production, and administration. By the end of 1990, many technology-development type scientific research organs in China had entered enterprises or enterprise groups and formed over 10,000 integrated scientific research and production joint ventures with enterprises, and over 3,500 independent investment and joint investment technical and economic entities have been created by scientific research organs. These have effectively promoted the integration of scientific research with the economy and greatly strengthened the economic power of scientific research organs. In 1990, China's scientific research organs earned 8.65 billion yuan, including 5.22 billion yuan in income from technology. China now has 5,074 research and development organs in natural science fields above the county level, including 1,186 research organs that no longer require funding by the state. This is equal to 60 percent of the number of technology development organs in 1983. In the area of basic research, we have established a natural science funding system and founded the National Natural Science Foundation in February 1986 that is now playing a growing role.

The technology market is becoming increasingly stronger under guidance by the principle of "opening up, invigoration, support, guidance". As reforms of the economic and S&T system have intensified, we have gradually entered the track of management according to laws. The breakthrough point has been a transition from uncompensated transfers to compensated transfers of S&T achievements, which has caused the volume of technology trade in China to increase every year. There have also been substantial increases in extension and application rates for S&T achievements that have changed the defect of the detachment of S&T from the economy and destroyed the situation of only importing and not exporting technology that has been around for a long time. After implementation of the "State S&T Achievement Key Extension Plan" in 1990, nearly 50 provinces, municipalities, and departments formulated local and industry extension plans. Large numbers of S&T achievements that cover broad areas, conserve energy and reduce consumption, improve quality, increase product variety, and significantly improve economic and social results have been extended and applied over a wide area in traditional industry. Many S&T achievements that in the past were used as samples, exhibits, and gifts have now been released from laboratories and exhibition halls and been sent to the front line of economic construction on a large scale, forming considerable economic and social benefits.

Reform of the S&T personnel management system has promoted the formation of personnel circulation and competition mechanisms that have further fostered the creativity and work enthusiasm of S&T personnel. Of China's 10 million natural sciences personnel, over 4 million have dedicated themselves to struggle on the main battlefields of agricultural production and several 100,000 S&T personnel are providing intellectual support to medium-sized and small enterprises and township and town enterprises. Civilian-run S&T organs that quietly arose during the surge of reforms are now developing and growing throughout China with a flourishing momentum. According to incomplete statistics, China now has 8,523 civilian S&T organs that employ over 200,000 people. Several civilian S&T organs have become group companies with yearly output values of 1 billion yuan or several 100 million yuan and some have expanded into foreign countries or integrated in various ways with large and medium-sized state-run enterprises, which has spurred technological progress in traditional industry. Civilian S&T organs have now become a powerful force among China's S&T staffs.

II.

China's S&T work is being carried out in depth at three levels and implemented in several major plans.

Level one is: Orienting toward the main battlefields of economic construction, rapidly raising technical levels in industrial and agricultural production, promoting technical progress in traditional industry, and serving the strategic objectives of China's economic and social development. This level mainly involves organizing to implement the "Plan To Attack Key S&T Problems", "Bumper Harvest Plan", "Spark Plan", "State S&T Achievements Key Extension Plan", "Set the Prairie Ablaze Plan", and so on.

The primary objective in the Plan To Attack Key S&T Problems is to resolve certain technical problems that have a major impact on development of our national economy and society. During the Seventh 5-Year Plan, the arduous efforts of more than 100,000 S&T personnel produced many important achievements. Most of the 76 projects and 384 topics arranged in state plans were completed on schedule, 80 percent of the projects may attain advanced world levels of the 1980's, over 400 intermediate testing lines and over 400 industrial experiment facilities were completed, over 300 new technologies and techniques were provided, and over 700 major new products were developed. In addition, 25,000 local attacks on key S&T problems that were arranged by 42 provinces, municipalities, and cities with province-level decision-making authority made 19,000 achievements and produced over 25 billion yuan a year in economic benefits. An example is the collection and evaluation of species resources in the area of agriculture, the breeding of improved crop varieties, and regional comprehensive improvement of medium and low-yield farmland, the development of important technical equipment in metallurgy, energy resources, communication and transportation, medicine, the chemical industry, and so on in the area of industry, the development of new technologies in the microelectronics, computer, bioengineering, new materials, and other industries, and other important technical achievements, all of which had a major effect on improving overall technical levels in traditional industry and promoting the development of our national economy, and they generated increasingly significant economic and social benefits.

The primary objective in the Bumper Harvest Plan is a major effort to extend advanced and appropriate technology to increase agricultural output. Over 90 percent of China's territory and 80 percent of its population is in rural areas and many regions have still not overcome the backward situation of a natural economy or semi-natural economy. If we fail to achieve a takeoff in our rural economy and simply rely on the pull of large and medium-sized enterprises to achieve industrialization, this will be an extremely slow and costly process. Relying on S&T progress to promote development of the rural commodity economy is an historical task that is not open to doubt. Over the past 10-plus years, work to use S&T to invigorate agriculture has gradually developed and great achievements have accumulated. According to statistics, 60 percent of China's counties, townships, and towns have established S&T deputy mayors and as many as 500,000 S&T personnel participate in using S&T to invigorate agriculture each year. The number of technical contractual responsibility groups of all categories has grown to more than 6,000 and a service system based on S&T services is now being establish throughout our rural areas. The number of technical economics cooperation organizations of all types has grown to 122,000 and they cover nearly 2 million peasant households. They have promoted the establishment and development of a dual-level administration system in rural areas that combines unification with a division of labor. Initial results are now being seen from the extension of agricultural S&T achievements centered on superior varieties and advanced plant protection technology. China's average per-mu grain yields increased from 150 to 250 kilograms in 1979 to 400 to 600 kilograms in 1990, while total output reached 435 million tons and the gross value of output in rural society exceeded 1.6 trillion yuan. Significant benefits have now been obtained in using S&T to support poor areas and the food and clothing problems of more than 90 percent of poor peasants have now basically been solved.

The objective in implementation of the "Spark Plan" is to promote technological progress in agriculture and township and town enterprises, whereas the focus in the "Set the Prairie Ablaze Plan" is on developing and training skilled technical personnel in rural areas.

Since implementation of the policy of reform and opening up, township and town enterprises have become a new force that is suddenly coming to the fore. Their value of output surpassed 900 billion yuan in 1990 and they have become a pillar of rural economic development and a significant part of the industrial realm. During a period of improvement and rectification and tight money supplies, the value of output and profits and taxes of township and town enterprises increased at a momentum in the two digits. The ability of township and town enterprises to develop so quickly is to a great extent due to the implementation of various types of S&T plans like the "Spark Plan". Since 1985, the Spark Plan has arranged a total of 27,877 projects in China and nearly 15,000 have been completed, while 302 types of technical equipment have been extended. According to statistics from just 11 provinces and seven cities with province-level decision-making authority, 140,000 sets of technical equipment have already been extended, with 33.9 billion yuan in additional value of output and 8.125 billion yuan in new profits and taxes. In the implementation of the "Spark", "Setting the Prairie Ablaze", and other plans, 6.5 million skilled S&T personnel of all categories have been trained for rural areas and they have become new types of peasants in the development of the rural commodity economy.

During the Seventh 5-Year Plan, while the national defense S&T battlefront has been working hard on military S&T research and raising technical levels of national defense equipment, they have also worked hard at reorienting toward national economic construction. The state arranged for 582 development projects to transfer technology from military to civilian uses, overcame more than 2,000 technical problems for civilian departments, carried out over 30,000 transfers of military technology to civilian uses, and completed 1.7 billion yuan in technology contracts.

Some 500 years ago during the Ming Dynasty, which was also the time when Columbus discovered the Americas in 1492, China had a population of 60 million people. Today, important tasks in the main battlefield of economic construction include controlling population growth, strengthening population quality, rationally developing and utilizing resources, improving and protecting the environment, and improving the health standards of our people.

Level two is: Tracking world development trends in high science and technology, selecting limited objectives, concentrating forces to attack key problems, and developing high and new technology and industry. At this level, the focus is on implementation of the "863 Plan" and "Torch Plan".

China began organizing implementation of the "863" Plan to develop high S&T in 1987. The focus is on selecting the seven realms of biotechnology, space technology, information technology, laser technology, automation technology, energy resource technology, and new materials in establishing 15 main topics and organizing over 10,000 superior scientists for a coordinated battle to attack key problems. After just over 4 years of efforts, over 400 stage-type achievements were made in five realms alone. More than 50 achievements like dual-strain method sub-interspecific hybrid paddy rice, intelligent robots, genetic engineering, hepatitis-B vaccine, paddy rice and corn combined nitrogen fixation, test tube calves, non-linear optical crystals, adjustable laser crystals, Chinese character recognition and Chinese speech recognition systems, computer integrated manufacturing systems, and so on have attained or approximated advanced world levels, fully revealing China's broad prospects for developing high S&T.

To spur the conversion of high-tech achievements into commodities and spur the rapid formation of high and new technology industry and its movement toward the world, China organized the "Torch Plan" to develop high and new technology industry in 1988. A total of 579 "Spark Plan" projects were arranged over 3 years. Added to projects implemented by provinces and municipalities themselves, the total is almost 2,000 projects. China now has 27 large and medium-sized cities and coastal open cities that have established national- level high-tech industry development zones and nearly 1,690 high-tech enterprises have entered the development zones. By relying on major support from the state's preferential policies and the efforts of vast numbers of S&T workers, high-tech industry is growing with flourishing vitality and displaying enormous development momentum. Statistics indicate that the Beijing Development Zone had a yearly growth rate of gross income of more than 40 percent for 3 consecutive years. Many development zones are playing a role in using high and new technology to transform traditional industry.

Level three is: Continued promotion of basic research and applied research. In this area, besides continuing to preserve advantages in several traditional realms, China has also made breakthroughs in research in several emerging fields. Over 100,000 S&T personnel are now engaged in basic research and more than 20,000 research projects were arranged during the Seventh 5-Year Plan, including nearly 3,000 projects that received subsidies each year from the National Natural Science Fund. Some areas and departments have raised their own capital to support more than 3,000 basic research projects. There are 63 key laboratories and nearly 100 open laboratories that have been completed through state investments. In February 1989, the State Council organized a National Basic Research Work Conference and increased the proportion of investments in basic research. There have been substantial increases each year in investments by the Natural Science Foundation in basic research. All of these things have created excellent conditions for strengthening basic research work. China has made several achievements in basic research work over the past several years in certain fields that have attracted world attention. Examples include the successive establishment of the Beijing Positron-Electron Collider, the Lanzhou Heavy Ion Accelerator, the Hefei Synchronous Radiation Facility, the Solar Magnetic Field Telescope, and several other experimental facilities, all of which have attained advanced international levels. China has consistently been among the world's leaders in the area of high-temperature superconductivity research, and we have made several achievements at advanced world levels in materials science, life sciences, and other fields.

During the 1980's, research in the soft sciences began emerging in China and developed in a flourishing manner. To date, China has nearly 1,000 research organs and a research staff of nearly 30,000 people and has made over 600 research achievements. S&T consulting services are also seeing healthy development. According to incomplete statistics, there are now over 30,000 registered consulting organs. Research in the soft sciences and S&T consulting have played a role in serving decision-making and economic construction. China has reinforced S&T legislation work over the past several years, promulgated and implemented the "Patent Law", "Technology Contract Law", and so on, and is now formulating an "S&T Progress Law". These will provide legal guarantees for opening up all channels for the entry of S&T into the economy.

Besides the three levels and several major plans described above, international S&T cooperation and exchange work, an important aspect of China's strategy of opening up to the outside world, has been unprecedentedly vigorous and we have broadly undertaken official, civilian, bilateral, multilateral, multichannel, multilevel, and multiform S&T cooperation and exchanges. China has established cooperative relationships with 108 countries and regions, concluded intergovernmental S&T cooperation and economic cooperation agreements with 57 countries, obtained legal seats in more than 30 S&T organs in the United Nations system, and participated in more than 280 international scholarly organizations. During the Seventh 5-Year Plan, we had more than 10,000 intergovernmental and inter-civilian cooperation and exchange projects each year, an 8-fold increase over 1978. International S&T cooperation and exchanges have made important contributions to China's S&T development and economic construction and played an active role in breaking down the sanctions on China by certain countries and promoting foreign relations and foreign trade work. There has been a substantial increase in China's technology export trade over the past several years and the volume of exports reached $980 million, a more than 30-fold increase over 1985.

At present, the enormous role of S&T as the first force of production and the significance of S&T progress are gradually being understood and acknowledged by leaders at all levels. New mechanisms for S&T progress in all of society are gradually taking shape. China now has 20 provinces and autonomous regions and more than 200 large and small cities that have proposed development strategies for using S&T to invigorate their provinces and cities, many industries have made deployments for using S&T to invigorate their industry, and financial, banking, taxation, industry and commerce, personnel, and other departments are providing major support for S&T progress work. The education and training of S&T personnel and work to popularize S&T knowledge are flourishing and the custom of "respecting knowledge, respecting skilled personnel" and a concern for S&T progress is now taking shape throughout society.

Under the correct leadership of the CPC Central Committee and State Council, the achievements, might, and structure of China's S&T work are now laying an excellent foundation for another step in the development of S&T, economic, and social progress during the 1990's and into the beginning of the next century. Of course, we have no reason to be blindly optimistic and we still face many difficulties on the road to S&T development. Technical levels in China's industry and agriculture and the proportion of S&T progress in economic development still lag far behind the advanced nations of the world, investments in S&T are still a low proportion of our GNP, and the role of S&T as the first force of production is still far from being fully fostered. Resolute and major efforts at developing S&T and true reliance on S&T progress to promote economic and social development are still an extremely arduous and urgent task that we face.

III.

The 1990's are a key historical period for the Chinese nationality. S&T circles must unite as one with all people of the nation and engage in arduous struggle to double our GNP by the end of this century, substantially increase labor productivity in all of society, and raise S&T levels for all nationalities to create the conditions for catching up with the moderately developed nations during the first half of the next century.

Since the 1950's, all nations have given increasing attention to science and technology, especially to high S&T. States and governments have been active in organizing and coordinating S&T forces, investing huge amounts of capital, and implementing enormous national-level S&T plans. This has been a common method in all nations of the world. All countries hope to use S&T breakthroughs to increase overall national strengths and occupy a high point in the new round of international competition. The new technological revolution led by information technology and biotechnology has already arrived. The old economic development model during the early industrial period of "risking resources, risking capital, and risking physical strength" is now gradually changing. Now, the value of commodities is determined by the amount of knowledge and intelligence investments that are materialized in a commodity. S&T, knowledge, intelligence, and the spirit of struggle are the basic guarantees for future victory.

China is a large developing nation that is poor in natural resources in per capita terms, but at the same time it is also a large country with abundant intellectual resources. For various historical, economic, and social reasons, China's overall national strengths lag far behind those of the developed nations and our economic development levels at the present stage correspond very poorly with the S&T strengths that China has. On the one hand, our educational activities are underdeveloped and the quality of most laborers throughout society is relatively low. We are still far from popularizing S&T knowledge and it has not yet become an incisive weapon for laborers to understand and transform nature and transform society. On the other hand, we have still not completely established operational mechanisms for effective integration of S&T with the economy and economic construction has still not truly oriented toward the track of relying on S&T progress. The extension and application rate for S&T achievements is still only about 20 percent and the contribution of S&T to economic growth is only about 30 percent. The enormous potential of the intellectual resources of China's scientific circles and technical circles is still far from being released. A rapid change of this situation is an important task that we now face. It has profound significance for correctly implementing the policies of reform and opening up, for the development of China's economy and society, and for invigorating our nationality. For this reason, striving to develop S&T, resolutely shifting the focus of economic construction toward reliance on S&T, and creating the conditions for achieving our second strategic objective and third strategic objective are glorious and arduous historical missions that we face in the 1990's.

Reliance on S&T to invigorate the Chinese nationality is a basic principle in our modernization and construction. The CPC Central Committee and State Council have made deployments for developing S&T activities in China and proposed clear goals of struggle. Overall, China's S&T work during the 1990's and for a period into the future must continue to make breakthroughs in five areas.

1. Establish the guiding ideology that S&T are the first force of production.

To stand on its own among the nationalities of the world, the Chinese nationality must further liberate its ideology, strengthen the S&T knowledge of the entire nationality, improve the quality of laborers of all the nationality, foster the role of S&T to the greatest possible extent, rapidly increase labor productivity, develop new forces of production, and truly shift national economic and social development onto the track of relying on S&T. For this reason, we must first establish throughout the CPC the ideology that S&T are the first force of production, include S&T among the important orders of the day for CPC committees and governments at all levels, focus on the rights of initiative of S&T work throughout all social and economic development work, do painstaking leadership, make unified deployments, and implement them will all their might.

2. Rationally allocate S&T forces among the three levels of main battlefields, high technology, and basic research, actively and stably promote organizational and structural readjustment, enable all scientific research organs and personnel at different levels and of different categories to play a role at a particular level, allow each to play a role, and give full play to their skills.

We must continue to preserve a crack and vigorous research force and take on major basic, comprehensive, and long-term scientific research tasks. Fully foster the role of institutions of higher education. Social public welfare- type research organs should achieve structural networking and functional socialization. Technology development-type scientific research organs should develop in the direction of integrating scientific research, production, and administration, continue with their efforts to enter and grow into the economy, strengthen integration with large and medium-sized enterprises, and, based on their own characteristics and concrete conditions and under the leadership and support of government plans, use the market as their stage and economic development as their goal, strive for their own development in competition, and search for the position in which they can play their role. We must strengthen guidance and management, encourage and support the development of all types of civilian-run S&T organs centered on the public ownership system and shareholding system, and make them become an important and organic part of China's S&T activities. In all categories of scientific research organs, we should give preference to a group and provided focused support according to their S&T levels and contributions to economic and social development. We should also make the necessary readjustments according to the state's development requirements and the development situation in each type of organ. At the same time, we should provide further guidance by categories over S&T work. Practice over the past several years has proven that these three levels and the deployment and objectives of S&T plans conform to concrete realities in China at the present time and should be comprehensively and better implemented during the 1990's to enable development, breakthroughs, and advances. In the area of S&T work in agriculture and rural areas, we should use implementation of the "Spark Plan", "Poor Areas Support Plan", "Bumper Harvest Plan", "Setting the Prairie Ablaze", and other plans and various types of S&T development and extension activities to achieve an extension rate of more than 60 percent for existing agricultural (including forestry, aquaculture, animal husbandry, and sideline production) S&T achievements. We should broadly popularize and apply electronic information and automation technology in all industrial realms (such as numerical control technology, soft processing, computer-integrated manufacturing, etc.) to transform traditional industry. In particular, we should raise S&T levels in manufacturing, make major efforts to extend and apply existing mature, advanced, and appropriate S&T achievements, form scale benefits over a large area, modernize production technology and equipment in traditional industry, and make administration and management more scientific. High technology and industry have become the key to influencing economic, national defense, S&T, and social development. Focus on implementing the "863 Plan" well, strive for the achievement of high-tech industrialization, commodification, and internationalization, and truly focus on construction and development of the 27 high and new technology industry zones approved by the State Council.

The experience of history shows us that ensuring the sustained and stable development of basic research must be a long-term and resolute basic principle of China's S&T work. The primary tasks of basic research work over the next decade are to move into international advanced ranks in certain important basic research areas, focus closely on the strategic foci in agriculture, energy resources, materials, information, and other parts of national economic development and on major problems in population, pharmacology, resources, ecology and the environment, natural disasters, and so on, undertake multidisciplinary comprehensive research, provide a theoretical basis and technical foundation for solving major problems in the development of the Chinese nationality, and strive to make major achievements at advanced international levels. During the Eighth 5-Year Plan, we should substantially increase capital inputs in basic research, increase their proportion of financial allocations from the present 6 percent to 8 percent, and raise it to more than 10 percent in the Ninth 5-Year Plan. In the next 5 years, the state should also invest in rebuilding several key laboratories and major engineering experiment centers. It should continue to support the free selection of topics by scientists and in particular should support those basic research topics that have important and broad applications prospects in national economic and social development. Based on the requirements of economic construction, S&T progress, and social development, the state will organize the implementation of important basic research and S&T engineering projects, gradually establish a high-level state basic research staff and several experimental base areas with modern equipment levels, train and create a large number of superior middle-aged and young scientists to go all out in certain key fields, make China have more and more basic research that occupies the leading edge of world science, and strive to make major breakthroughs and contribute to the cause of science in China and the world.

3. Try to increase S&T inputs.

S&T inputs are an important condition for S&T development. The historical experience of world economic development shows that when a nation is in the process of an economic takeoff, it must substantially increase direct and indirect investments in S&T. To ensure the smooth progress of all S&T plans, we must substantially increase all of society's inputs into S&T and form three main pillars for S&T investments composed of state financial allocations, capital raised by enterprises themselves, and loans from banking organs. At the same time, we should actively attract civilian and foreign capital and establish a multilevel and multichannel S&T investment system. At present, the proportion of S&T investments as a part of our GNP is lower than in the developed nations and lower than several developing countries. Over the next 10 years, we should adopt truly effective measures to ensure that the growth of financial outlays on S&T is higher than the growth in financial income and the growth in GNP so that the ratio between China's R&D expenditures and GNP increases from about 0.7 percent in 1990 to 1 percent in 1995 and more than 1.35 percent in 2000, so the expected yearly rate of growth would be about 13 percent. Moreover, we should guide and spur enterprises and financial organs to slant their capital toward S&T development, scientific research, and extension. The People's Bank of China and special banks all should establish S&T credit accounts, create risk investments, and try to increase the annual scale of S&T loans to more than 10 billion yuan by the end of the Eighth 5-Year Plan. Enterprises and enterprise groups should invest a substantial portion of their volume of sales into R&D. Only in this way can we ensure that a rather good result is achieved for the problem of relatively low S&T investments.

4. Continue to intensify reform of the S&T system.

Reform of the S&T system involves complex systems engineering. It will still take a rather long time to truly establish a new system that is adapted to integration of the planned economy with market regulation and achieve the integration of S&T with the economy, and reform of the economic system and reform of the S&T system must proceed together before this can be accomplished. On the basis of continuing to intensify and perfect existing reform work, we should increase the pace of moving forward, establish and perfect new mechanisms with full vitality and vigor that benefit S&T progress, economic prosperity, and social development, fully foster the comprehensive advantages of planned management and market regulation, and shift China's S&T work from the situation of relying primarily on administration to being based on the economy to form a benevolent cycle with economic development in which each promotes the other. We must fully foster the initiative of existing S&T staffs and encourage and support S&T personnel in scientific research organs and institutions of higher education to extend S&T achievements into the main battlefields of the national economy, attack key technical problems, establish high and new technology industries, create various types of new technology enterprises, use high and new technology to transform traditional industry, and struggle to establish an energy conservation, consumption reduction, water conserving, and land-conserving energy resource conservation-type economy. By the end of this century, we should try to raise the contribution of technical progress toward China's economic growth to about 50 percent and the yearly value of output of high and new technology products to more than 100 billion yuan, and there should be a substantial increase in the volume of exports as a proportion of the total volume of China's export trade.

In the area of management and development models in scientific research organs, those that can be invigorated should proceed first and gradually carry along the whole group. Those scientific research organs with rather large scales and rather powerful comprehensive characteristics should centralize and reorganize superior personnel and advanced equipment, focus on guaranteeing projects to attack major problems, implement preferential support policies and new management methods, and foster the advantages of S&T groups. A group of S&T-type enterprises should be selected for trying out a shareholding system. Basic and social public welfare type scientific research organs which have the proper conditions should explore new management systems that enable their work to better serve scientific progress and social development. National-level scientific research organs should be given focused support and given the authority to participate in international S&T cooperation and technical and economic cooperation with foreign countries. Actively encourage the movement of research achievements and products of scientific research organs with the proper conditions into international technology markets. Actively attract organs or individuals in foreign countries or outside our borders to cooperate with China in establishing scientific research organs here. We should strengthen the managerial and administrative authority of scientific research organs, expand the decision-making rights of scientific research organs, and gradually achieve the socialization of scientific research organs.

We should further adopt strong measures to strengthen and perfect S&T progress mechanisms in industries and enterprises. All relevant departments should make major efforts toward cooperation, promote and encourage technical progress in enterprises, and gradually transform enterprises into the main bodies of technological development work and primary investment bodies for technological development. On the basis of their industry's characteristics, all industries and departments should establish enterprise S&T progress evaluation indicator systems, include them in the objective responsibility system for the term of office of plant managers, the enterprise contractual responsibility system, and evaluation indices for raising the grades of enterprises. We should establish and perfect a chief engineer and R&D department responsibility system under the leadership of plant managers, clearly stipulate the duties of chief engineers, and further perfect the enterprise technology development and production technology management system. Large and medium-sized enterprises and enterprise groups should absorb independent scientific research organs, build their own, or use other methods to establish their own development organs, while small enterprises and township and town enterprises should have their own technological backing. We should strengthen macro management of enterprise technical upgrading and apply administrative, economic, legal, and other measures to spur S&T progress in enterprises.

The rapid development and widespread application of modern science and technology have turned today's world into a large open system. S&T can develop quickly only under open conditions and in a situation of mutual competition and mutual absorption of experiences. Making full use of all favorable conditions and promoting domestic and foreign cooperation and exchanges in an omnidirectional fashion should become a long-term principle for the development of S&T activities in China. We must strive to preserve and develop the situation of opening up to the outside world that has taken shape over the past 10-plus years, be open and aboveboard, be neither humble or pushy, and, under the principle of equality and mutual benefit, take the initiative in attacking every realm in which we hold an advantage and head the list in setting forth all types of international cooperation. We should train large numbers of Chinese high-level S&T personnel for participation in major international cooperation and guide emerging high-tech industries in moving into international markets. High-S&T industry can only exist and grow with the support of large markets and China's S&T activities can only develop in a substantial way in major international cooperation and competition. We must further create a legal environment and social order conducive to S&T progress, apply the might of the socialist system and readjustment and control measures, develop and perfect achievements in reform of the S&T system, promote more scientific and democratic decision-making, and ensure the coordinated development of S&T with the economy and society. Perfecting construction of the S&T legal system is an important aspect of S&T work during the 1990's. We must strengthen and give attention to research work in the soft sciences, strengthen research work on S&T laws and regulations and establish legislative processes, focus on the formulation of S&T progress laws, research institute laws, S&T award laws, and other important S&T laws. Conscientiously do good propaganda and popularization work for S&T policies, laws, and regulations and make them policies and regulations that guide S&T activities.

5. Further foster the initiative of large numbers of intellectuals.

In the final analysis, competition of comprehensive national strengths is competition of personnel and intelligence. Developing S&T, invigorating the economy, and skilled personnel are the foundation. We must give the task of strengthening China's S&T staff construction and improving the quality of laborers a primary status in national construction. We must continue to adopt effective measures to solve the problems of inadequate numbers and irrational distributions of S&T personnel. We should work in a planned manner to organize and absorb S&T workers to take on tasks to attack key S&T problems in major construction of the national economy, participate in enterprise S&T work, and solidly reinforce S&T forces in light industry, textiles, commerce, and tertiary industry. We should implement preferential policies for the planned organization and absorption of S&T personnel into newly emerging fields with insufficient skilled personnel and to go to local areas to establish enterprises and contribute their own skills. We should make major efforts to attract young S&T personnel who have gone to foreign countries for study or additional training to return to China and work and fully foster their roles to gradually form academic backbones and academic leaders. We should give special attention to training young S&T personnel working in China, be bold in utilizing them, enable them to grow and gain skills through practice so that they can grow as quickly as possible. We should truly improve the working conditions and living treatment of S&T personnel and, while gradually reforming the wage system, we should also encourage and support scientific research organs and S&T personnel in using the income from their labor in S&T, economic, and social development to improve their own working conditions and living treatment. S&T personnel who have worked for long periods under difficult conditions should be given special awards to truly resolve their fears of trouble back at home. Substantial awards should be given to S&T personnel who have made prominent contributions. Leading organs at all levels should be good at discovering talented people, training talented people, absorbing talented people, and not stick to one pattern in utilizing skilled people. We must create an excellent environment for superior young S&T personnel to reveal their talents and gradually deal with the problem of allowing everyone to do their best via systems and mechanisms. We should continue to reform the educational system, focus on the state's economic, S&T, and social development goals, and train large numbers of skilled personnel in basic fields, utilize skilled people, and manage people in a planned manner. Training and creating skilled personnel who are loyal to the basic lines and who have received full scientific training and establish mechanisms that conform to the basic lines and which can also encourage people to make continual advances are the key tasks of our S&T and educational work over the next 10 years.

Measures To Promote Industrial Technology Formulated

92FE0282A Beijing GUANGMING RIBAO in Chinese 24 Dec 91 p 1

[Article: "State Formulates 12 Policy Measures for Comprehensive Promotion of Technical Progress in Enterprises to Strengthen the Self-Upgrading and Self-Development Capacity of State-Run Large and Medium-Sized Enterprises"]

[Text] Reporters were told at the National Enterprise Technical Progress Work Conference that the State Council has agreed to China's adoption of 12 policy measures to strengthen the self-upgrading and self-development capacity of state-run large and medium-sized enterprises and to comprehensively promote technical progress work in enterprises.

These 12 policy measures are:

1. Complete elimination within 3 years of the "two funds" (energy resource and communication key construction funds and budget adjustment funds) paid to higher authorities out of state-run large and medium-sized industrial and communication enterprise depreciation funds.

Setting aside the "two funds" from depreciation funds has been implemented for many years and the revenues have been computed in annual budgets. Moreover, state finances are still experiencing considerable difficulties and there will be a positive value of peak debt repayment during 1992 and 1993, so reduction of the "two funds" must be implemented in steps. After research, a decision was made to begin in 1992 to focus on supporting mining enterprises in the energy resource, communication, and raw material industries and to give appropriate consideration to military industry enterprises that face substantial difficulties. First, the "two funds" will be completely eliminated in 1992 in coal, petroleum, communication, railroad, civil aviation, posts and telecommunications, mining, weapons, nuclear industry, ship, space, and aviation enterprises. The electric power industry will first be exempted from the energy resource and communication key construction fund in 1992 and then from the budget adjustment fund in 1993, for total exemption over 2 years. State-run large and medium-sized enterprises that were included in the 1992 State Key Technical Upgrading Plan will also receive exemptions and reductions of the "two funds".

2. The pace of re-estimating the fixed assets of state-run industry and communications enterprises will be accelerated. Depreciation will be calculated according to the re-estimated value after reappraising the stocks and assets of enterprises. On the basis of the deployment of stock and asset reappraisal groups, all provinces, autonomous regions, and municipalities under direct jurisdiction of the central government should actively conduct trials, immediately summarize experiences, and gradually extend them after formulating methods.

3. Reductions in the income tax rate for state-run large and medium-sized industrial enterprises.

To create the conditions for equal competition between large and medium-sized enterprises and other enterprises, starting in 1992 the income tax rate for all state-run large and medium-sized enterprises will be reduced from 55 percent to 33 percent over 3 years. The funds from reduced payments will be focused on enterprises with heavy technical upgrading tasks.

4. Appropriate readjustment of financial credit policies.

Policies for the payment of interest in the form of a deduction when selling a bill of exchange will be implemented for some key state technical upgrading projects.

To reinforce intermediate links in the conversion of S&T achievements into forces of production and the digestion, absorption, and shift to domestic production of imported technology, the new increase portion of S&T loans will be focused on technical development in state-run large and medium-sized enterprises starting in 1992.

5. Increased enterprise new product development funds.

In accordance with comrade Li Peng's instruction to "continue to implement the setting aside of 1 percent from sales to serve as a new product development fund", with a prerequisite of the proportion deducted not exceeding 1 percent in provinces, autonomous regions, municipalities under the direct jurisdiction of the central government, and cities with province-level decision-making authority, determine concrete deduction proportions based on the characteristics of regions and industries and on the bearing capacity and development needs of enterprises.

6. The state is preparing some increases in foreign exchange for importing advanced technology from foreign countries for use in importing for technical upgrading in enterprises.

Prior to the end of 1993, the technology import projects arranged through the increased foreign exchange from the state should be used to import key equipment that cannot be produced inside China temporarily, and areas of the interior should do as coastal areas do in providing complete exemption from tariffs and added value taxes.

7. Implement methods to reduce the linkage of funds tied up in finished goods with increased loans for technical upgrading and circulating capital loans.

From 1991 to 1993, all funds that are freed up as a result of reducing the linkage between funds tied up in finished goods and increased technical upgrading loans should be used for the special purpose of technical upgrading and technical development, and they can be used for carry-over and regulation.

8. Establish special funds for new product development, digesting, and absorption at the state and local levels.

9. Increase the proportion of state key technical upgrading loans, made a corresponding reduction in the proportion of regular loans.

10. Establish technology centers in large enterprises and enterprise groups, provide tax reductions and exemptions for fixed periods for intermediate testing products.

11. Strengthen macro control, prevent redundant construction.

There is considerable redundant construction at the present time, and production capacity far exceeds requirements or is creating large overstocks of finished goods. In addition, although some products may be in short supply, they are popular projects and it is easy for new redundant construction to occur. Administrative departments of the state will formulate concrete control methods and implement them after submitting them to the State Council for approval.

12. Perfect restraint mechanisms, promote the proper use of self-owned capital for technical progress.

Enterprise depreciation funds, major repair funds, new product development funds, increases in retained profits from reductions and exemptions from the "two funds", and reductions in income tax rates must be saved in special accounts, and special funds must be used for special purposes and not diverted. Enterprises experiencing losses are no exception.

For the capital owned by enterprises themselves, the enterprises have the right to allocate and utilize it in accordance with State Council stipulations and no unit can for any reason make uncompensated transfers for equalization.

Provisional Measures for Authorizing, Selecting State Key Basic Research Projects

91FE0835A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 14 Aug 91 p 2

[Article by State Science and Technology Commission: "Provisional Methods for State Major and Key Basic Research Project Plan Compilation and Project Establishment"]

[Text] Editor's note: The State Science and Technology Commission has decided to start now in selecting the second group of state major and key basic research projects. To enable all relevant departments to submit their state major and key basic research project proposals to the State Science and Technology Commission's High Technology Department prior to 30 August 1991 as required by the State Science and Technology Commission, KEJI RIBAO is publishing the entire document "Provisional Methods for State Major and Key Basic Research Project Plan Compilation and Project Establishment".

Section I. General Principles

Article 1. To strengthen state leadership of basic research and applied basic research in the natural sciences (abbreviated hereafter as basic research), and based on China's economic construction requirements and scientific development trends, while the state will use a guidance arrangement to support self-selection of topics by scientists involved in basic research and key topics for disciplinary development, it will also establish state major and key basic research projects.

Article 2. State major and key basic research projects are major projects in basic research that have a comprehensive and promoting role in national development and S&T progress and which require undertaking by the state in an organized and planned manner. The State Major and Key Basic Research Project Plan is an important part of the state's basic research plans. They undergo full debate by scientists and the state uses a guidance arrangement to promote their implementation.

Article 3. Selection of state major and key basic research projects is done jointly with the State Science and Technology Commission providing direction in conjunction with the State Education Commission, Chinese Academy of Sciences, State Natural Science Foundation, and relevant ministries and departments. It adheres to scientific and democratic decision-making, expert evaluation, consultation among many parties, and preferential support.

Section II. Plan Compilation

Article 4. State major and key basic research projects are under the guidance of the State Science and Technology Commission and the state's "Medium and Long-Term Science and Technology Development Program". On the basis of widespread solicitation of expert opinions, a unified planning method that integrates moving from the top down and from the bottom up is adopted.

Article 5. The State Major and Key Basic Research Project Plan should be coordinated and linked with the State Plan to Attack Key S&T Problems, the High Technology Development Plan, and other research and development plans and work in the Natural Science Foundation.

Article 6. State major and key basic research projects must fulfill one of the following four conditions:

1. Basic research projects at the leading edge of a discipline that already have a relatively good foundation and can be expected to make major breakthroughs by the end of this century;

2. Basic research projects that have major applications prospects, that are urgently needed for China's economic construction, that are very active internationally, and that can be expected to make unique achievements during this century;

3. Basic research projects that can foster China's natural geographical and resource advantages and that can be expected to make achievements in research work that have a Chinese character during this century;

4. Basic research projects where China has an international advantage and which occupy a vanguard status, and where continuous major advances can be expected by the end of this century.

Article 7. State major and key basic research projects should be directed by scientists with high academic levels and prominent achievements and who have relatively powerful organizational abilities and a cooperative spirit. In addition, they should have a group of key research personnel with an innovative spirit and a rationally organized scholarly staff that is united in cooperation. They should take fully advantage of the role of superior quality middle-aged and young scientists. Young personnel should account for a substantial proportion of the research collective (at least one-third). The units taking on the projects should have an excellent study style, work environment, and research conditions.

Article 8. The organization of state major and key basic research projects should encourage cooperative research among many disciplines and many units at an appropriate scale. To ensure the required investment strengths, the special topics or topics included in a project should be carefully selected. The scope of special topics cannot be too broad, and there must be interrelationships among topics so that together they form an organic whole.

Article 9. State major and key basic research projects should have an innovative scholarly ideology and an advanced, rational, and feasible research program, and take full advantage of existing work conditions.

Article 10. The main source of funds for state major and key basic research projects should be special state allocations and they should encourage integrated funding from multiple channels. Fund budgets and final accounts will be compiled by the State Science and Technology Commission.

Section III. Project Establishment Procedures

Article 11. The State Science and Technology Commission will issue notices announcing the State Major and Key Basic Research Project Plan compilation and project establishment methods to clarify project selection principles and concrete requirements.

Article 12. Based on the requirements of the State Major and Key Basic Research Project Selection Principles issued by the State Science and Technology Commission, the relevant ministries and departments will organize scientists to suggest opinions concerning state major and key basic research projects. Scientists can also directly submit opinions individually or collectively to the State Science and Technology Commission concerning state major and key basic research projects.

Article 13. The State Science and Technology Commission will meet with the State Education Commission, Chinese Academy of Sciences, State Natural Science Foundation, and the relevant ministries and departments to organize scientists in many academic fields and management experts to establish a high-level "State Major and Key Basic Research Project Establishment Assessment Commission" that will be responsible for work to assess state major and key basic research projects.

Article 14. Work to assess project establishment will be carried out in three steps.

Step 1, the Project Assessment Commission will organize and establish an experts working group. The duties of the experts working group are: based on the state's macro requirements, to use communication, appraisal through discussions, and other arrangements to further solicit the views of experts and relevant departments. They will carry out scientific and fair analysis, selection, integration, and project division based on the state major and key basic research project proposals described above and submit a draft project establishment plan that includes objectives, research contents, matching conditions, and other aspects to the Project Establishment Assessment Commissiôn.

Step 2, the Project Establishment Assessment Commission will organize experts in the same field to make an item-by-item preliminary assessment of the draft project establishment plan.

Step 3, a comprehensive overall assessment will be made.

Article 15. The State Science and Technology Commission will notify the relevant departments of state major and key basic research projects that have been selected through appraisal and solicit a wide range of views. It will also ask all the academic departments of the Chinese Academy of Sciences to organize consulting, and the State Science and Technology Commission will make the final approval.

Section IV. Additional Principles

Article 16. For administrative questions concerning state major and key basic research projects, the State Science and Technology Commission has already formulated the "Provisional Methods for Management of State Major and Key Basic Research Projects".

Article 17. The State Science and Technology Commission is responsible for interpreting these methods.

Article 18. These methods become effective on the date they are announced.

Appendices:

1. Proposals should include the following contents:

Project name

Name of the person submitting the proposal and brief background (job title, age, unit, address, postal code, telephone number, etc.)

The reason that the proposal is a major and key project (views, current situation)

The content and objectives of the proposed research

The research program adopted in the proposal and division into sub-topics

The organizational arrangement, research personnel, and responsible unit for the proposed project

The director and directing unit of the proposed project, with brief background Including: professional history of the project director Existing work foundation in the unit directing the project Proposed expenditure (estimated)

2. To facilitate assessment by the relevant leadership departments and experts, please submit 10 copies of the proposal. When the communication and assessment have entered the assessment meeting stage, an additional notice will be issued concerning the number of copies required.

3. Send to address: State Science and Technology Commission; Basic Research and High Technology Department; 54 Sanlihe Lu, Beijing, postal code 100862

The envelope should have the words: "State Major and Key Basic Research Project Proposal" written on it.

State Science and Technology Commission Appoints Chief Scientists for Key Projects

92FE0031D Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 2 Sep 91 p 1

[Article by reporters Han Yuqi [7281 3768 3825] and Huang Yong [7806 0516]: "Chief Scientists Appointed for Key Basic Research Projects, Song Jiang Stresses That Basic Research is the Foundation of High Science and Technology"]

[Text] The State Science and Technology Commission has appointed a group of chief scientists for state major and key basic research projects. On the morning of 31 August 1991, State Council member and State Science and Technology Commission chairman Song Jian [1345 0256] issued the certificates and spoke to the chief scientists.

Song Jian said that the three-level configuration of our S&T work has been approved by the CPC Central Committee and State Council. As part of this configuration, basic research is an important level for us. Basic research is the base area that supports high S&T and we must strengthen investments and personnel training for basic sciences. This is the basis for developing high technology in China and raising overall S&T levels. We must try in every possible way to work on several important vanguard topics within the scope of our limited capital. In areas like topic selection, determination of the directions of primary attacks, organizing and selecting forces, and so on, a group of famous scientists must serve as commanders. All of the chief scientists must lead the way in devising strategies and organizing for all primary projects, form a new force, and train and create a generation of skilled personnel for their fields.

Song Jian stressed that we must try to make correct choices of the primary directions of attack. Correct topic selection is the key to success. We must broadly attract and discover talented people and give them important duties. This is especially true for discovering and training talented middle-aged and young people, attracting talented people from among those studying in foreign countries, absorbing talented people from all areas of China and breaking down departmental boundaries, pushing young people onto the world stage and making horizontal comparisons with world levels, standing at the vanguard of S&T and trying not to repeat things that have already been confirmed by others, and focusing on opening up. Song Jian called on all of the chief scientists to be bold leaders and contribute to the training and creation of a young generation of superior quality scientists.

Selection of state major and key basic research projects began in 1988. The State Science and Technology Commission assigned famous scientist Tang Aoqing [0781 2407 1987] and others to organize a Committee of Specialists. After a two-stage assessment, they established "Basic Research on High Critical Temperature Superconductivity" and several other state major and key basic projects. These projects have already been considered by a conference of all Academic Committees in the Chinese Academy of Sciences [CAS].

The State Science and Technology Commission appointed professor Min Naiben [7036 0035 2609] as the chief scientist for the project "Research on the Structure, Properties, Molecular Design, and Preparation Process for Photoelectric Functional Materials" and researcher and Academic Department member Zeng Qingcun [2582 1987 1317] as chief scientist for the project "Research on Climatic Dynamics and Climatic Forecasting Principles". Xie Yibing [6200 5030 3521], Ye Duzheng [0673 4648 2973], and Tao Shiyan [7118 6108 6056] will serve as project advisors. Researcher and Academic Department member Feng Kang [7458 1660] is the chief scientist for the project "Large- Scale Scientific and Engineering Computing Theory and Methods". Researcher and Academic Department member Huang Kun [7806 2492] is the chief scientist for the project "Explorations of Semiconductor Super Lattice Physics and Materials and New Component Structures". Researcher and Academic Department member Ye Duzheng is the chief scientist for the project "Research on Forecasting Trends in Environmental Changes for China's Future Existence (20 to 50 Years) and Countermeasures". Researcher Hong Guofan [3163 0948 5672] is the chief scientist for the project "Research on Optimum Nodular Nitrogen Fixation Control Models in Symbiotic Nitrogen Fixing Systems". Researcher and Academic Department member Ye Shuhua [0673 3219 5478] is the chief scientist for the project "Research on Modern Crustal Movement and Geodynamics and Applications". Professor and Academic Department member Tang Youqi [0781 2589 4388] is the chief scientist for the project "Research on Important Chemical Questions in Life Processes". Professor Gan Zizhao [3927 1311 6856] and researchers Yang Guozhen [2799 0948 2823] and Zhou Lian [0719 1670] are the chief scientists for the project "Basic Research on High Critical Temperature Superconductivity". Hong Chaosheng [3163 2600 3932], Cheng Kaijia [4453 7030 3946], and Hu Zhaosen [5170 0340 2773] are project advisors. Professor and Academic Department member Gu Chaohao [6253 6389 6275] is chief scientist for the project "Non-Linear Science".

State Science and Technology Commission vice chairman Zhu Lilan [2612 7787 5695] chaired the meeting on 31 August 1991. CAS director Zhou Guangzhao [0719 0342 0664], China Science and Technology Association chairman Zhu Guangya [2612 0342 0068], CAS deputy director Wang Fosong [3769 0154 2646], and others attended the meeting. The chief scientists gave speeches at the meeting.

Putting Science in Perspective

40101005F Beijing CHINA DAILY (Opinion) in English 15 Aug 91 p 4

[Article by Cai Yan]

[Text] In the past 40 years, China has made unprecedented improvements in the fields of science and technology. Hybrid rice, the discovery of a new high-temperature super-conductor and rocket technology are just some of the breakthroughs that have set China on the road to becoming a scientifically strong nation.

But scientists are not overwhelmed with optimism. "It's hard to tell exactly where China stands in the international science arena, but we're obviously not in an ideal position," said Guan Jialin, vice-president at the Institute of Scientific and Technical Information of China (ISTIC).

Ma Hong, director of the Research Centre of the State Council claimed that the contribution rate of science and technology to the State economy indicated that China was weak in this field, both internationally and historically.

According to Ma, between 1952 and 1957, science and technology contributed to 47 percent of the State economy. In the past decade, however, it has been hovering around 30 percent. In contrast, the rate for developed and developing countries averaged 49 and 35 percent respectively between 1950 and 1970.

Further details must be considered to assess the nation's technological power.

With 5,760 research institutes and 10.35 million technological personnel in 1989, China was only behind the USSR, Japan and the United States in numerical terms.

Yet only 89 out of every 10,000 Chinese citizens fall into the technological staff category. The figure even lags behind many developing countries, and there is little sign of a quick increase in the near future.

According to Jia Qian, professor in ISTIC's research department, the low percentage of undergraduates in China can hardly compare with figures in developed countries and developing countries such as Thailand and Brazil. The meagre talent resources hinder a soar in the percentage of researchers.

The turbulent "cultural revolution" (1966-1976), when no university students were systematically enrolled, is also held widely responsible for the lack of talented scientists aged between 35 and 45. This phenomenon, termed with geological origins as the "talent fault," is also undermining the country's technological take-off.

Another weak link lies in the government's low allocation in scientific research.

In 1990, the State earmarked 13.7 billion yuan ($2.6 billion) for scientific research. This stands as a mere 0.8 percent of the gross national product (GNP) of 1,740 billion yuan ($328 billion). In developed countries, scientific investment has hit 3 percent of GNP.

According to Jia, who participated in research to assess China's scientific status, most research institutes are not well informed of the latest world developments.

Each year, upward of 40,000 researchers go abroad to conduct co-operative research or attend training courses. These are the people who learn about the most up-to-date scientific achievements, but there are too few such researchers and a considerable number of them fail to return.

"We get most information from international publications," said Jia. "But when these publications come into circulation, they are often a year out of date."

Even this information is not accumulated comprehensively. Statistics from China National Publications Import and Export Corporation, the country's biggest science publications inlet, show that the corporation imports over 100,000 kinds of books and periodicals each year, of which some 80 per cent are science related. In comparison, more than 751,600 science publications rolled off the print in the United States alone between 1981 and 1985.

Furthermore, orders on the mainland have been cut by 10 percent annually since the mid-1980s due to a fall in cultural funds and a rise in publication costs.

Consequently, a considerable proportion of the original science publications are not found at home, though scientists can pick up 80 percent of the indexes through computerized world reference networks.

According to CHINA CULTURAL GAZETTE (Jan. 3, 1990), scientists can only get access to 40-50 percent of the original versions. This was confirmed by Ye Jianzhong, a research fellow at Chengdu Information Research Center under Academia Sinica.

The centre, located in Southeast China's Sichuan Province, now obtains foreign data through the Dialog reference system based in the United States and reference networks in European countries.

Prospects seem brighter in Beijing, the hub of most ministries, key universities and Academia Sinica. The capital assembles 60 percent of the country's scientific data.

China's 413 major science information and documentation centres are vital sources, but far from satisfactory.

ISTIC, a major scientific intelligence source under the State Science and Technology Commission, "will hardly be able to cater for the ever growing demand for information, if the operation mechanism remains as it is," said Guan Jialin, who is trying to improve the system.

Despite this imbalance, the country's science output is increasing every year. In 1989, 12,232 science theses were picked up by four of the world's most famous index almanacs, a 3.2 percent increase over the previous year. The figure presents China as the 15th highest theses producer in the world.

The 1990 Science Bulletin released by the Science and Technology Commission also revealed a rise in the nation's technological export.

The hi-tech related export volume alone was reportedly $2.69 billion in 1990, a 45.3 percent leap over the previous year. This has brought down the nation's technological trade deficit by a big margin.

With appeals growing louder for more incentives to be injected into science and technology, China can hope to take a more powerful stand in the international science arena.

Patent Applications Show 'Dramatic Increase'

40101012A Beijing CHINA DAILY in English 25 Feb 92 p 1

[Article by staff reporter Yuan Zhou: "More Apply for Hi-Tech Patents"]

[Text] Rapid progress in the protection of high-technology electronic products was reported by a senior Chinese patent officer yesterday.

Gao Lulin, director of the Patent Office of China, told an international forum in Beijing that there had been a dramatic increase in Chinese applications for patents on superconductor materials, high-definition television, super-integrated circuits, computers and Chinese character coding technologies.

China has handled 18,810 patent applications for electronic products and granted 8,217 patent rights for them, Gao said.

He was speaking at a 5-day Asian regional training workshop on the use of industrial property and technology transfer arrangements in the electronics industry. It was organized by the World Intellectual Property Organization (WIPO) in co-operation with the Patent Office of China and the Japanese Patent Office.

N. K. Sabharwal, director of WIPO Development Cooperation and External Relations Bureau for Asia and the Pacific, said that the objectives of the workshop were to promote the use of industrial property in the developing countries in the region, and to facilitate the transfer of technologies.

During the five-day forum, which started yesterday, he said the participants "will survey the state of the art in the electronics industry and examine intellectual property aspects as well as legal and commercial arrangements for the transfer of technology in that industry."

Attending the meeting are about 100 officials and specialists from 13 Asian and Pacific countries including China, Bangladesh, India, Indonesia, Malaysia, Pakistan, the Philippines, Singapore, and Sri Lanka.

According to Lu Guoquan, a senior engineer with the Ministry of Machine-building and Electronics Industry, many new models, such as chip components, multi-layer printed circuit boards (PCBs), head drums, loading motors and photoswitches, have been developed and produced in China. He said dozens of component models had been incorporated in the listing of qualified products of the International Electrotechnical Commission (IEC).

Another 10 models in six categories of power switch, colour picture tube holder, general purpose relay, remote control relay, power wire, and PCB have passed U.S. UL [expansion unknown] inspection.

Electronic product worth $638 million were exported in 1990, he said.

China has more than 1,300 electronic component manufacturers employing 520,000 people.

First Information Industry Base Built in Beijing

92FE0115E GUANGMING RIBAO in Chinese 13 Oct 91 p 1

[Article by reporter Zhuang Jian [1641 1696]]

Construction of China's first information industry base began today just north of the ruins of Yuanming Park in Beijing. This project was the strategy decision adopted by Beijing Municipality to speed the construction of the Beijing New Technology Industries Development Experimental Zone. State Council member and Minister-in-Charge of the State S&T Commission, Song Jian, and State Council member and Mayor of Beijing Municipality, Chen Xitong, attended and addressed the work start-up ceremony.

The construction of the information industry base will give existing high-tech enterprises of the Beijing New Technology Industries Development Experimental Zone development space with advantageous conditions.

The site chosen for the base is at Wangxiangshangdicun in northeast Haidian District, an area of 1.7 square kilometers, for which investments totalling over 700 million yuan will be made. The base will primarily be for development of computer application software, digital and fiber-optics communications, satellite communications, remote sensing communications, precision electronics instruments and meters, and peripheral industries. After 3 or 4 years of construction, this area will become a burgeoning S&T industrial park with a concentration of development, production, management, livelihood, and services, and will be composed of nearly 200 high-tech enterprises.

Neuro-Network Commission Established in Nanjing

92FE0282C Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 15 Dec 91 p 3

[Article by reporter Li Xianzhong [2621 3759 1813]: "China Neuro-Network Commission Established, China's Neuro-Network Research Staff Develops and Grows"]

[Text] A formal announcement was made recently in Nanjing concerning the founding of the China Neuro-Network Commission, jointly established by 13 associations including the China Artificial Intelligence Society, China Psychological Association, China Computer Society, China Electronics Society, and others. Qinghua University professor Wu Youshou [0702 0147 1108] is chairman of the commission.

Neuro-networks are a comprehensive discipline that touches upon fields including information science, neural biology, knowledge science, mathematics, physics, and others and it has developed for nearly 50 years to date. The rapid development of digital computers and the significant achievements in artificial intelligence during the 1960's concealed the necessity and urgency of develop neuro-networks. However, due to the model and structural limitations of computers, it is very difficult for them to deal with large numbers of visual and audio differentiation problems that the human brain can easily handle. Moreover, through mankind's own study, understanding, and grasp of the structure and working principles of the brain, it is very possible that new methods may be found to make breakthroughs in traditional computing models. Thus, there has been a resurgence of interest in research on neuro-networks since the 1980's.

Although China's research on neuro-networks got started rather late, it has developed very quickly. In 1990, nine associations including the China Artificial Intelligence Society, China Electronics Society, and others jointly convened the First China Neuro-Network Symposium, which can be called a "portable exploration of intelligence and united attack on major questions". Now, 13 top-rate associations have participated in the formal establishment of the China Neuro-Network Commission. More than 1,500 workers are involved in neuro-network research, and scholars at Qinghua University account for a large portion of them. Major advances have been made in neuro-network implementation technology, neuro-network applications in model differentiation and signal processing, and other areas, and they have gained the approval and respect of international colleagues. The conference also announced that the International Neuro-Network Symposium will have held in Beijing in November 1992.

XINHUA Reviews Achievements in Nuclear Industry

OW2802142692 Beijing XINHUA Domestic Service in Chinese 0801 GMT 27 Feb 91

[Report by reporter Zhuo Peirong [0587 1014 2837]: "A New Nuclear Industrial System Catering To Both Military and Civilian Sectors Has Taken Shape in China"]

[Text] Beijing, 27 February (XINHUA)—Thanks to 10 years of hard work, the project to readjust the development of the nuclear industry—approved in 1981 by the central authorities—has on the whole been completed. Last year, the readjustment of the nuclear military industry was basically achieved, and the output value of civilian products churned out by the nuclear industry surpassed that of military products for the first time. The line, policies, and guiding principles for nuclear science, technology, and industry are well defined in terms of technology, equipment, and development. A new nuclear industrial system that caters to both military and civilian sectors has taken shape in China.

The major sign indicating the formation of this new system is the smooth takeoff of the nuclear power industry. The Qinshan nuclear power station has been successfully connected onto the power network and has begun to generate electricity on a trial basis. Construction of the Dayawan [Daya Bay] nuclear power station has entered into a crucial phase. Work on the second phase project of the Qinshan nuclear power station and the preliminary work for other nuclear power stations are actively under way.

Meanwhile, diversification of the nuclear industry by applying advanced nuclear technologies to other fields of economic construction has borne very good results. Last year, the Xinning sugar mill under the Xinjiang Ore Smelting Bureau and the production line for titanium dioxide at the No. 272 plant began to produce qualified products. The titanium dioxide project at the No. 404 plant, the large chemical fertilizer factory at the No. 816 plant, as well as the production lines for magnesium at the No. 202 plant and the No. 712 mine are at the peak of installation. Progress has been made in gold mining—ranging from prospecting techniques to the refining process—as well as in the rare earth industry—ranging from the production of raw materials to the development of new products; and a number of deposits have been verified. Good results have been achieved in a host of technological development projects, including fire alarm systems, high-efficiency filters, and plasma cutters.

Along with the formation of the new industrial system, China's nuclear industry has in recent years also made progress in scientific and technological cooperation with foreign countries, as well as in foreign trade. The industry's exports have expanded from nuclear to non-nuclear products. In 1991, the export volume of machinery and electrical appliances upped by 150 percent from a year earlier. Not long ago a contract was signed for China to export a nuclear power station to Pakistan, signaling China's nuclear power technology is going international. China has signed memorandums of understanding with Australia and Indonesia for cooperation in the peaceful utilization of nuclear energy, and has expanded exchanges in nuclear science and technology with France, Japan, the former Soviet Union, and a number of Third World countries. Moreover, the Standing Committee of the National People's Congress has passed a decision allowing China to join the "Nuclear Nonproliferation Treaty."

Nuclear Industry Production Becomes More Civilian

40101012B Beijing CHINA DAILY in English 25 Feb 92 p 1

[Article by staff reporter Li Hong: "Nuclear Industry Shifting to Civilian"]

[Text] The balance of China's nuclear industry production has shifted and is now more civilian—and profitable—than it is military.

The changeover has primarily come through building nuclear power plants and exploring new products such as isotopes, radiation therapy and other medical technology.

The solely State-owned industry used to exist only to fulfill government military contracts. But last year, the industry saw a 14 percent increase over 1990 in its civilian sales, which accounted for 54 percent of its annual total.

Following the successful commissioning last December 15 of the country's first Chinese-built nuclear power station—the Qinshan station in Zhejiang Province—the industry is now on course in its 10-year technology development programme.

It aims to achieve the following goals before the year 2000:

—Research, production and marketing of 600,000-kilowatt water-pressurized power reactor.

—Improvement and commercialization of the Qinshan 300,000-kilowatt water reactor, and development of three other advanced-technology reactors.

—Boosting research and production of new civilian products such as isotopes, radiation therapy and other medical technology.

The industry expanded its exports by 15 percent last year, with more varieties of civilian and non-nuclear products, according to officials of the China National Nuclear Corporation (CNNC).

The industry's shift from military hardware [passage illegible] several years ago, is part of the country's general emphasis on economic development, CNNC officials said.

Now, officials said, the industry has decided to "rely on itself in addition to absorbing foreign technologies" in order to generate more nuclear electricity, which is much needed in China's fast-developing southeast provinces.

This year, CNNC will try to make the Qinshan station generate electricity at full capacity by June, and the National Nuclear Safety Administration will carry out two inspections prior to issuance of operation certificate to the station.

Production of the Daya Bay Power Station in Guangdong Province will enter its final experimental stage this year. The first 900,000-kilowatt generator is expected to begin operating next summer, CNNC officials said.

Due to increasing installation work and delay in some supply of materials, the station's operation has been postponed by a year.

Also in 1992, CNNC will have to complete preparatory work for the scheduled two 600,000-kilowatt water-pressurized generators in Qinshan.

And, it will be busy helping Pakistan to build a 300,000-kilowatt power station, according to a contract signed late last year between CNNC and Pakistan Atomic Energy Committee.

China joined the Nuclear Non-Proliferation Treaty late last year, which CNNC said would promote scientific and technological co-operation on nuclear energy between China and other countries.

"It makes the importers understand their imported nuclear technology and products from China are solely for peaceful use," said an official.

Satellite Industry Seeks New Frontiers

40101005A Beijing CHINA DAILY in English 7 Oct 91 p 1

[Article by staff reporter Li Hong]

[Text] China's space industry, which is celebrating the 35th anniversary of its launch, aims to spearhead the country's technological breakthroughs and become more internationally competitive.

The Ministry of Aerospace has been promised increased State investment in the next five years to speed its development, said a senior ministry official.

In 1990, the industry accomplished five space ventures, including the launch of AsiaSat 1 in April and the rehearsal blast-off of the powerful Long March 2-E launch vehicle in July.

Deputy Aerospace Minister Wang Liheng told a press conference that the central government was banking on space technology to lead and help other sectors of the national economy.

Three space-related high-tech organizations were launched on Saturday: the China Resource Satellite Application Centre; the Space System Engineering Development Centre; and the China Association of Computer Automatic Measurement and Control Technology.

The ministry is responsible for the research, design and production of aircraft, spacecraft, rockets and missiles. It is developing a 24-transponder "Dongfanghong 3" telecommunications satellite to cover all of China's land area.

Chinese space scientists, in collaboration with Brazil, are manufacturing a multi-functional resource-exploratory satellite.

According to a reliable source, another telecommunications satellite is expected to be launched before the end of this year.

Earlier this year, the country launched its first 120-kilometre-high, low-latitude sounding rocket, named "Weaver Girl 3" to conduct scientific probes. Data obtained from the rocket will be used as altitude environmental parameters for the development of carrier rockets, ballistic missiles, satellites and manned spacecraft.

Since October 1956, when China set up its first missile research institute, the country has successfully launched 31 self-made satellites, which scientists said had brought enormous benefits to the economy.

The four telecommunications satellites sent into space since 1986 are now capable of transmitting television and radio programmes from Beijing throughout the country. Transmission of TV training courses, made possible by the satellites, has saved 5 billion yuan ($960 million) a year in conventional microwave relay facilities.

However, China faces a strong challenge from international competition, according to a high-ranking official with the China Great Wall Industry Corporation.

He said the United States, France, Germany and Japan had expressed the desire to join hands to co-manipulate the world launch market.

Ministry officials said the scheduled launch this year of two Australian telecommunications satellites atop the Chinese Long March 2-E booster-rocket will be postponed for a year, at the request of the satellite manufacturer, Hughes Aircraft of the United States.

However, China may launch a solar synchronous post and telecommunications satellite for Sweden next year or in 1993.

Wang also denied the allegation that China's launch price was government subsidized. He attributed the low launch price to such factors as low labour costs in basic research, development and production, a high success rate, and the principle of not seeking large profits.

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Aerospace Agency Has High-Tech Itinerary

40100017 Beijing CHINA DAILY in English 9 Jan 92 p 1

[Article by Xie Liangjun]

[Text] The Ministry of Aerospace Industry has outlined its 1992 development targets, which focus on further expanding its international market and increasing research in aerospace technology.

This year will be a busiest in the industry's 40-year history, with more aircraft models researched and more satellites launched, Minister Lin Zongtang told an ongoing national conference yesterday in Beijing.

China will use Long March 2 carrier rockets to launch two Australian telecommunications satellites in March and autumn respectively, and launch a Swedish research satellite in October.

Lin said at the conference his ministry would continue to adjust its export product base and manufacture more high-tech products to expand China's role in the world market.

Lin also set $500 million in foreign currency as the ministry's export target for machinery and electronics made by its factories, $100 million more than last year's target.

He urged the use of aerospace technology to develop more civilian products and encouraged research centres, institutions of higher learning and enterprises to join to form high-tech development groups.

Lin's remarks were echoed by State Councillor Song Jian, also the minister in charge of the State Science and Technology Commission. Song said at the conference that putting aerospace products into the world market should be considered a long-term policy.

"It is the way for the development of China's aerospace technology," he said.

The State Council has decided that every enterprise should channel 1 per cent of its total sales volume into technological development, with higher percentages for high-tech firms.

Also at yesterday's press conference, ministry officials said that since China started reforms and open policies in 1979, the country has established co-operative ties in aerospace science and technology with many countries, including the United States, Germany, France and Sweden. Last year China signed cooperation agreements on aerospace technology with India, Pakistan and Italy.

Officials also said that since 1990, China has signed agreements with the former Soviet Union, and concerned departments in the republics of the new commonwealth have said that the recent developments will not affect these agreements.

Commenting on China's recent telecommunications satellite launch mishap, Minister Lin said, "We have already found out the cause of the malfunction and are confident that it will not occur in the future."

Laser Research Shifts to Creating Products

40101005E Beijing CHINA DAILY (Shanghai Focus) in English 26 Aug 91 p 1

[Article by Chen Qide, CD staff reporter]

[Text] Shanghai will strive to develop its laser industry within the next five years by turning laser research into products.

Recently the city has made progress in the field of laser research, but has been unable to put the results into immediate use in industrial production, said Hu Xiaobao, deputy director of the Shanghai Institute of Laser Technology.

With backward equipment and a lack of capital, Shanghai's main laser institute has had no choice but to develop laser products with backward production means, Hu said. As a result, it cannot carry out the large-scale production which would allow its laser technology to contribute to local industries, he said.

For example, the versatile and portable laser therapeutic system is a new product developed for clinical treatment. Only four technicians at the institute are involved in the work despite the instrument being favoured by hospitals and patients.

In two 15-square-metre work rooms, technicians manufacture the laser therapeutic system with simple basic tools. To date 100 machines have been sold to domestic hospitals and 10 exported to Southeast Asia and Japan.

Yu Yaomin, engineer with the institute, said that with more than 60,000 hospitals at the county level, China had a large market for laser machines. In Shanghai only 3 percent of 7,400 medical organizations have adopted this type of machine. The situation is similar for other laser research results such as the optical disk document filling system, holography technique and laser thermal manufacture.

"The only solution is to co-operate with foreign investors," said Hu, adding that by using foreign capital and equipment the institute would boost the laser industry.

The deputy director said the institute's first joint venture with the American Ion Laser Technology Company would be put into trial production this October.

With an investment of $2.35 million, the venture will use American technology and equipment worth $500,000 to turn out laser devices.

Located in the city's Minhang Economic and Technological Development Zone, the Shanghai Ion Laser Technology Company is designed to produce 180 laser machines a year, 70 percent of which will be exported to markets in the United States, Europe and Japan. Five years' efforts will increase output to 1,250 machines a year with an output value of about $5 million, said Wang Chunrao, deputy general manager of the venture.

The institute is also seeking foreign investors to develop other laser products so as to speed up its application of high technology to industrial production and civilian use, said Hu.

Syndicate Targets Civil Electronics for Its Development

40101005D Beijing CHINA DAILY (Business Weekly) in English 2 Sep 91 pp 1, 4

[Article by staff reporter Lao Huang]

[Text] China's largest electronics syndicate is targeting the civilian market for the bulk of its growth in the 1990s.

China Electronics Industry Corporation (Chinatron) will derive more than 90 percent of its output value from civil electronics development, with the military providing the balance, according to its president Zhang Xuedong.

The syndicate was launched to ensure a high-technology-oriented development of electronics products by forming an elite force, said Zhang, in an interview with BUSINESS WEEKLY.

The formation of the umbrella company was approved by central government in July 1990 and announced in June. It controls more than 200 of the industry's major manufacturers, trade firms and research institutions.

Commenting on the military-based operations of Chinatron, Zhang said: "There is no such thing nowadays in China as a pure military electronics industry, though it undertakes a small portion of military orders."

Zhang said at the top of Chinatron's agenda is the supply of electronics components for large integrated circuits.

Large-scale technological updating work will be soon launched in several research institutes and factories to ensure mass production of the products.

Also on the priority list is the development of a variety of computers and telecommunications products, said Zhang.

Targets have been set on research and production of traffic control systems, monitoring equipment for use in energy and materials industries, and information transmission and processing systems for the post and telecommunications departments, radio and television stations, newspapers, financial institutions, and meteorological observatories.

Operation will also focus on production of colour picture tubes, colour television sets, electronic switching equipment, and satellite ground stations.

Zhang said the launching of Chinatron was a concrete response to the government's 10-year Economic Programme which put the electronics industry high on the development list.

The government has promised to throw its weight behind a sustained growth of the high-technology electronics industry, which it hopes will serve to enhance the overall economic performance.

The birth of Chinatron also marks a strategic shake-up in boosting the technological levels and competitive strength of the industry, which has so far kept a low profile on the world market.

Last year the industry turned out 63.42 billion yuan ($11.82 billion) worth of goods while exports totalled only $3.7 billion.

Government statistics show that China now has a mere 2 percent share in the international electronics trade.

As a veteran trader put it, Chinatron is not a simple-minded grouping of firms, it is born to be the flagship of the whole sector, both domestic and overseas.

BUSINESS WEEKLY learned China National Electronics Import and Export Corp., Chinatron's foreign trade arm, had been set up, along with China International Co-operation Corp., which provides consultation services for the entire conglomerate.

Previously the foreign trade subsidiary has announced its intention to introduce the latest technology from abroad to accelerate the industry in the 10 years.

As a first step, the company unveiled a package of electronic technology items that are expected to be purchased during the 1991-95 period. It is also considering contacts with foreign partners in setting up joint ventures in high-tech production.

Progress in Chinese Biomedical Electronics

91FE0835B Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 21 Jun 91 p 3

[Article by Qinghua University professor Zhou Ligao [0719 4409 2640]]

[Text] Biomedical electronics is a new field in electronics that emerged gradually during the 1960's. It mainly involves using modern electronics technology and computer technology to solve medical problems and provide modernized measures for disease prevention and treatment. The invention of the X-CT (X-ray computer tomography device) in the early 1970's is a prominent example of the application of electronic and computer technology to solve clinical medical problems. It greatly spurred the formation and development of biomedical engineering and the field of biomedical electronics. It has been called a revolution in modern medical instruments, and the inventor of the X-CT received a Nobel Prize in medicine in 1979. Moving into the 1980's, the continual perfection and updating of B-type [Bray] ultrasonic scanning devices, the invention and extension of nuclear magnetic resonance CT, the appearance of the third and fourth generations of X-CT, and the birth of color ultrasonic Doppler hemadromometers, nephrolith external pulverizers, single photon emission-type CT, and so on led to the continual appearance and flourishing development of new and unusual modern medical instruments. Today, one would not think of calling a hospital that lacks these modern medical instruments a modernized hospital or a hospital capable of high-level diagnosis and treatment.

The field of biomedical electronics did not begin developing in China until the 1980's. The China Electronics Society Biomedical Electronics Society was established in 1980 to unite scientific and educational workers in this area and actively develop scholarly exchanges. China has developed quickly in this area over the past 10 years and made many very good achievements, especially in the following areas:

1. Biomedical signal measurement and processing

Medical diagnosis cannot be detached from physiological signal measurement and processing. Many biosensors have been studied for this purpose. However, biomedical signals often have powerful unstable randomness and strong noise, and we lack knowledge from previous experiments, so processing is rather difficult. China has already done considerable research and adopted modern signal processing technology like Wiener filters, parameter modelling, modern spectral estimation, self-adaptive processing, and so on. Examples include electroencephalogram EEG self-daptive quasi-stationary segmentation and focused classification analysis, fetal electrocardial real-time adaptive noise cancellation, brain stem-auditory induced-potential frequency divider segment optimized weighting extraction, application of AR models for frequency domain characteristic analysis, electroencephalographic state mapping technology, and so on. Because physiological signals at the body surface assume a distributed state, developments have also been made in using multi-dimensional spatial filtering-wave technology for signal extraction, such as the extraction of Xi Shi [1585 3044] beam potential, electrocardial late potential, and abdominal fetal electrocardial signals. In the past few years, the singular value division (SVD) method has been used for multi-dimensional fetal electrocardial spatial filtering. Other examples include applied research on the Prony method, wavelet analysis method, and so on.

2. Medical imaging and image processing

Medical imaging is now a primary direction in the development of medical diagnostic instruments. China has successfully developed a nuclear magnetic resonance CT imaging device. It employs dual-energy X-ray projection that can use computer processing to distinguish between bone and soft tissue. This enables observation of pathological changes in some soft tissue that is obstructed by bone and the method has already been used successfully in the laboratory. Three-dimensional stereoscopic imaging has been carried out for CT images to help physicians determine the location of pathological changes from tumors, as has been reported. Moreover, new types of roentgenoscopes that use medium-frequency power source power supplies have been successfully studied.

It deserves special mention that China has made quite a few achievements in the area of ultrasonic imaging technology. We have successfully developed color ultrasonic Doppler blood flow imaging devices and they have passed state inspection. We have also made several research achievements in continuous-wave and pulsed-wave ultrasonic Doppler blood flow signal analysis and processing. There have been reports recently concerning research achievements with pseudo-random code color Doppler blood flow imaging. Even more achievements have been made in research on B-type ultrasonic real-time imaging technology. Examples include acoustic field analysis and computation with a new type of ultrasonic energy converter, a fan-shaped scanner's digital scanning converter, and so on. State research to attack key problems with fan-shaped B ultrasound during the Seventh 5-Year Plan may enable China to achieve partial self-sufficiency in the area of B-type ultrasound. We are also involved in research on high-frequency, high-resolution B-type ultrasonic imaging that may raise resolution by one numerical grade to 0.1 mm.

3. Modern biomedical electronic instruments

China has done a great deal of research on computer analysis of electrocardiogram from electrocardiograph. A critical patient monitoring system has passed examination. This system is capable of simultaneously monitoring eight critical patients. In electrocardial signal analysis and processing, rather good achievements have been made in baseline drift correction, computer discrimination of arrhythmia, and communications management between central consoles and bedside monitors. Body surface distribution computation and analysis using multi-conductor linking to study electroencephalograms (16 conductors) and electrocardiograms (102 conductors) has been used to make electroencephalographic mapping instruments and electrocardial mapping instruments and both have been developed.

4. Digital modelling and computer simulation of physiological systems

Generally speaking, it is extremely difficult and sometimes impossible to do non-traumatic experiments in the body for human physiological systems. As a result, digital modelling and computer simulation have attracted attention. China has done quite a bit of research in this area. For example, we have used analysis of the operational state of physiological membrane passages under external control to establish a new cell membrane passage model that can be used to analyze the mechanisms of controlled static passage activation and excitation passage inhibition. We have established a complete cardiovascular system model that has consistently attracted attention in China and foreign countries. On the basis of existing multi-element arterial system models, we have added a multi-element vein system model that has been combined with an existing cardiopulmonary model to form a complete cardiovascular system computer model. It has been used for research on acceleration resistance in pilots with very good results. In the area of brain computer simulation, we have established a computer model of the cerebellum that can be used for study of the brain, and it has all adaptive capabilities and can analyze the coordination and control mechanisms of the cerebellum.

5. Molecular electronics and the nervous networks

This high-tech field can apply modern electronics technology to solve biomedical problems, and it can use biomedical technology to solve engineering technology problems. China has now begun research on the formation of Langmuir-Blodgett (LB) membranes and on the materials and characteristics of LB membranes. We have developed biosensors and established a molecular electronics research laboratory.

In summary, China has made excellent progress in the area of biomedical electronics. Compared with overall levels in foreign countries, however, we still lag substantially behind. For example, the United States and other advanced countries have already gradually developed PACS systems (picture archiving and communications systems). After digitizing the radiation image, it is stored in a computer and can then be archived, called up, processed, transmitted, displayed, and so on. In the radiation department of a hospital associated with Washington University in the United States, I saw physicians outfitted with workstations in their offices. They have high-resolution displays (such as 1024 X 1026, 2048 X 2560) that make it extremely convenient to call up any X-ray image and display it with great clarity. They can also transmit them over long distances to other cities and request consultation by several famous medical experts.

Foreign countries have suggested that the next 10 years will be the golden age of medical imaging and they are now studying several encouraging new imaging devices. Examples include low-magnetic-field nuclear magnetic resonance CT, three-dimensional single-photon real-time emission-type CT, digital pathology imaging, biomagnetic imaging, and so on. Another example is the nighttime electrocardial recording device provided to ambulatory patients (called the Holter system). If instead of using magnetic tape for recording it were converted to low-power consumption solid-state RAM, the problem of the Holter system requiring 22 megabytes could be completely resolved and it could develop quickly.

Measures To Revitalize Shanghai Microelectronics Industry

92FE0031F Shanghai JIEFANG RIBAO in Chinese 26 Jul 91 p 6

[Article by Liu Jingxiang [0491 4842 4382] and Bi Xianshao [5643 7359 4801]: "Ways To Invigorate Shanghai's Microelectronics Industry"]

[Text] Shanghai is one of China's main scientific research and production base areas in the microelectronics industry. During the Sixth 5-Year Plan and Seventh 5-Year Plan, several key enterprises received support from the state to import technology and equipment and expand their development and production capacity, and this played a positive role in the development of the microelectronics industry. For the past several years, because of insufficient investments, a lack of intermediate testing base areas, a neglect of market development, and other reasons, our lag behind international levels has grown, while fraternal provinces and municipalities have caught up quickly. Facing a serious situation, Shanghai's microelectronics industry requires careful thought and summarization of experiences and lessons. We offer the following views on invigoration of Shanghai's microelectronics industry for reference by the relevant departments.

I. Make Full Use of Shanghai's Existing Foundation and Comprehensive Advantages, Promote Close Integration of Microelectronics Enterprises and Equipment Plants

The recently established Shanghai Semiconductor Components Company is an economic entity in the semiconductor components industry that is organized according to the principles of a horizontal division of labor and vertical linkages, which has helped destroy the separated state of small-scale production. It is a breakthrough step in the movement of Shanghai's microelectronics industry toward an industrialized scale of production. The Semiconductor Components Company should face the current situation, do good equipment adjustment, and increase equipment utilization rates. At the same time, it should centralize personnel and materials, strengthen and improve product research and design capabilities, actively develop new products, and reduce the schedule from development to operationalization to adapt to market changes.

Internationally, most microelectronics enterprises are subsidiaries of large equipment companies so they have reliable component production and sales, and there are guarantees for inputs and output. IBM Corporation in the United States has many small matching enterprises that can produce 80 percent of the basic circuits and components required for their equipment. We can borrow from this model of a high degree of vertical integration. Shanghai Semiconductor Components Company should encourage integration of microelectronics enterprises and equipment plants and establish multi-industry and even multi-region integrated enterprises. This close integration will strengthen investment, research, development, and other areas in microelectronics enterprises and is a realistic choice for moving the microelectronics industry out its slump within a short period of time.

II. Use Shanghai's S&T Advantages, Further Perfect Scientific Research and Intermediate Testing Base Areas

There are over 1,000 S&T personnel in Shanghai engaged in integrated circuit research and development and over 150 of them have high-level job titles. They are mainly concentrated in the Metallurgy Institute, Semiconductor Institute, Fudan University, China Teachers' University, and other places. During the Seventh 5-Year Plan, Shanghai invested in the establishment of an application-specific and semi-application specific integrated circuit development base area led by the Chinese Academy of Sciences Shanghai Metallurgy Institute, and they made major achievements. During the Eighth 5-Year Plan, the state and the Shanghai government also continued to focus on support for this foundation. Not long ago, Shanghai Radio Plant 14 established a computer-aided design system development center that was another gratifying step in the development of key special-purpose materials. Although the Metallurgy Institute's base area made many achievements, few were converted into scale economies. Plant 14 originally was an intermediate testing base area for the Beiling Company but technical inversions prevented it from playing its role and the relevant departments had to find ways to operationalize the achievements of the Metallurgy Institute. Plant 14 had to strengthen its equipment and technical forces to enable it to truly play its role as an intermediate testing base area. In the future, attention must be given to fully fostering the role of specialized microelectronics S&T personnel to promote accelerated product renewal and replacement.

III. Establish a Risk Fund, Gradually Give the Microelectronics Industry a Self-Development Capability

For the past several years, results in Shanghai's microelectronics enterprises have been slipping each year, most have rising debts, and their technical equipment is outdated, so they require large capital inputs. At the same time, product development and intermediate testing also require the investment of large amounts of capital. This is hard for limited local finances and the seriously "bleeding" enterprises to bear. As a result, Shanghai must meet with the relevant ministries and commissions in the central government, centralize investments in the microelectronics industry, and establish special funds. On the other hand, they should further expand the importation of foreign capital and set up joint investment enterprises. In addition, they can also issue bonds and stocks to society and collect the scattered capital in society.

IV. Special Preferential Protection Policies Should Be Adopted for the Microelectronics Industry

During the Eighth 5-Year Plan, the state has placed development of the electronics and information industries in a prominent status and will continue to make substantial investments in four basic products, including integrated circuits, computers, and so on. It will also implement policies for exemption from the business tax, added value tax, and tariffs on imports of key equipment and reduce collections of income taxes by one-half, and may also set aside 10 percent of income from sales as a technology development fund, and other preferential policies. To enable Shanghai's microelectronics industry to form scale economies as quickly as possible and to catch up quickly with advanced international levels in production technology, we propose the adoption of additional preferential and protection policies. Examples include implementing a licensing system for integrated circuit sales for resolute suppression of unlicensed sales and illegal buying and selling of smuggled imported circuits and components, establishing a microelectronics product development and application fund to encourage more S&T personnel to develop and extend microelectronics, and encouraging enterprises and businesses involved in microelectronics technology to open plants in foreign countries and Hong Kong and engage in joint investment and cooperation with foreign companies, to more quickly import advanced technology.

In addition to these points, it should also be pointed out in conclusion that the ability of Shanghai's microelectronics industry to form scale economies within a rather short period of time will depend on whether or not leading departments of the government truly focus on it as a strategic industry, and it will depend on whether or not all relevant departments work together in cooperation and create a better environment for innovation. Only through the common understanding of all of society and the wisdom and efforts of the masses will Shanghai's microelectronics industry be able to rely on its huge technical advantages and regain its vitality.

Developing Military-Civilian Dual-Purpose Technologies Urged

92FE0031C Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 9 Sep 91 p 3

[Article by Jin Zhouying [6855 0719 5391]: "Give Preference to Developing Military-Civilian Dual-purpose Technology"]

[Text] With the changing international situation, converting from military to civilian production has become a hot topic internationally. For China, which uses guidance by the military industry to develop high technology, military-civilian integration and a transition from military to civilian production have already exceeded the scope of using the surplus capacity of the military industry during peacetime or resolving problems concerning the existence and development of military industry enterprises.

A nation's military strength and economic strength are two facets of its overall national strength. The Gulf War that concluded not long ago told us that modern warfare is competition of overall national strengths, and that competition of overall national strengths is in essence competition of science and technology. This has made us more soberly understand that in a certain sense invigoration of the Chinese nationality is dependent on high technology and the development of high-tech industry. In such a situation, independent discussion of shifting from military to civilian production or increasing military expenditures is inappropriate. The issue of military-civilian integration and a shift from military to civilian production is no longer a simple question of what path China's military industry should take. Instead, it is a question of how China, which is still a very poor country, can use its limited financial strengths most effectively to develop S&T (including military S&T) and how it can more quickly industrialize high technology so that S&T are truly converted into real forces of production.

A review of the development of national defense high technology in China is in order. In the 1950's, under the appeal to make the military more scientific, China relied entirely upon its own strengths to develop the atomic bomb, nuclear bomb, satellites, rockets, missiles, and other strategic weapons and used them as a vanguard in opening up the nuclear industry, aerospace industry, electronics industry, shipbuilding industry, weapons industry, and so on. They made indelible contributions to China's development of high technology and high-tech industry and to training and bringing up several skilled high-tech personnel, and they played a major role in improving China's political and foreign relations status on the world stage. Still, our past achievements could not change the real situation of China's substantial technological and economic backwardness. Facing the challenge of the new S&T revolution, when we are preparing to take full advantage of and seize this opportunity, we should soberly note that under the difficult circumstances after the establishment of New China, reliance on highly centralized directive plans and organizing our national finances, materials, and manpower to support the development of military technology and the military industry did not properly or immediately promote civilian industry, and the military industry itself formed a situation of a big industry with a little market.

First, because China's S&T and industrial foundations were very weak shortly after our nation was founded and because of the hostile international environment and substantial hostilities, it was natural to give preference to developing national defense S&T. The problem lies in the subsequent 20 years, when we failed to deal properly with the relationship between national defense guidance and market guidance and did not immediately achieve diffusion toward civilian technology and civilian industry. We always adopted a singular model of military products being the main factor, so we were unable to promote traditional industry. Moreover, because of the narrow markets of the military industry itself, it does not have solid basic technology and civilian markets to serve as a backup force and most are at a low level. From the start, military scientific research has not been capable of paying proper attention to military-civilian integration, which made it hard for China to shift from military to civilian production during the 1980's.

Second, while we were developing military technology and the national defense industry, we paid too much attention to product technology and neglected technical technology and manufacturing technology, and we stressed performance while neglecting producibility. This was another reason why our high technology, and in particular our military S&T, were difficult to industrialize. The structure of China's national defense industry is irrational and it competes with civilian industry for products and markets. It faces a serious situation of an urgent need for structural readjustment and structural grade raising.

When we are studying military-civilian integration, comparison and analysis of experiences in the United States and Japan is very meaningful.

In the last half of this century, the United States has expended a great deal of its efforts on developing and maintaining a military advantage and it has consistently held a vanguard status in the world in scientific research and technological innovation. As the international situation has changed, however, and especially since the 1980's, industry and S&T in the United States have faced serious challenges from Japan, Western Europe, and other developed nations. The United States has discovered that its industrial technology fields that were far ahead have begun to fall behind several developed countries and the competitiveness of its entire industry has declined. Its national defense industry foundation is facing a crisis, key supplier plants and businesses have vanished, and its reliance on foreign countries is growing. The efficiency of military industry during peacetime is low. Japan has been allowed to produce several technologies that were studied and developed by the Department of Defense in the United States and it has taken over civilian markets (such as video recorders). Several departments under the Department of Defense in the United States are forced to reply on Japan for basic technology. For this reason, the United States has organized government conferences focused on dual-purpose technology and competitive strategies for the United States. It has formulated a series of huge plans concerning military-civilian dual-purpose technology and manufacturing technology, and it has placed dual-purpose technology in the primary position in key technology rankings each year.

At the same time, in the world situation of bipolar hostilities between the United States and Soviet Union after World War II, Japan used a unique technological development model to successfully attain its objective of simultaneously increasing its economic strength and raising its military S&T levels. For example, one characteristic of its high-tech development strategy was preference for developing military-civilian dual-purpose technologies (semiconductor chip technology, computers, etc.). Efforts were expended at all levels on high technology for military and civilian purposes, making transitions from military to civilian uses and from civilian to military uses, and a diffusion effect appeared in both civilian and military technology. As a result, Japan became both an economic power and an important supplier of some military technology to the United States and one of the main pillars in the military strategy of "deterrence by Western high technology".

Of course, the environment of the period was different, as were the conditions in each country, so we must not nor can we copy another country's model. However, we must conscientiously draw on the experiences of other countries and formulate a technological development model based on China's national conditions that helps win time and speed.

We feel that China's best choice is giving preference to developing military and civilian dual-purpose technology and focusing on developing manufacturing technology.

Military-civilian dual-purpose technology is technology that can be applied in the two areas of national defense and civilian uses, and it includes ideas and technologies for creating new capabilities and new products. Dual-purpose technology is the name used for joint technology that helps economic development and helps improve national defense weapons systems. Examples include semiconductors, computers, communications, robots, biology, new materials, information, visual, and other technology. The goal in developing dual-purpose technology is optimum economic benefits and social benefits, and the most effective utilization of capital, technical achievements, and personnel resources. Actually, in any country, the question of how to maintain a minimum level of military capacity and the maximum level of potential military strength during peacetime in case war should erupt and shift its greatest strength to national defense in the shortest amount of time is an eternal question. In the high-tech age, the key to maintaining the greatest potential military strength during peacetime lies not in the size of the equipment production capacity maintained by military industry or in how many advanced weapons and equipment are available, nor is it in the number of troops. Instead, it is the economic strength of a country and the amount and quality of military technology reserves. The development of national defense technology during peacetime cannot be separated from the technology required in civilian markets. Thus, in modern society, demand in civilian markets is the greatest motive force for new technological innovation and it is essential that national defense departments and civilian industry departments jointly develop dual-purpose technology in order to use civilian markets to develop military technology and to enable military technology and military industry to promote civilian industry.

Besides the motive force and promotion of the market, developing dual-purpose technology in a developing nation is also very important for effectively using limited financial resources, attracting and protecting military scientific research personnel, and so on.

A focus on developing manufacturing technology is an important foundation and prerequisite for developing dual-purpose technology. First, developing a high technology item certainly requires that this high-tech product enter the market very quickly. Moreover, advanced manufacturing technology is essential for ensuring shorter schedules for the entry of dual-purpose technology, including intelligent technology products for military use, into civilian consumer good markets. For China, where overall technical levels are still rather low, foreign countries are the source of many types of high and new technology, so a focus on developing manufacturing technology and technical technology to raise overall industry standards is the key to improving our ability to absorb and digest imported technology and accelerate schedules for a shift to domestic production. It is also an important measure for raising grades in the structure of the processing industry in China's readjustment of its economic structure.

Second, manufacturing technology is typical dual-purpose technology. The development of modern high technology has brought a revolution to manufacturing technology itself. CIMS (computer-integrated manufacturing systems) technology, for example, has brought fundamental changes to production technology and production patterns and even production organization in the manufacturing industry. It has greatly shortened design and manufacturing schedules, increased labor productivity, improved personnel quality, and brought epochal progress in the strain capacity of enterprises for using it to adapt to modern market demand for small batches of a variety of products. For this reason, I propose:

1. National defense scientific research and national defense industry departments, institutions of higher education, civilian research units, and all industrial departments should make unified plans, have a division of labor and cooperation, and concentrate manpower, materials, and finances to give preference to developing military-civilian dual-purpose technology like large-scale integrated circuits, computers, information technology, biology, new materials, electromechanical integration technology, and so on, and establish organizations or organs with special responsibility over work to coordinate the development of dual-purpose technology.

2. Military-civilian integration should focus on developing manufacturing technology. In state projects to attack key problems in high-tech fields, CIMS projects in the automation field are an advanced manufacturing technology that are almost industrialized, but they are the weakest link in terms of investment strengths, so there is an even greater need for a strategic program that is integrated with industrialization.

3. Borrow from Japan's positive experiences in developing high technology, do not take the low-tech road of nuclear military armaments, take full advantage of the dual-purpose characteristics of high technology, and develop supernuclear high-tech weapons based on electronics and information.

4. National defense scientific research and the national defense industry cannot be a small but complete closed system that is isolated from civilian markets. In moving from scientific research to production, we should give consideration from the beginning to orienting toward dual purposes. For this reason, we should reconsider S&T interchange between national defense scientific research organs and civilian development organs and industrial departments as well as cooperative standards, scopes, policies, and so on.

China's scientific research, technical upgrading, technology importing, national defense scientific research, and construction departments each do things in their own way. The situation of an absence of unified consideration should end. At a time of intensive reform, we should make preferential development of dual-purpose technology a national policy for systems (the S&T system, economic system, and national defense system), plans (scientific research, industrialization, and conversion to commodities), investments, personnel, organizational organs, and other areas and implement policies in all areas.

How Defense Research Institutes Adapt to Strategic Change from Military to Civilian Uses

92FE0031A Beijing KEYAN GUANLI [SCIENCE RESEARCH MANAGEMENT] in Chinese No 5, Sep 91 pp 12-14

[Article by Xia Guofan [1115 0948 5672] of the Ministry of Aerospace Industry Institute 608: "Superficial Views on How National Defense Scientific Research Institutes Can Adapt to the Strategic Change from 'Military to Civilian Uses'"]

[Text] [Abstract]

This article focuses on six areas, the direction of service, scientific research structure, S&T system, science and technology, civilian product development, and management mechanisms, to discuss concrete ways to implement a strategic shift from "military to civilian uses" in national defense scientific research institutes. Achievement of this strategic change will inevitably strengthen the output functions of national defense scientific research for the national economy.

The CPC Central Committee and Central Military Commission analyzed the international strategic situation and made a diagnosis that we may not have to fight a major war for quite some time into the future, so the state decided to make three different types of unified programs for the national defense S&T industry based on dominance of military uses, integration of military and civilian uses, and a shift to entirely civilian uses. Basically, all national defense scientific research units are "integrated military-civilian" research institutes. Aerospace S&T, for example, is a technology that has joint military and civilian uses. Thus, we must observe the overall configuration of national construction and, under the guidance of state policies, state plans, and state macro management, actively adhere to and adapt to this strategic transformation, conscientiously implement military-civilian integration, reform operational mechanisms, and enter the main battlefront of service to the national economy to strengthen the output functions of national defense scientific research for the national economy.

I. The Direction of Service By Integrated Military-Civilian Research Institutes Should Change From Service to National Defense Modernization to Service to the Entire Four Modernizations Drive

The central point in service to the four modernizations drive is service to national economic construction because the development of national defense scientific research in the final analysis depends on the strength of our national economy. Development of the national economy is essential to enable more scientific research funds to be provided for national defense scientific research. Development of national defense S&T and their transfer into the civilian realm can also promote the national economy and generate huge economic benefits. According to the relevant data, for every $1.00 the United States spends on its space program, it can recover $14.00. Investing $1 billion in its space program can increase the United States' forces of production by 0.1 percent and form benevolent cycles in its national economy and national defense economy. The output value of civilian goods from China's aerospace industry accounts for a rather high proportion of our gross value of industrial output and the value of output of civilian products from scientific research units amounts to several 100 million yuan. Experience in China as well as in foreign countries shows that national defense scientific research should assume the burden of service to national defense modernization during peacetime as well as the burden of service to national economic construction by becoming integrated military-civilian scientific research units that have two essences and dual functions. At present, they should focus on R&D related to technology-intensive industry and on technology development work for the exported-oriented economy, explore technical avenues to seize opportunities to spur coastal areas to move toward international markets, explore the development of high technology and new technology industry, and actively participate in feasible routes to large international cycles.

II. The Structure of Scientific Research in Integrated Military-Civilian Institutes Should Change from Military Uses as Its Main Factor to Military Uses as Its Foundation and Civilian Uses as Its Main Factor

Military uses as the foundation and civilian uses as the main factor are two aspects of one question and a unity of contradictory opposites.

Adherence to the direction of military uses as the foundation is determined by the basic nature of national defense scientific research. Concretely speaking, first of all we must maintain a key staff for military industry scientific research. To stabilize a high-level S&T staff, specific material subsidies should be provided on schedule during the period of military product research, and 10 to 15 percent of surplus scientific research funds can be set aside to reward development personnel to ensure that scientific research units promote scientific research, develop on the foundation of production, and continually improve the working and living conditions of S&T personnel. Besides receiving state awards, S&T

personnel who receive state and ministry- level invention awards or progress awards should also receive additional rewards from the scientific research institutes where they work. With a prerequisite of no changes in treatment and continued issuance of bonuses as before, preference should be given to arranging advanced training in China and foreign countries for personnel involved in military research. Evaluations of levels should be made immediately for members of project groups that complete major military product scientific research projects and they should be provided with the corresponding technical duties. Work done on additional scientific research tasks after completing contractual responsibility indices for scientific research on military products can be treated as labor of a sparetime nature to link military industry scientific research and development with the income of S&T personnel. Second, we must continually improve military industry scientific research measures. Besides investing development funds in new scientific research, scientific research institutes should mainly use them to improve scientific research equipment and update management measures to increase their self-accumulation, self-upgrading, and self- development capabilities and maintain the development momentum of military industry high technology. Third, they should give preference to ensuring that military product scientific research tasks are completed. At present, the national defense S&T development strategy should be the basis for a focus on completing the development of weapons and equipment where we have relative advantages and on increasing the self-defense capabilities of China's army under modern warfare conditions. At the same time, with a long-term view toward the future, we should strengthen preliminary research and tracking of advanced technology, prepare reserve strengths for development in the 21st Century, and solidly grasp the correct direction of the military being the foundation.

Adherence to the principle of civilian uses as the main factor requires using a foundation of maintaining and improving scientific research levels in the military industry to make appropriate readjustments in the structure of scientific research based on the need to shift from military to civilian uses and from an internal to external focus. First, this involves deploying scientific research capabilities according to the principle of civilian uses being the main factor. Besides having a crack scientific research staff to guarantee the completion of military product scientific research, about 60 to 70 percent of our S&T forces should be changed into scientific research on civilian uses and secondary development of military industry technology, as well as actively taking on experimentation and production for the relevant parts and components, developing international cooperation, and expanding exports to earn foreign exchange. Second, this involves undertaking income earning activities in accordance with the principle of civilian uses being the main factor. The income from horizontal contracts, technical services, and intermediate testing and production should gradually grow to about 80 percent of total income in the institutes, or average profits per person for S&T personnel should surpass 10,000 yuan, to use income earned from civilian products to improve the lives of S&T personnel themselves and compensate for insufficient military product scientific research funds to achieve the need to "use civilian production to develop military production". Third, we should actively organize research projects according to the principle of civilian uses being the main factor and try as much as possible to develop research and experiments on technology-intensive, export substitution, and export foreign exchange earning products, play a role as the primary army and leading role in national economic construction, and become the most vital and vigorous part in developing social forces of production.

III. The S&T System in Integrated Military-Civilian Research Institutes Should Make a Transition From the Small But Complete "Closed Type" to an All- Azimuth "Open Type"

For a long time, our national defense scientific research system has been a closed system with very few connections to civilian departments. On the one hand, many basic facilities have been idle and large portions of their scientific research forces and S&T achievements have not played their roles fully. On the other hand, there has been continual investment and construction that have formed a "small but complete" closed system. For this reason, national defense scientific research units must make integrating scientific research with production their strategic direction and remold themselves into all-azimuth "open type" research institutes. They should mainly use horizontal integration, cooperation, contractual responsibility, leasing, annexation, and other forms to extend the "antennae" of scientific research institutes toward society, toward domestic and foreign markets, toward medium-sized and small enterprises and township and town enterprises, and use multiple channels to radiate their technology and release latent energy, and in particular they should take advantage of their technology, equipment, and personnel, integrate research on high technology with commodity markets and with international cooperation, move high S&T achievements into the international market, and take the route of using exports to promote scientific research and using military trade to promote the military industry.

IV. Science and Technology in Integrated Military-Civilian Research Institutes Should Make a Transition From Purely Military Uses to Combined Military and Civilian Uses

There is no unbridgeable gulf between military technology and civilian technology. This is particularly true of the mutual promotion of military technology and civilian technology in the high S&T realm. The government of the United States, for example, decided to open up in a limited fashion over 200 technologies developed in its "Star Wars" program to civilian enterprises and added a civilian plan to its national defense program for this purpose. Like the core of an aviation engine, revision of the design or appropriate refitting can enable the derivation of military and civilian aviation power plants with different powers and different engine types. In the past, with the separation of military and civilian uses so that each formed their own system, many technologies that could be converted to civilian uses were "imprisoned" inside the little universe of the military industry. To adapt to the strategic shift, S&T in national defense scientific research institutes should make a transition from purely military uses to combined military and civilian uses: 1) When making plan arrangements, investment strengths and overall benefits for scientific research projects that have powerful military- civilian use, mutual use, and general purpose characteristics should be guaranteed to optimize the technical structure. 2) When designing and developing military products, integration of S&T circles, military circles, and industrial circles should be reinforced for joint exploration of feasible routes to combined military and civilian uses. 3) When soliciting bids and making bids on military research projects, the awarding of bids should take into consideration the possibility of development for civilian uses in the bid document. 4) After examining and accepting military research project achievements, technologies that have commercial value should be actively transferred to enterprises and scientific research achievements that have potential for civilian use should be separated out in an effort to expand the scope of utilization for military technology and make national defense scientific research a radiation source and diffusion source for emerging technology.

V. Civilian Product Development in Integrated Military-Civilian Research Institutes Should Change From a Focus on Adaptive Innovation as the Main Aspect to Directed Innovation as the Main Aspect

Innovation is an indicator of the organic vitality of scientific research units and the source of the entrepreneurial life force. For product development, there are two main categories, adaptive innovation and directed innovation. Adaptive innovation refers to the development of new products to adapt to market demand. Facing increasingly intense market competition, national defense scientific research institutes usually adopt adaptive innovation tactics, meaning that they develop whatever the market demands, using "sales" to determine "products", with "products" satisfying the needs of "sales". In a market environment of rapidly developing S&T and fast and frequent changes, there are often new products with comparable benefits and at comparable levels and as a result they have completely different statuses according to when they enter the market and only the swift-footed ones are successful. Thus, national defense scientific research institutes must use the advantages they have in military industry technology and apply guided innovation tactics, which means that they must be based on the requirements of leading development and based on projected future market demand on the basis of conducting risk analysis, benefits analysis, and technical level analysis to develop unique new products or derivative products before others do. Dongfang Electronics Enterprise Co., Ltd., a joint venture of Institute 608 in Shenzhen, used market survey research and projections to accurately analyze the enormous development prospects for quartz watches. Then, in accordance with the law of value of comparable prices and superior performance, they adopted a high starting point, came up with a surprise technical development program, and were the first to develop a new type of quartz watch with time, music, decorative, and light control functions. When they moved prior to the "time difference" to place them on the market, they conformed exactly with the requirements of consumers and the products sold extremely well. In just 3 years they went from losses of 410,000 yuan to profits of more than 5 million yuan. When other business units swarmed into the market, they adopted an "extended function" method and designed a new product with program control functions that shifted them into a commercial cycle for another model number. In this way, they used their military industry technological advantages, focused on latent market demand, applied guided innovation tactics, and were able to achieve a strategic transformation in effectively integrating military and civilian uses.

VI. Management Mechanisms in Integrated Military-Civilian Research Institutes Should Change From a Purely Scientific Research Type to a Scientific Research and Administration Type

Management and administration in research institutes cover a broad area, extending in two directions from simple scientific research type management. One can extend to management forecasting and decisions on topic selections ahead of simple scientific research type management. The other can extend to the extension of achievements and sales services behind simple scientific research type management. Whether extending forward or extending backward, the targets that research institutes encounter are users and markets. For this reason, the nucleus of scientific research management is the need to strengthen consciousness of commodities and consciousness of markets to include development of national defense S&T in the orbit of the planned commodity economy. One, management strategies that use domestic and foreign markets as a guide must be formulated. Two, new research topics must be continually selected from market feedback. Three, competitive mechanisms must be included in the S&T contractual administrative responsibility system. Four, autonomous administration, independent accounting, and responsibility for profits and losses must be established as scientific research operational mechanisms. Five, an integrated administrative system for scientific research, development, and sales that is adapted to the market must be formed. These things will create an excellent environment and conditions for military- civilian integration and civilian product scientific research. Institute 608 has reinforced management and administration, oriented toward the technology market, and taken on over 60 large and medium-sized R&D tasks over the past several years in more than ten industries, including energy resources, communication, pharmaceuticals, food products, light industry and textiles, petrochemicals, and so on. For example, it was assigned by the Zhongyuan Petroleum and Development Bureau to use multiple aircraft engines in a network to make a unit that they used in conjunction with an expansion device that can recover 120 tons of light oil, 600,000 standard cubic meters of dry natural gas, and 400,000 standard cubic meters of liquefied gas a day for the oilfield that can earn the state 45 million yuan in profits each year. It has changed from "consumption-type" national defense scientific research to "added value-type" national defense scientific research, which has created excellent conditions for national defense scientific research institutes to change from having negative effects to having positive effects on the national economy.

Liaoning Province, Ordnance Industry Sign Cooperative Agreement

92P60023 Shenyang LIAONING RIBAO in Chinese 20 Aug 91 p 1

[Article by Li Dan [2621 0030]]

[Summary] On 19 August, Liaoning governor Yue Qifeng [1471 2978 1496] and the chief manager of the Liaoning ordnance industry Lai Jinlei [0171 6855 3525] signed a cooperative agreement between the Liaoning provincial government and the head company of ordnance industries at the Liaoning Friendship Hotel. Because Liaoning Province is an important base of the Chinese ordnance industries, it is especially significant for Liaoning to shoulder the dual-mission of either fully suing Liaoning's superior weaponry industrial technology and production capability, or ensuring Liaoning's fulfillment of military and civilian products' research and development. According to the agreement, a team was established to lead the collaboration effort, and the Liaoning Machinery Commission will be responsible for handling the actual administrative work. A preliminary agreement was made to establish 20 capital construction and technology improvement projects in 9 ordnance industries in Liaoning in the Eighth 5-Year Plan Period.

Strategy on Developing High and New-Tech Industries in Shanghai

92FE0064B Shanghai WEN HUI BAO in Chinese 8 Sep 91 p 1

[Article by reporter Jin Dan [6855 0030]: "Several Scientists in Shanghai Municipality Focus on Electronic Information, New Materials, and Bioengineering, Jointly Discuss High and New-Technology Industry Development Strategy"]

[Text] How will high and new-tech industry develop in Shanghai? Several renowned scientists in Shanghai Municipality are now holding special discussions focused on the three main fields of electronic information, new materials, and bioengineering and jointly discussing high and new-tech industry development strategies and countermeasures.

I. CPC Shanghai Municipality Advisory Commission Member Gu Xunfang [7357 6054 2455] Says There Should Be a Sense of Urgency Regarding Reinforcing the Development of High and New-Tech Industry

World high and new technology are now developing from "infancy" to "adulthood" and the strategic focus of development has shifted from increasing national power to a focus on reinforcing national strengths. Developing high and new technology is not just for the purpose of gaining fame but is mainly for economic development.

What should Shanghai do in facing this sort of great momentum? I feel that we must conscientiously summarize past experiences and lessons and seize this seldom-seen opportunity. Shanghai implemented an economic development strategic program in 1984 and Shanghai is now facing a key instant in shifting onto a second track. Faced with the objective reality of coexisting difficulties and opportunities, if Shanghai fails to foster its overall S&T and economic advantages, take another step forward in technological progress, and strive to achieve a raising of its industrial structure, it will find it hard to get out its present difficulties and move toward a benevolent cycle. For this reason, we must increase our sense of urgency, sense of crisis, and sense of responsibility.

II. Shanghai Municipality Science and Technology Association Deputy Mayor, East China Computer Institute Director and Researcher He Chengwu [0149 2052 2976] Says That Electronic Information Must Become a Preferential Development Industry

Shanghai formerly had a rather good electronics industry foundation and rather solid technical forces. The electronic information industry itself was the industry with the greatest development prospects and highest added value. Shanghai should include the electronic information industry among those for preferential development and there should be major efforts to develop computers and software, which are the pillars of the information industry.

It is precisely because of the unique qualities of high-tech itself that all countries have adopted support policies when developing high and new technology. China should also adopt the corresponding policies. One, the state should support powerful development-type research institutes in developing toward the direction of industrialization, organize implementation in a planned manner, strengthen investments, and provide them with policy preferences. Two, companies run by research institutes that integrate scientific research and development with management and marketing should be distinguished from other companies in administration. Third, banking and financial circles should provide credit support to scientific research academies and institutes and form a multi-element capital raising system that includes state investments, capital raised by units themselves, bank credit, and so on.

III. Ministry of Posts and Telecommunications First Institute Deputy Chief Engineer and Senior Engineer Liu Ximing [0491 6932 2494] Says That Communications Technology Products Should Work on "Chinese Brands" and "World Brands"

The development of international communications technology at the present time can be summarized as "digitization, integration, broadbandization, intelligentization, and individualization", and China's present and future communications construction is also developing in these directions.

Shanghai's communications industry should focus on the needs of communications construction and development through this century and cannot be limited to the production of present products and can even less be limited to the communications needs of Shanghai. It should be "Chinese Brand" and even "World Brand".

China has almost 20 scientific research units and institutions of higher education that are involved in communications research and nearly 7,000 specialized communications S&T personnel. Not only are the numbers large, but the levels are also high, they have solid strengths, and they touch upon all communications fields. At the same time, several major scientific research achievements in communications in China like portable telephones, program controlled exchanges, satellite ground stations, high-power microwave velocity tubes, and so on were also born in Shanghai. Due to separation and scattering of forces, however, many scientific research achievements were unable to form forces of production in Shanghai. Thus, we need to raise the elevation of high and new-tech industry, strengthen organizational leadership and coordination over communications scientific research and the communications industry, and in particular we should include the scientific research forces of the Chinese Academy of Sciences and ministries and commissions of the central government that are in Shanghai into Shanghai's program for development of the communications industry.

IV. Chinese Academy of Sciences Shanghai Silicate Institute Deputy Director and Researcher Xi Tonggeng [1153 0681 1649] Says That Shanghai Has the Conditions To Establish a Modern Ceramics Industry

There must be a focus in high and new-tech industrialization and the following principles should be observed in the selection of this focus: One, establishing high and new-tech industry should be an important aspect of the readjustment of Shanghai's industrial structure and should be closely integrated with the strategic focus for future development of Shanghai's industry or pillar industries. Second, we should select those projects in which Shanghai has overall advantages or in which Shanghai can lead the way in assuming responsibility for state topics to attack key problems during the Seventh 5-Year Plan and Eighth 5-Year Plan. Third, the base point in topic selection should be placed on the foundation of reliance on our own efforts and there should also be selective and focused imports or absorption of key technologies from foreign countries. Fourth, we should select projects with large markets in China and foreign countries and which have high value and high added value.

Materials are the material foundation for the birth and development of all types of high and new technology as well as a type of high technology themselves.

Unlike the metallurgical industry and petrochemical industry, an equipment industry for China's new ceramics industry has not yet taken shape, which is one of the primary obstructions that impede industrialization. Based on the equipment we have already imported, Shanghai has the conditions to develop a ceramics industry equipment industry and there is a projected market within the industry itself in China of several billion yuan, so we must organize forces to digest and absorb imported equipment. A major difference between high-tech ceramics and traditional ceramics is that the former uses high-level powdered raw materials and the new discipline of "powder engineering" has already been established in foreign countries. Shanghai should also establish and develop ceramics powder engineering.

V. Chinese Academy of Sciences Shanghai Metallurgy Institute Director and Researcher Zou Shichang [6760 0013 2490] Says That We Should Adopt the Corresponding Policies To Encourage the Invigoration of Shanghai's Microelectronics Industry

In developing its microelectronics industry, Shanghai should encourage the integration of integrated circuit scientific research and production units with overall system plants, reinforce the intersection and permeation among industries, and foster comprehensive advantages.

He proposed that Shanghai Municipality formulate special topics based on readjustment of its industrial structure and the requirements for developing emerging industries like special-purpose communications (including optical fiber communications) integrated circuits, automobile electronics, special circuits for household appliances, and development plans for 1 megabit projects to integrate Shanghai's microelectronics scientific research, development, production, and applications units and invigorate Shanghai's microelectronics industry.

Regarding invigoration of its microelectronics industry, Shanghai should adopt the corresponding encouragement and support policies. One is to organize work in state engineering centers and key laboratories into Shanghai's plans for upgrading traditional industry and high and new-tech industry. The second is to set aside 3 to 5 percent of the funds from vertical projects for use as

S&T personnel bonuses. Present S&T staffs for undertaking vertical scientific research tasks are unstable and one of the main reasons is few bonus sources and low bonuses.

VI. Chinese Academy of Sciences Shanghai Branch Director and Researcher Wang Zhiqin [3769 1807 0530] Says That Shanghai Has the Conditions To Catch Up to Advanced World Levels in the Field of Biotechnology

Since the late 1970's, a new type of biotechnology that is different from traditional fermentation technology has taken shape internationally. Because of its rather good biological sciences foundation, Shanghai can rapidly catch up with the pace of world biotechnology development. Overall, however, progress toward industrialization of Shanghai's biotechnology industry has lagged significantly behind international advances and the discrepancy is rather large. However, Shanghai does have the conditions to catch up with and reach advanced world levels.

In the area of developing high and new biotechnology, Shanghai began rather early and has large forces, and there is a relatively complete complement of disciplines. The Chinese Academy of Sciences alone has seven biology institutes in Shanghai as well as a newly-built bioengineering experiment base area. In addition, Fudan University, East China College of Chemical Industry, the Pharmaceutical Industry Institute, and other units also have a trained and quality biotechnology R&D force.

The tactics for developing Shanghai's biological high-tech are: one, establish a biological high-tech industry, which does not require taking apart the existing foundation and reassembling it. During the Eighth 5-Year Plan, we should focus on several products and do good work on one or two demonstration projects in biological high-tech. Two, besides focusing on demonstration projects, in consideration of the economic benefits, we should also develop "short, easy, and quick" products. Third, utilize genetic engineering and cell engineering technology to upgrade traditional industry. Fourth, every effort should be made to remove new types of biological high-tech industry from their original organs, develop them in development zones, and from the beginning allow them to operate with entirely new operational mechanisms. Fifth, high-tech development involves substantial risk and the government should provide preferences in policies.

Hi-Tech Industry Boost

40101006B Beijing CHINA DAILY (Shanghai Focus) in English 7 Oct 91 p 1

[Article by Chen Qide, CD staff reporter]

[Text] Shanghai has taken positive steps toward developing the local micro-electronic industry.

Part of the city's strategy to boost its technical industries, the micro-electronic production base includes a research lab, two joint ventures that produce hardware, and a radio factory. At the end of the Eighth 5-Year Plan, micro-electronics are expected to increase Shanghai's output of high-technology by 2 per cent in the total industrial output.

The city has invested $10 million in the radio factory, which assembles integrated circuits, said factory office director Shen Xiaoping. The Asian Development Bank has loaned money for importing advanced equipment while the city will borrow 6.95 million yuan ($1.29 million) from domestic banks for factory construction. "Funding is no problem," Shen said.

By 1993, the factory should be producing 100 million integrated circuits annually, of which 70 percent are for the Philips Semiconductor Corporation of Shanghai, she said.

The factory produced digital circuits until 1988, when it lost business to foreign competition. As a result, its output dropped and the factory lost 1.16 million yuan ($215,000) in 1987.

By changing its product, the factory survived, Shen said. Now, it also makes circuits for televisions, tape-recorders and telephones.

The two joint ventures—Shanghai Belling micro-electronic Manufacturing Company and Philips Corporation—are located in Shanghai Caohejing Hi-Tech Park. Both provide the radio factory wafers for the integrated circuits.

This year, the city should produce 15 million integrated circuits, Shanghai's Economic Commission said.

And to further stimulate the city's micro-electronics industry, State government has invested in a nation-wide Shanghai micro-electronic Engineering Research Centre, said a centre official in charge of the project.

In addition to offering advanced research in design and production, the centre hopes to bridge the gap between labs and factories, said the official. The country plans to establish similar research centres during the Eighth 5-Year Plan (1991-1995).

1990 Statistics of National High and New Technology Industrial Development Zones

92FE0031E Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 31 Aug 91 p 2

[Article by State Science and Technology Commission: "1990 Statistical Report for National High and New Technology Industry Development Zones"]

[Text] The birth and growth of China's high and new technology industry development zones (abbreviated as "development zones" below) is a product of reform and opening up, a response to the challenge of the world's new technological revolution, and a major event in the process of developing high and new technology industry in China. By the end of 1990, the State Council and People's Governments of all provinces and municipalities had approved the establishment of a total of 37 high and new technology industry development zones (Note 1). These development zones are important base areas for developing high and new technology industry, radiation sources for diffusing high and new technology into traditional industry, windows for opening up to the outside world, and integrated experiment zones for intensive reform.

Statistical data for 1990 for 31 of the development zones (Note 2) indicate that the area of development zones planned for China covers 557.9 square kilometers with enterprises that will employ 128,000 people. There are 23 development zones with more than 1,000 employees.

I. High and New Technology Industry Development Zone Enterprises and Personnel

There are 1,690 recognized high and new technology enterprises in all of China's development zones (enterprise groups are included in the statistics as one enterprise). They include 679 enterprises under ownership by the whole people, equal to 40.2 percent of the total number of enterprises, 639 enterprises under collective ownership, equal to 37.8 percent of the total number of enterprises, 147 joint venture enterprises, equal to 8.7 percent of the total number of enterprises, 81 three capital sources [foreign capital, overseas Chinese capital, and Hong Kong and Macao capital] enterprises, equal to 4.8 percent of the total number of enterprises, and 144 enterprises of other economic categories, equal to 8.5 percent of the total number of enterprises. They have formed a preliminary cluster of a new category of enterprises in which the public ownership system is the primary factor and various types of economic components coexist.

Most of the high and new technology enterprises in the development zones are medium-sized and small enterprises. They include 30 enterprises with more than 500 employees, equal to 1.8 percent of the total, 252 enterprises with 50 to 500 employees, equal to 14.9 percent of the total, and 1,408 enterprises with fewer than 50 employees, equal to 83.3 percent of the total.

Regarding employee job title levels, the personnel in the development zone enterprises include 53,680 employees with specialized technical job titles, equal to 41.9 percent of the total number of people. These include 9,000 employees with senior-grade job titles, 20,494 employees with mid-level job titles, and 24,186 employees with low-level job titles, equal to 7.0 percent, 16.0 percent, and 18.9 percent, respectively, of the total number of people.

In terms of educational levels, a total of 45,056 of the personnel have educational levels at the college level and above, equal to 35.2 percent of the total number of personnel.

Enterprises in the development zones have attracted 6,673 part-time personnel and 93 unregistered personnel.

II. Management Conditions in the High and New Technology Industry Development Zones

Most of the development zones were established rather recently, but they have already achieved rather good results. The gross income of the development zones for 1990 was 7.68 billion yuan and per capita income was 60,000 yuan. This includes 4.36 billion yuan in income from production and product sales, equal to 56.8 percent of their total income, 1.20 billion yuan in technical income, equal to 15.6 percent, 1.85 billion yuan in income from commodity sales, equal to 24.1 percent, and 270 million yuan in other income, equal to 3.5 percent.

All of China's development zones realized 1.02 billion yuan in taxes and profits in 1990, which was 8,000 yuan in profits and taxes realized per person. They paid 480 million yuan in taxes in 1990. Their total export volume (abbreviated as "export volume" below) for 1990 converted to renminbi was 690 million yuan. Their outlays of R&D expenditures during 1990 were 430 million yuan. Their fixed assets had a net value of 2.46 billion yuan at the end of 1990 and they had a total of 5.28 billion yuan in circulating capital at the end of 1990.

The development zones had 938 achievements that received awards including 67 international awards and 160 state-level awards.

III. Primary Products and Projects of China's High and New Technology Industry Development Zones

In 1990, China's development zones had a total of 2,375 types of primary products including 178 types of state-level Torch Plan project products, equal to 7.5 percent of the total, and 232 types of local-level Torch Plan project products, equal to 9.8 percent of the total.

China's development zones had a total of 2,026 primary development projects, including 788 projects in the electronics and information fields, equal to 38.9 percent of the total, 174 projects in the field of new types of materials, equal to 8.6 percent of the total, 393 projects in the field of electromechanical integration, equal to

19.4 percent of the total, 136 projects in the field of biotechnology, equal to 6.7 percent of the total, 163 projects in the field of new energy resources and high efficiency energy conservation, equal to 8.0 percent of the total, and 372 projects in other fields, equal to 18.4 percent of the total.

Total funds of 880 million yuan were invested in primary development projects, including 110 million yuan in project allocations, equal to 12.5 percent of total expenditures, 300 million yuan in project loans, equal to 34.1 percent of total expenditures, 420 million yuan in funds raised by the projects themselves, equal to 47.7 percent of total expenditures, and 50 million yuan in foreign investments in projects, equal to 5.7 percent of the total.

IV. Export-Oriented Capabilities of China's High and New Technology Industry Development Zones

The development zones had a total of 151 enterprises that earned foreign exchange from exports, equal to 8.9 percent of the total number of enterprises. These enterprises that earned foreign exchange from exports accounted for 60.8 percent, 51.4 percent, and 72.4 percent, respectively, of the corresponding total figures for the gross value of output, gross income, and total taxes actually paid for 1990 of all enterprises in the development zones.

In 1990, China's development zones had 180 types of primary export products, equal to 7.6 percent of the total number of their products. The product export rate was 16.5 percent (product export rate: volume of product exports as a proportion of income from product sales).

The total volume of product exports was 290 million yuan, including 130 million yuan from exports to the primary industrial nations of the West, equal to 44.7 percent of the total volume of exports, and 120 million yuan from exports to Hong Kong, Taiwan and Southeast Asia, equal to 41.4 percent of the total volume of exports.

Note 1: After approval of the Beijing Municipality New Technology Industry Development Experiment Zone by the State Council in 1988, the State Council also approved 26 high and new technology industry development zones in 1991 that had already been examined and approved by the State Science and Technology Commission as National High and New Technology Industry Development Zones. They included five development zones that were established within special economic zones and economic and technological development zones. The State Council authorized the State Science and Technology Commission to be responsible for examining and approving the regional scope and area of the National High and New Technology Industry Development Zones and carried out responsible management and concrete guidance.

Note 2: There were 36 development zones that participated in the statistics for 1990, including five development zones that had just been established and for which no enterprise data was available for 1990, so actually only 31 development zones participated in the pool.

Western China's Largest S&T Park Built in Gansu

92FE0115D Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 2 Oct 91 p 1

[Article by reporter Sun Minghe [1327 2494 3109]]

[Excerpts] A typical western province, Gansu, has recently made an meaningful advance on to the high-tech industrial scene. The Governor of Gansu, Jia Zhijie announced not long ago that the Lanzhou Ningwozhuang High-Tech Development Experimental Zone would become China's largest western high-tech park with an annual output value of over 2 billion yuan.

Ningwozhuang, the "Science City" of the west is located in the center of Lanzhou, where the talent, technology, achievements, and facilities may be called the best in the west. Three years ago, Gansu Province built the Ningwozhuang Development Zone. In March of this year, the Ningwozhuang Development Zone was designated by the State Council as a national level high-tech development zone.

"In the whole western half of China, if a line is drawn from Chengdu to Shaanxi, Lanzhou Ningwozhuang is the only national level high-tech development zone in more than half of that territory. Therefore, it is the star and the beacon of the west." This is what Governor Jia Zhijie said on 27 May this year during a workday talk at the Ningwozhuang Development Zone. At an office meeting attended by members of the provincial and municipal government's planning, banking, construction and labor affairs departments, eight decisions were reached giving Ningwozhuang the go-ahead toward a target of "2 billion yuan". Now, after only 3 months, construction progress at the Ningwozhuang Development Zone has been remarkable. [passage omitted]

It has been learned that Gansu will soon issue policies favorable to the development zone, and most recently, 43 enterprises have sought to invest 230 million yuan in the zone and have applied for the construction of 86 factories.

Electronics and Communications S&T Development Park Under Construction

92FE0041F Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 7 Aug 91 p 1

[Article by Lu Hua [7627 5478]]

[Excerpts] In an effort to accelerate the development of high-tech, new-tech industries, the Weifang City

Commission and the City Government decided to construct an Electronics and Communications Science and Technology Park. The first stage of this construction project is currently under way.

The Weifang Electronics and Communications S&T Park is anchored by the Weifang Electronic Engineering Co. and the Huaguang Electronics Group; additional electronics and communications firms are also expected to be located in the Park and new products will be developed. The goal of this project is to develop the S&T Park into an electronics research and development center, an integrated production base and a technical service and training center, and target on domestic and international markets.

Construction of the Weifang Electronics and Communications S&T Development Bank is divided into two stages. The first stage will be completed by 1993, at which time the annual revenue of the high-tech, new-tech industry is expected to reach 500 million yuan, and the profit tax revenue is expected to be 100 million yuan.

Liquid Crystal Technology and Engineering Research Center Established in Beijing

92FE0041G Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 8 Jul 91 p 1

[Article by Fan Jian [4907 4675]]

[Text] China's first Liquid Crystal Technology and Engineering Research Center was recently established in Beijing. Liquid crystal technology is a modern high technology pursued by most developed countries. Experts predict that by the year 2000, liquid crystal components will become the dominant products for display equipment. The greater Beijing area was the birth place of China's liquid crystal technology; the first production line of liquid-crystal display devices was established here in 1980. This reporter has learned that the primary mission of the Liquid Crystal Technology and Engineering Research Center is to study practical techniques for mass-producing liquid crystal materials and liquid-crystal display equipment, and to promote the commercialization, mass production and international marketing of products of scientific research and development. It is also the Center's goal to establish an important base for disseminating new technologies and training skilled personnel for the liquid crystal industry of other parts of the country.

Shanghai Microelectronics Engineering Research Center

92FE0041E Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 25 Sep 91 p 4

[Article by Jiang Wei [1203 1792]]

[Text] The Shanghai Microelectronics Engineering Research Center, which was the first engineering research center approved during China's "Eighth 5-year plan" period, is currently under construction in the Caohejing Development Zone.

This project is the result of an important decision made by the State Planning Commission during the "Eighth 5-year plan" period to develop China's microelectronics industry, and in particular to meet the urgent needs for large-scale integrated circuits (LSIC). The plan calls for the allocation of 90 million yuan to be managed by the Microelectronics Branch of the Shanghai Institute of Metallurgy of CAS—the Shanghai Microelectronics Research and Development Foundation—for the purpose of developing an autonomous production capability of microelectronic components and integrated circuits. In support of the "Seventh 5-year plan," the Microelectronics R&D Foundation had completed 41 scientific and technical projects and had developed 62 different types of integrated circuits for 33 users around the country. In particular, the "3-micron CMOS optimization process" developed by the Foundation was given the Award for Superior Scientific Achievement by the State Planning Commission, the State Science and Technology Commission, and the Ministry of Finance.

According to the plan, the Engineering Research Center will construct a standard production line and a design/fabrication center for LSIC; this facility will have the same high standards as other integrated-circuit production lines in the Shanghai metropolitan area, and will serve as a model facility for transforming R&D products into mass-production industrial products, as well as for market development.

The Engineering Research Center will operate as a single research-development-testing-production organization. Once completed, it will be able to partially satisfy the domestic needs for small-scale, special-purpose integrated circuits; it will also be constantly developing new products and converting those high-demand products into mass-produced industrial products for marketing.

First Agricultural High, New-Tech Experimental Park in Operation

92FE0115F Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY]in Chinese 18 Sep 91 p 1

[Article by Liu Youlin [0491 0645 2651] and Li Yucheng [2621 3768 2052]]

[Text] On 16 September, at the Cuipinghu S&T Park in southeastern Jixian, Tianjin Municipality, China's first agricultural high-tech experimental park was formally opened. This experimental park for the development of agricultural high-tech industry will emphasize biotechnology.

The S&T park for agriculture has 5 plant, animal, biochemical, and soil experimental laboratories, 4 classrooms, and 300 square meter greenhouse and nursery, and it has also opened up an experimental area for breeding varieties of forest trees, forest produce, economic crops and food crops.

It has been learned that after 5 years this park, which occupies an area of 238 mu, will become a new-age agricultural S&T park capable of providing S&T experimental, S&T modelling, S&T exchange and training, and S&T consultation services.

Hefei "Science Island"

92FE0041D Shanghai JIEFANG RIBAO in Chinese 30 Jul 91 p 5

[Article by Zheng Zhengshu [6774 2973 1859] and Gao Guoquan [7559 0948 2938]]

[Text] After 10 years of hard work in research and exploration, the Hefei branch of the Chinese Academy of Sciences (CAS) has made a series of breakthroughs in the so-called "sun-belt" high-tech areas. Members of the CAS are working with scientists around the world to attack the four key projects of the 21st Century.

The four key projects are: lasers, new energy sources, new materials and information technology. During the past 10 years, the more than 2,500 scientists and research staff of the Hefei CAS have been actively and diligently working in these areas, and more than 300 significant results have been obtained. Among these accomplishments, nuclear fusion research and superconductivity research which can potentially produce far-reaching results to develop new energy sources and new materials for the next century, are at the same level attained by developed countries.

The Hefei CAS has the nickname "Science Island" because it is located on the Dongpu Island in Shushan Lake west of Hefei City; its structures consist of a series of beige and white buildings hidden in dense woods. These buildings are occupied respectively by the Anhui Institute of Optical and Precision Machinery, the Plasma Physics Research Institute, the Solid-State Physics Research Institute and the Institute of Intelligent Machines. Over the past 10 years, these institutes have acquired more than 30 well-equipped laboratories, approximately 1,000 senior and mid-level scientific and research staff, and have produced nearly 400 students with Master's and Doctor's degrees. The Hefei "Science Island" has become one of China's key research centers for physics and technology.

Of the more than 300 scientific accomplishments, the HT-6M Tokamak device which received the CAS First Prize Award for Science and Technology is already operational; it is an experimental fusion device designed and built by members of the Plasma Physics Institute to support the study of new energy sources for the 21st century. Because of the rapid depletion of the limited energy resources on earth such as petroleum and coal, scientists around the world are devoting considerable effort in trying to extract new energy sources from the ocean. It is estimated that by the middle of the 21st century, mankind will have the capability to harness new sources of energy from the ocean by controlled fusion processes, and will be able to produce it commercially. Scientists at the Plasma Physics Research Institute have made significant progress in this area using the HT-6M Tokamak device, which is considered to be the same standard as mid-class fusion devices built by developed countries. They have also equipped the Tokamak device with a 30-parameter diagnostic system and a computer system, and have constructed a high-power a.c./d.c. pulse generator and a large induction unit with the highest capacity in Asia to produce high- temperature plasma beams for laboratory use. The high-temperature plasma beams have been used not only for nuclear fusion research but also for agricultural seed breedings; seeds that were injected with plasma beams have shown consistent increases in production and harvest yields. Other accomplishments that also received CAS First Prize Awards include: suppression of Tokamak lacerations, new development in the understanding of internal dissipation at the interface of crystals, gaseous overload protection, laser drilling technique, laser medical treatment technique, artificial crystals, etc., have been used in the mass-production of commercial products. The economic benefits generated by the dozen or so products developed by the Institute of Intelligent Machines alone have reached 5 million yuan.

As pointed out by the director of the Hefei CAS, Huo Yuping, the scientists and research staff do not seek personal recognition or financial rewards; the only thing they are striving for is China's position in the world arena of high-tech research. Ninety percent of the comrades who had the opportunity to visit or study abroad have returned to their homeland and are actively working and applying their new knowledge in the assigned research posts.

Since China instituted its political reform and open-door policy, the Hefei CAS has established relations with more than 40 countries and has participated in numerous academic-exchange activities and cooperative efforts with colleagues from other countries. A number of State-level open laboratories have also been established; for example, the Internal Dissipation and Solid-State Defects Laboratory under the direction of the world-renowned scientist and academic committee member of the CAS, Ge Tingsui, has made a number of contributions which are highly regarded here and abroad; the Solid-State Physics Research Institute has published or presented nearly 300 technical papers in international journals or at international conferences. Many well-known foreign scholars and experts have high regards for their Chinese colleagues' accomplishments in the high-tech area, and have expressed admiration for the outstanding efforts made by Chinese researchers in advancing the state-of-art in science. The newly-established research team on the "Science Island," along with the CAS Science and Technology University south of Hefei City and the Hefei Science and Technology

Industrial Park, will play a major role during the next 10 years and during the "Eighth 5-year plan" period in stimulating the growth of China's high-tech industry and in promoting the economic development of the Anhui area and the entire country.

High-Tech Zones Eye Export Mart

40101006A Beijing CHINA DAILY (National) in English 5 Oct 91 p 3

[Text] An export-oriented industrial group based on the development of new and high technologies has formed in East China.

According to an overseas edition of PEOPLE'S DAILY, the group's annual output value has surpassed 20.6 billion yuan ($3.88 billion).

Approved by the State Science and Technology Commission in March this year, eight State-level new and high-tech zones in East China's Shanghai and Fujian, Jiangxi, Jiangsu, Zhejiang, Shandong and Anhui provinces were established. Some provincial zones were set up in Shandong and Fujian.

To create a favourable environment for investment and to attract more advanced enterprises both from home and abroad, the zone has been granted preferential policies in taxation, import and export, and travel abroad for employees.

Most of the eight newly-established zones have completed basic infrastructure construction such as running water, electricity and roads. With the construction of new workshops and service buildings, some enterprises have gone into operation.

With more than 300 new and high-tech enterprises, the zones have developed nearly 100 items of technologies to be used in fields such as micro-electronics, fibre optics communications and environmental protection, creating an output value of 2.66 billion yuan ($501.9 million).

The region has also made much headway in renovating traditional enterprises relying on new and advanced technologies.

Computer-controlled design, photoelectricity and application of new materials have been incorporated into traditional industries as machinery, textile and medicine.

Nearly 20 billion yuan ($3.77 billion) worth of new and high-tech products is produced by traditional industries in the region.

Economists predicted that the rising export-oriented new and high-tech enterprise group will give impetus to the country's economic take-off and promote and strengthen its contacts with other countries. (CD News)

Kunming Wuhan High-Tech and New-Tech Industrial Zone

92FE0041C Kunming YUNNAN RIBAO in Chinese 21 Jul 91 p 2

[Excerpts] The Wuhua development zone is Kunming's first high-tech, new-tech development zone that was established and approved by the People's Provincial Government in September 1990 under special development policies. It is an experimental and prototype district dedicated to the development of Yunnan Province's high-tech and new-tech industries; it is also a frontier district designed to stimulate and internationalize Yunnan Province's economy.

The overall development strategy is to attract domestic and foreign investments, technologies, and skilled personnel by promoting Yunnan's rich natural resources and its favorable geographic conditions. The main goal for this region is to establish high-tech and new-tech industries by applying technologies to natural resources, and consolidating research and production; to establish international markets in South Asia and Southeast Asia; and to transform the local economy into a technology-based economy.

The new development zone will be supported by a flexible government with favorable policies and new management systems to provide a good environment for the high-tech and new-tech industries.

Development will be focused on two major resources of Yunnan Province: biological resources and mineral resources, and five technology areas: new materials technology, bioengineering technology, integrated optical-mechanical-electrical technology, electronic computer applications and new energy sources technologies. Three functional districts with a total area of 3.3 square kilometers will be established. Also, a high-tech, new-tech industrial team which consists of engineers, technicians and businessmen will be formed.

Construction of the development zone will be divided into three stages.

During the first stage (1990-1991), 240 mu of land will be acquired for development and 50 high-tech and new-tech industries will be accepted as initial members of the development zone.

During the second stage (1992-1995), the three functional districts will be constructed, and the basic layout of the different firms will begin to take shape; at the same time, the number of high-tech products will grow, and the technical quality of the products will continue to improve.

During the third stage (1996-2000), two new functional districts will be constructed and the development zone will become the strategic center for development, distribution and coordination of Yunnan Province's high-tech and new-tech industries.

Jinchang High-Tech, New-Tech Industrial Zone

92FE0041B Lanzhou GANSU RIBAO in Chinese 12 Aug 91 p 4

[Text] In order to speed up the development of high-tech and new-tech industries in the Jinchang development zone and to implement Comrade Song Jian's directive to develop Jinchang City into a high-tech, modern industrial city by using the resources and products of the Jinchuan Co., the Provincial Government held a working conference in Jinchang City in early June, and decided to designate a 3 square-kilometer area east of the City as the Provincial high-tech and new-tech development zone. It was pointed out that the development of high-tech and new-tech industries in this region not only is of critical importance to the economy of Jinchang City and to the entire province, but also has a significant effect on how to take the next step in achieving the strategic target for this province.

The Jinchang high-tech and new-tech industrial zone is located east of the City, adjacent to downtown and the development zone; with ready access to basic support facilities of the City and absence of industrial pollution, it is an ideal place to develop high-tech industries, research organizations and laboratories.

The Jinchang development zone will rely on the Lanzhou Ningwozhuang high-tech and new-tech development zone and the Jinchuan Co. to establish technical interchanges with both domestic and foreign scientific organizations and universities. Through imported foreign technologies and through our own innovative efforts, much resources will be devoted to the scientific and technological developments of this region. In the near term, the key development efforts will be concentrated in the following areas:

—To increase the recovery rate and product quality of metal production.

—Development of special alloy materials.

—Application of microelectronics technology.

—Development of refined chemical industries and new chemical engineering products.

—Development of energy-conservation technologies and new energy resources.

—Development of biological and biochemical technologies.

—Use of high-tech and new-tech procedures in producing non-metallic mineral products.

—To continue research and application of advanced environmental protection technologies and to establish additional research organizations.

Currently, a number of high-tech and new-tech items have been put in scale production; for example, rare-metal process factory and powder metallurgical factory have been constructed. Preliminary development efforts have also been initiated in other items such as Monel alloy, disposable syringes, battery charger and vegetable glycerine. In an effort to reach the development goals in the shortest possible time, the Municipal Government has taken additional measures and instituted favorable policies to encourage research institutions, universities and industries to participate in the construction of the Jinchang development zone, and to take a leadership role in establishing high-tech and new-tech enterprises as well as scientific consulting, design and information firms. It is also providing various service and support facilities such as residential apartments, office buildings, warehouses and centralized heating plants; in addition, it is increasing its budget to ensure that public services such as water, roads, electricity, telecommunication lines, etc., are adequately provided for this region.

The Jinchang development zone invites all scientists, engineers and scholars to take part in this exciting opportunity by contributing their talents and pursuing their careers in this region.

Xiamen High-Tech Zone Signs Big Deals

40101006C Beijing CHINA DAILY (Economics and Business) in English 18 Oct 91 p 2

[Text] Xiamen (Xinhua)—The Xiamen special economic zone (SEZ) in South China's Fujian Province recently signed $20.8 million worth of contracts with overseas companies involving computers, digital machine tools, semi-conductive materials and crystal displayers.

During investment and trade talks held here in September, the Torch High-tech Industrial Development Corporation (HIDC) in the SEZ signed contracts with four overseas companies.

In the future, the company will co-produce Mac-model computers with the American Apple Computer Corp. It is the first co-operative project for Apple to carry out in China.

Under another contract, HIDC will introduce technology from Canny Sun International of Hong Kong to produce liquid crystal displayers. HIDC will also introduce a production line of copper alloy cord used in transistors from the Fan Jia International Co. of Hong Kong.

In addition, the corporation has signed a contract with Chanda Enterprises Co. to establish a software centre. The contract involves production of computerized digital-controlled machine tools, computer software, communication networks and integrated circuits.

The Xiamen SEZ set up a torch high-tech development zone at the end of 1990 under the co-sponsorship of the city government and the State Science and Technology Commission.

Complete transportation and basic facilities have been built in the 84-hectare zone located to the north of the city. New workshops are under construction in the high-tech zone.

Discussion of dozens of high-tech co-operative projects between Xiamen and overseas companies are underway.

The SEZ has drafted a number of favourable policies for overseas investors to set up high-tech industries in the zone. The SEZ has planned to increase the percentage of high technology application in its economy to 45 percent in the next five years.

Study on S&T Investment Coordination

92FE0031B Beijing KEYAN GUANLI [SCIENCE RESEARCH MANAGEMENT] in Chinese No 5, Sep 91 pp 62-64, 48

[Article from GUOJIA KEWEI JIANBAO [State Science and Technology Bulletin] No 16, 25 Mar 91: "Major Progress in Coordination and Research Work on the Question of China's S&T Investment Specifications"]

[Text] S&T investments are an issue of extreme concern to S&T circles and all the people of China. The S&T Investment Coordination Group and Expert Research Group organized by the State Science and Technology Commission and with participation by S&T, finance, planning, unified planning, and other departments conducted special research and coordination work on the question of S&T fund investments in an attempt to establish a set of S&T investment indicators that can be used for international comparisons and which conform to our national conditions and have unified specifications.

I. The Importance and Urgency of Unified Specifications for S&T Fund Investments

1. For a long time, China has not had a unified set of specifications and computation methods for S&T funding indicators that could be made public and compared internationally and which conformed to our national conditions, which was very ill-matched to China's modernization and construction. Developing countries like India, Brazil, South Korea, and so on all have been able to make public the total amount of S&T funding in their country, expenditures on research and development (R&D), the ratio of R&D expenditures to GNP, and so on.

2. This situation is very poorly adapted to the basic principle in China of relying on S&T to invigorate the economy. It has direct effects on the mobilization and fight for more effective support from society for S&T. There is no comprehensive understanding of the total amount, structure, proportions, and so on of S&T fund inputs by S&T circles and financial departments, and it makes it difficult to carry out macro regulation, control, and guidance based on the needs of S&T reform and development.

3. In the several decades from the founding of our nation to today, there has still been no set of unified S&T funding indicators and figures that could be made public and that had the same specifications. This is another indication that management levels in China are still extensive, which is not adapted to the situation in reform and opening up.

II. The Primary Content and Progress of Research and Coordination Work

To establish a set of indicators and specifications for S&T investments that are internationally comparable and that conform to our national conditions, we should focus on doing research and coordination concerning these three problems:

1. Investments in S&T from state finances;

2. China's investments in research and experimental development (R&D);

3. S&T investments by enterprises, research organs, and institutions of higher education.

We have already made important advances and results:

1. China has designed and proposed the first set of unified specifications and computation methods for S&T funding that are internationally comparable and conform to China's national conditions. They have standardized the definitions, boundaries, and contents of the three main S&T activities supported by China S&T expenditures.

2. We have proposed four funding indicators that reflect the overall situation in China's S&T funding in the present stage.

3. We have prepared calculations for the situation in China's S&T funding for the past several years based on these unified specifications and methods.

4. We have analyzed several important development trends in China's S&T funding.

III. The Three Major S&T Activities Supported by China's S&T Expenditures

To establish indicators for China's S&T funding (unified specifications), we first studied and standardized the definitions, boundaries, and contents of S&T activities.

A. Definition of S&T activities

According to the definition of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), these are "activities that are closely related to the creation, development, transmission, and application of scientific and technical knowledge in all S&T fields". Based on China's national conditions, S&T activities in China include three main parts: 1) Research and experimental development (R&D) activities (internationally comparable); 2) S&T activities during the stage of converting S&T achievements into commodities (based on China's national conditions); 3) S&T service activities (internationally comparable and conforming to China's national conditions).

B. Research and experimental development (R&D) activities

We fully adopt the internationally comparable UNESCO definition: "systematic and creative work carried out to increase total knowledge and apply this knowledge in creating new applications". Research and experimental development activities are composed of three parts: 1) Basic research; 2) Applied research; 3) Experimental development.

C. S&T activities in the stage of converting S&T achievements into commodities

Research considers S&T activities to convert S&T achievements into commodities an essential and important part China's S&T activities. This is essential for reflecting the overall situation in China's S&T activities. This area was rather weak in the past. Reinforcing the conversion link is one task that China has had to deal with in S&T structure reform and development over the past several years. Although there are no unified views regarding this in foreign countries, this conforms to China's national conditions. The definition of S&T activities during this stage is: "S&T activities carried out to gain an understanding of the conversion of achievements in R&D activities (theses, principle prototypes, samples, etc.) into products and commodities". They are a part of S&T activities and an extension of R&D activities, but do not fall within the scope of R&D activities. Their scope of coverage is the stage following the completion of R&D activities up to industrial fixed-model production. They are composed of three parts: 1) Design and trial manufacture; 2) Small batch trial manufacture (intermediate testing); 3) Industrial experiments, etc.

D. S&T service activities

According to the UNESCO definition, these are "activities related to scientific research and experimental development and which assist in the creation, transmission, and application of S&T knowledge". In themselves, they are not R&D activities. In China, they serve R&D activities as well as S&T activities during the stage of converting S&T achievements into commodities. According to the UN definition, they are composed of nine main categories of S&T service activities: S&T libraries, archives, and information abstract centers; computation and standards; statistics; S&T museums and S&T animal and plant zoos and parks; editing and translation of S&T books and periodicals; resource exploration; topographic and hydrological surveys and astronomic, climatic, and seismic observations; patents, licenses, S&T popularization and consulting, and so on.

In summary, China's total investments in S&T activities should be composed of three parts: funds invested in R&D activities, funds invested in S&T activities during the stage of converting S&T achievements into commodities, and funds invested in S&T service to these two categories of S&T activities.

IV. Four Overall Indicators That Characterize China's S&T Funding Situation

To describe China's S&T funding, a group of funding indicators that reflect the overall situation must be designed for the situation that supports these three major S&T activities. The Research Group proposed these four most representative funding indicators that are also scientific and manipulable:

1. All expenditures on S&T activities (not including S&T loans)

The composition is: 1) Expenditures on R&D activities; 2) Expenditures on S&T activities for the stage of converting S&T achievements into commodities; 3) Expenditures on S&T service activities. These include those coming from: 1) Government financial S&T fund allocations; 2) S&T funds raised by enterprises, research organs, and institutions of higher education themselves.

2. Expenditures on research and experimental development (R&D) and the R&D/GNP ratio

The composition is: basic research expenditures, applied research expenditures, and experimental development expenditures. These include those coming from: 1) Government financial allocations; 2) Funds raised by enterprises, research organs, and institutions of higher education themselves.

3. Financial S&T fund allocations

The composition includes: 1) Expenditures on R&D activities; 2) Expenditures on S&T activities in the stage of converting S&T achievements into commodities; 3) Expenditures on S&T service activities. In concrete terms, the standard is total state financial S&T fund allocations each year from the Ministry of Finance.

4. S&T loans

These are mainly used for capital investments in S&T activities during the stage of converting S&T achievements into commodities. In concrete terms, the standard is the sum of S&T loans arranged in bank plans each year and the total loans actually issued by each of the specialized banks and financial organs.

V. Using Computations of China's S&T Funding Situation To Analyze Development Trends in China's S&T Investments

Based on the definition with unified specifications for China's S&T activities, the results of computations of the four S&T funding indicators for 1990 are:

1. Total expenditures on S&T activities (not including S&T loans) were 30.05 billion yuan.

2. The ratio of expenditures on research and experimental development (R&D) to our gross national product (GNP) was 0.7 percent (GNP 1,740 billion yuan).

3. Financial S&T fund allocations were 13.66 billion yuan.

4. The sum of S&T loans was 2.89 billion yuan. The total amount of loans actually issued was 6.12 billion yuan.

Computation of China's S&T funding situation over the past several years shows that there are several major development trends in China's S&T funding:

1. Over the past several years, major changes have occurred in the structure of the sources of China's S&T funding. Of the total of 30.05 billion yuan spent on S&T activities in 1990, 13.66 billion yuan or 45.5 percent came from government financial allocations, while 16.39 billion yuan or 54.5 percent came from non-government allocations, which was a larger proportion than government financial allocations. This shows that by reforming the S&T system, a situation of multiple investment channels has begun to appear in China's S&T funding. This is also the result of active orientation toward the economy by S&T circles over the past several years.

2. The internationally comparable R&D/GNP ratio was 0.7 percent in 1990. This figure indicates that China is at a middle level among the developing nations (Note: the R&D/GNP ratio for developing countries is generally between 0.5 percent and 1.0 percent. It is 1.2 percent in India, 1.8 percent in South Korea, 0.7 percent in Brazil, and 0.5 percent in Singapore, and is above 2 percent for all the developed countries). To adapt to the requirements of the present new technological revolution in the world and adhere to the principle of relying on S&T to invigorate the economy, investments in this area must be increased. If we ensured a 0.1 percent increase each year in the future, China's R&D/GNP ratio could be expected to reach about 1.2 percent by the end of the Eighth 5-Year Plan.

In addition, about two-thirds of R&D funding came from government financial allocations, which shows that government finances are still the primary aspect of investments in S&T activities.

3. There was an increase of about 6.8 percent from 1989 to 1990 in financial S&T funding allocations, while our GNP rose by 10.2 percent (calculated at current prices) over the same period. Thus, there should be further reinforcement of financial S&T funding. We suggest that in the future, listings for S&T funding and R&D funding should be added to finances.

4. S&T loans are a new capital channel for S&T investments that has appeared in the past several years. On the one hand, this is a reflection of the changes in China's S&T operational mechanisms and a product of the integration of the planned economy with market regulation. On the other hand, it is also an inevitable trend in the optimization of capital investment directions by financial circles. The integration of S&T with finance is revealing its vitality with each passing day. However, the amounts at present are still small. Loans in 1990 totalled 2.89 billion yuan, which is only about one- fourth of research expenditures (i.e., R&D expenditures). As capital support for the conversion of achievements into direct forces of production, however, this amount should usually be several times that of research expenditures. Analysis of real needs shows that it should be increased substantially. Projections indicate that over the next 5 years or so, S&T loans should attain or surpass the situation for the amount of financial S&T allocations and become one of the three main pillars of China's S&T investments.

Approach Combining Science and Technology With Financial Resources

92FE0064C Shanghai KEJI GUANLI YANJIU [STUDIES IN S&T MANAGEMENT] in Chinese No 4, Jul-Aug 91 pp 26-27

[Article by Cao Ruxian [2580 3067 6343] of the Hunan Province S&T Information Institute: "A Preliminary Exploration of Integrating S&T and Banking"]

[Text]

I. Mechanisms for Integrating S&T and Banking

Integration of S&T and banking refers to S&T departments changing from complete reliance on the financial administration as their source of capital to partial reliance on the financial administration and partial reliance on credit support from banking departments. Banking departments use support of S&T departments to spur S&T progress, promote readjustment of the industry structure and product mix, and rationalize the credit structure to achieve a benevolent cycle in the national economy.

Integration of S&T with banking is embodied in the two processes outlined below.

1. It is embodied in the process of creating S&T achievements. During this process, to meet the requirements for socioeconomic development and their own needs, scientific research units must rely on compensated utilization of bank credit capital all the way from topic selection to the making of an achievement. To obtain excellent social and economic benefits, banks must also make compensated investments in scientific research units. Because scientific research activities have a certain exploratory nature, both parties bear the burden of the potential investment risk.

2. It is embodied in the process of converting S&T achievements into forces of production. During this process, scientific research units need bank loans to convert an S&T achievement into a commodity and enterprises need them to achieve product replacement and increase competitiveness and economic benefits. The banks use investor S&T tracking loans to raise the integration of credit with S&T achievements to a higher level. In this process, S&T achievements continually increase in value, enterprise profits are multiplied, and banks also receive stable benefits.

II. Methods for Integrating S&T With Banking

A. Macro control, establishing foci.

Provincial and municipal science and technology commissions should normally maintain relationships with various banks, immediately notify banks of state, provincial, and municipal principles, policies, plans, and so on concerning S&T work, and encourage banks to understand and support S&T work. They use joint survey research, analysis of the resource characteristics of provinces and municipalities, existing economic and technological conditions, and market demand conditions to determine the foci of S&T development and S&T loans in the short term, make S&T development plans conform to strategic objectives for economic development, and achieve macro control.

B. Joint discussion, selection of optimum projects.

S&T loans have definite exploratory qualities and involve risks. These risks concern not just the technical aspects but market changes as well, so conscientious and comprehensive technical debates and economic evaluations are required during the project establishment stage. First, science and technology commissions should make initial assessments and preselections of projects submitted. Then, they should organize leaders and experts in the science and technology commission, banks, and administrative departments in the units assuming responsibility to make on-site inspections and jointly conduct feasibility discussions. S&T departments should focus on the advanced qualities, appropriateness, and reliability of the technology. Banks should focus on economic evaluations, analyze the economic rationality, and forecast the economic benefits. Administrative departments in the units assuming responsibility should focus on debating the capacity of the enterprises for assuming responsibility, the material conditions, and personnel quality. Finally, joint evaluations and selections are made to establish projects.

C. Tracking services, expanded benefits.

When initial results are seen from an S&T loan, S&T achievements have begun to be converted into forces of production, and there are excellent prospects for trial marketing certificates for new products, enterprises usually hope that banks will continue to make loans so that they can further develop series of products and expand production. At this time, banks should waste no time in investing tracking loans and matching loans to enterprises to achieve an even higher level. In this way, while the value of materialized new products continues to expand, S&T achievements can also continue to increase in value and both the enterprises and the banks can obtain even greater benefits.

D. Submission by categories, reinforced management.

When banks are selecting their own investment directions, they often must consider many types of factors. The investment directions of different banks change during different stages. The science and technology commissions can provide differential treatment for different banks according to project categories. For banks that are enthusiastic about large and medium-sized enterprise projects, projects from large and medium-sized enterprises should be submitted to them. For banks that are willing to centralize capital to support key projects, typical projects can be submitted to them. For banks that are enthusiastic about supporting foreign exchange earning projects, foreign exchange projects can be submitted to them. When compiling S&T plans, science and technology commissions should make analytical comparisons and strictly sift through them.

We should reinforce management over loans to prevent a focus on loans while neglecting management. After a project is approved, a contract should be signed between the borrowing unit, the bank, and the science and technology commission and only then can the loan be allocated. For science and technology commission S&T development funds and S&T loans issued by banks under authorization by science and technology commissions, after determination by the science and technology commission and the bank, the bank should be responsible for allocating the loans and for supervising their utilization and recovery on schedule. While banks are recovering loans, they can also collect 1 to 3 percent of the amount of the loan authorized by the commission from the borrowing unit as a procedural fee. This would reinforce supervision over loan utilization and it would help in recovering S&T expenditures and filling out S&T development funds. In addition, we must strengthen post-loan scheduled tracking and inspection, supervise the special use of special funds by enterprises, immediately discover problems, finds causes, and urge and encourage resolution. When it is discovered that a project has been terminated or that the loan has been misappropriated, they should immediately pursue recovery of the loan.

More Funds for Science

40101005B Beijing CHINA DAILY (National) in English 21 Sep 91 p 3

[Text] A senior government science official has called for more input in the country's science and technology development.

Song Jian, State Councillor, said that to ensure a sustained science and technology advance, the financial allocation for scientific research should be raised from the 0.7 percent of the gross national product in 1990 to 1.35 percent in the year 2000.

Song's prescription places scientific power, high technology, and basic research on centre stage in the country's science programme.

Song, also minister in charge of the State Science and Technology Commission, recently wrote a long article delineating five points which are critical for developing science and technology in the 1990s.

The article, entitled "Science and Technology in China, a Retrospective and Prospectus", says that the development of science and technology should be put high on the agenda of party and government organs at all levels, and that Chinese people's scientific consciousness should be improved.

To help prevent a further decline in numbers of technicians, Song wrote that the government and all units and enterprises should encourage and motivate technicians by improving their work conditions and welfare.

It has also been learned from yesterday's board meeting for China International Association of Science and Technology, that China is to further its efforts to introduce scientific and technological achievements, particularly in the high-tech field, onto the international market.

The association, set up three years ago, has backed several deals to promote Chinese technology into foreign countries and has hosted several international scientific exhibitions, according to a spokesman for the association. (CD News)

Beijing To Upgrade Budget for High-Tech

40101005G Beijing CHINA DAILY (Economics and Business) in English 17 Aug 91 p 2

[Text] The Beijing municipal government plans to double its new technology budget to $1.3 billion in the next five years.

The generous purchase scheme is part of the city's plan to seek wider technical links with foreign countries to promote technical progress, a senior Beijing foreign trade official said yesterday.

The outline under consideration includes securing the bulk of funds from foreign governments and commercial banks while stepping up efforts to increase technical exports.

The decision seems to echo the central government's frequent calls for more efforts on technical progress as outdated machinery and obsolete technologies hamper economic development.

Beijing's foreign trade officials are currently huddled in a three-day conference which ends today, comparing notes and working out strategies and guidelines for technical imports and exports.

The trade official said the city intended importing up to $1.3 billion worth of new technologies to update urban infrastructures and environmental protection as well as industrial and agricultural production projects.

Of the funds needed, the city plans to borrow $700 million-$800 million from foreign governments and the World Bank and $200 million-$300 million from foreign commercial banks with the rest coming from the domestic banks.

He said that software imports will be given top priority while technical imports would centre on updating mid-size and large State-owned enterprises.

He said that as foreign government loans had been the major source for financing the city's technical imports, Beijing had decided to set up a debt repayment fund to pool capital and stipulate measures on debt repayment.

The city's outstanding foreign debt now stood at $400 million and was expected to reach $1.2 billion by the end of 1995.

Beijing would try everything possible to deal with the forthcoming debt repayment peak period.

Meanwhile, the official said, further efforts would be made to increase technical exports from the current $50 million per year to $100 million by the end of 1995.

More loans will be given to finance exports of steel products, electrical-mechanical products, building materials, and light industrial products.

As part of the efforts, more teams would be sent overseas to scout for sales opportunities and open up more foreign markets.

He said that the ambitious plan on technical imports were based on the enormous benefits that the technical imports had brought to the city in the past decade.

By the end of 1990, the city imported 1,772 technical projects and key machinery and industrial installations, amounting to $1.68 billion.

The technical imports have helped boost development of the city's industries such as auto, electronics, foodstuff, textiles, and building materials, bringing the products up to the international standard.

Funnel Funds to Science Ventures

40101005C Beijing CHINA DAILY (Opinion) in English 5 Sep 91 p 4

[Text] China's State treasury cannot be responsible for funding all of the nation's scientific and technological ventures.

The newspaper SCIENCE AND TECHNOLOGY DAILY quoted Wang Bingqian, Minister of Finance, as saying that society as a whole should support science and technology and that other sources must be found to invest in scientific projects.

At present, the government supports scientific and technological projects through the direct allocation of State funds and by preferential policies.

During the Seventh 5-Year Plan (1986-90) the State allocated more than 61 billion yuan ($11.5 billion) for scientific ventures. This increased at an average rate of 5.9 percent annually during the period.

The State's preferential policies for technological projects include tax breaks that are aimed at improving the enterprises' profits and encouraging the development of new products. These policies also allowed enterprises and scientific research institutions to raise another 60 billion yuan ($11.3 billion) for technological development.

But compared with developed countries, China's investment in science and technology is still at a rather low level, Wang said.

China must increase its investment so as to compete on the world market, he said.

Wang said that despite the strained financial conditions, the State budget still plans to earmark 15 billion yuan ($2.8 billion) this year, 10 percent more than last year.

But these are far from adequate, the minister said. In 1990, State funds and preferential policies provided about 80 percent of the 30 billion yuan ($5.6 billion) spent on science and technology.

Wang held that bank loans are becoming an important source of funds. Last year, loans accounted for 20 percent of the total investment.

According to the minister, this proportion is unsatisfactory, as bank loans in developed countries usually equal or exceed government allocations, he said.

To ease the shortage of funds, enterprises, research institutions and institutions of higher learning should be encouraged to raise funds by themselves and get farmers, township enterprises and private enterprises to invest in science and technology, Wang said. Donations by non-governmental organizations and overseas circles are also welcome, he said.

The minister stressed that the preferential policies adopted by the State in favour of technical enterprises must be implemented fully so that the ventures can put more money towards product development, and he revealed that more such policies are planned.

It is imperative that scientific research results be applied to production, Wang said. At present, only 25 percent of research results can be utilized in production, a figure Wang said is too low.

It is useless to invest in science and technology if research results are not applied to production, he said.

The minister suggested that the management of funds for scientific and technological undertakings be strengthened to guarantee the funds are not diverted to any other purpose, and to improve the utilization rate of the funds.

In many scientific research institutions and institutions of higher learning, operating expenses often use up one-third of the funds earmarked for scientific and technological undertakings.

Zhou Lian Appointed Superconductivity Research Chief Scientist

92FE0115A Xian SHAANXI RIBAO in Chinese 12 Sep 91 p 1

[Article by Liu Jincheng [0491 6855 1004]]

[Excerpt] [passage omitted] Recently the vice president of the Northwest Nonferrout Metals Research Institute, a standout contributor among national-class specialists, researcher Zhou Lian, has been appointed by the State S&T Commission as the chief scientist for the national key project for "basic research on high-critical-temperature superconductors".

Zhou Lian is an internationally famous superconductor specialist who during the 1960's-70's worked with scientists and technicians of the institute to make the first Chinese breakthrough in niobium-titanium alloy superconductor materials processing and enhanced performance technology, research-manufactured niobium-titanium single and multiple copper core composite wire, and supplied nearly 3,000 kg of superconductor materials of many specifications for China's test-engineering for controlled nuclear fusion, for the first superconductor generator, and for simulated magnetics for high performance accelerator experiments, all with performance characteristics up to international advanced standards. In 1980, they adopted a micro-team approach to new techniques, and set a world record by achieving a critical-current density of 347,000 amperes per square centimeter at -269°C, 5-tesla magnetic field conditions using niobium-titanium multi-copper-core filaments. At the same time, niobium-3-tin (Nb_3Sn) superconductor materials with performance at international advanced standards were test-manufactured.

In 1987, to keep up with world-class high-temperature superconductor materials competition, the scientists and technicians of the institute, working as one of China's premier units, under the guidance of Zhou Lian, began to research high-critical-temperature oxide superconductors, and each year they maintained their leadership position in the country. In 1989, for a world's first, they employed "dynamic continuous-zone melting directional-solidification technology" and achieved an advanced world-level critical current density of over 4,000 amperes per centimeter at 77K (-196°C), 1-tesla magnetic field conditions, using yttrium-barium-copper oxide lump materials. Following that, they were the first in the world to use powder-melt technology to make even higher performance yttrium-barium-copper oxide materials. In October of last year, these materials tested at 77K, 1-tesla magnetic field, achieved a critical current density of 70,800 amperes per square centimeter, another world record, and they received high praise from international superconductor researchers for the contribution to world research.

Overhead Remote Sensing Expert Xue Yongqi Introduced

92FE0115B Shanghai JIEFANG RIBAO in Chinese 27 Sep 91 p 2

[Article by reporter Jia Baoliang [6328 1405 5328]]

[Text] Xue Yongqi [5643 3057 4388] is a news personality who is hard to catch up with. This time, he had just returned from abroad and he's already off again to Australia to look into cooperative aerial remote-sensor prospecting with the Northern States Aerial Survey and Mapping Corporation.

If the 1960's are taken as a starting point, this famous 54 year-old specialist has been involved in China's aerial remote-sensing arena for a full 30 years. He has concentrated his research on getting infra-red (IR) remote sensing data and imagery from the surface of the earth, via the upper atmosphere, on natural resources, the ecological environment, and disasters. In the early years, he took part in successful research on air-borne IR search and survey installations, and successfully built an IR scanner camera.

However, high S&T IR remote sensing technology is still a new and growing science in China. Foreign experts had predicted, "In the next ten years, China will not catch up to present international levels". Xue Yongqi and the older generation at the institute, not willing to take that lying down, were charged with determination to catch up to the "foreigners". In the early 1980's, Xue Yongqi took the responsibility for the key IR technology project for aerial multi-spectral scanner research assigned by the state government. This type of advanced IR instrument was the monopoly of a few developed countries, but Xue Yongqi led the task group from a situation lacking either a model or advanced research conditions, and in 2 or 3 short years achieved success. Once the instrument was installed, aerial remote sensing flights were carried out in the Shenmu area of Shaanxi and in the tomb of Qin Shihuang protected zone, and the data and images that were obtained were world-class. Xue Yongqi was very tenacious at his work, and before long he again set his sights on one of the remote sensing world's most cutting-edge items, the "imaging spectrograph", and he led the task group in a new attack. In less than 3 years time the systematic research that was done on this Seventh 5-Year Plan advanced research task, from overall design, scanning methodology, spectrum analyzer, to the data processing aspects, was a complete success. In 1990, China's first test model 64-band air-borne imaging spectrograph was born at the Institute of Technical Physics. In the Autumn of the same year, test flight trials were successful and China became the 2nd country in the world, behind the U.S., to possess such an advanced technology.

In this way, Xue Yongqi's specialty research laboratory, step by step, developed quickly, and created a series of advanced remote sensing instruments that are preeminent on the international stage. In June 1990, at request of the Soviet Academy of Science, leading a group of scientists and technicians, he carried 19-band multi-spectrum scanners to the Soviet Kursk ecology research site to conduct aerial remote sensing ecology research. The high quality imagery and data earned high praise from the Soviets. Xue Yongqi also continued his successes in China; in the Yunnan Tengchong area he used aerial IR remote sensing technology to conduct geological, geothermal, and forestry studies; in Xinjiang he conducted gold mine, and oil and gas remote sensing prospecting research; sea ice remote sensing imagery studies and national marine pollution enforcement flights were carried out in Liaodong Bay. Last year, he was recognized by the Chinese Academy of Sciences as an outstanding middle-aged and young specialist. This year he was again recognized as an "S&T elite" of Shanghai Municipality.

Prominent Scientists Emerging From Shanghai CAS

92FE0041A Shanghai WEN HUI BAO in Chinese 30 Jul 91 p 1

[Article by Wang Lin [3769 3829], Pan Jinping [3382 6930 1627]]

[Excerpts] The over 300 second-generation academic leaders at the Shanghai branch of the Chinese Academy of Sciences (CAS) have emerged as China's prominent scientists who are playing a major role in basic theoretical research and in development.

The Shanghai CAS has a technical team that includes world renowned scientists and academic leaders. There are 22 veteran scientists who are Academy Members of the CAS such as physiologist Feng Depei, biochemist Wang Yinglai, neuro-physiologist Zhang Xiangtong, organic chemist Wang You, and plant physiologist Yin Hongzhang. In recent years, these first-generation scientific pioneers have gradually retreated into the background, and the second-generation academic leaders are taking over most of the research and development work. The young scientists have out-performed their predecessors with outstanding achievements; 225 of them have become advisors of students seeking Doctor's Degree.

In the area of basic research, the results obtained by middle-aged research scientists Hong Guofan, Yang Xiongli and Xu Zhihong have attracted worldwide attention. Hong Guofan of the Shanghai Institute of Biochemistry has developed the simplest and most-efficient measurement and analysis system available for studying DNA sequences; this system has been incorporated into several authoritative manuals such as the U.S. "Molecular Cloning." The Rockefeller Foundation has accepted Hong to be a member of the Foundation with a 6-year continuous membership. Also, he was assigned the position of editor-in-chief for the book "Biological Nitrogen Fixation and Its Research in China"; this book will be published in Germany this year for worldwide distribution.

Researchers Yang Xiongli of the Shanghai Institute of Physiology has adopted microelectrodes in-cell recording and dyeing techniques and by combining such techniques with pharmacological theories and computer technologies, he has conducted systematic studies of the mechanism of information transfer, modulation and control in the retina and obtained several important results. He was the first one in the world to discover a new horizontal cell based on morphology and physiology. His research on the relationship between the intensity of background lighting and the electrical coupling between retina rods and cones was listed as an outstanding achievement in retina research of the 1980s. These achievements played an important role in the study of information processing in the retina. Yang's work was praised by the international academic community as "having made a fundamental contribution to the understanding of the function of retina."

This group of middle-aged scientists are not only academic leaders but also pioneers in technology development. Researcher Guo Jinkun of the Shanghai Silicate Institute was one of the first investigators engaged in the study of improving the brittleness of ceramic materials. He has systematically studied the chemical and physical compatibility of many fibers—inorganic composite systems, and successfully developed a composite quartz material reinforced with carbon fibers; the strength of this new material was increased several folds and its fracture energy was increased by approximately three orders of magnitude. A new ablation type heat insulation material made of this new composite material was shown to have extremely high resistance against thermal shock and mechanical shock. [passage omitted]

Researcher Kuang Dingbo of the Shanghai Technology and Physics Research Institute has been engaged in the applied research of infrared technologies over the past 20 years. The infrared scanning radiometer used on China's "FY-1" satellite were developed under the direction of Mr. Kuang. These instruments, which were responsible for sending high-quality infrared pictures back to earth, were considered to be state-of-the-art during the 1980s. He also directed the research and development activities of the "spin-scanning infrared altazimuth" used on geostationary satellites, the optical attitude sensor used on the "TW-1" satellite and the sun direction gauge of different degrees of precision.

Returned Scholars Vital in Research

40101005H Beijing CHINA DAILY (National) in English 31 Aug 91 p 3

[Text] Researchers who have returned from studying abroad are playing an increasingly important role in the country's science and technology development.

The overseas edition of the weekly, OUTLOOK, recently reported that by the end of May 1991, the Chinese Academy of Sciences (CAS) had sent 7,371 scholars abroad to study advanced technology in 41 countries, including France, Germany, Japan and the United

States. Included in that number were 5,315 visiting scholars and 2,063 postgraduate students.

Statistics compiled by the Education Bureau at CAS show that over 20 percent of the scholars returned have showed new and different scientific views, and many have achieved excellent results in scientific research. Some 70 percent of the group published valuable theses while abroad.

A bureau official said many of the 3,781 returned scholars were well-known throughout the world. For example, Feng Yuling, a professor at the China Sciences and Technology University, has been a visiting scholar in both the United States and Japan. At present, Feng tutors doctorate students, and during the Seventh 5-Year Plan period (1986-90) was actively involved in key scientific research programmes in the field of high technology.

The survey also showed that of the 3,365 scholars who returned to China between 1978 and 1990, 331 won State-level prizes, while 1,629 had been awarded prizes by academy or ministries. The four winners of first prizes in the 1989 young scientists awards competition at CAS were all returned students.

Many of the returned scholars now hold leading positions at CAS, and over 82.3 per cent have received senior technical titles in various specialty areas.

A CAS official said that the academy would improve its administration of programmes responsible for sending students abroad, and would encourage the students to pursue advanced scientific achievements.

CAS would establish a talent bank of students who excelled while studying abroad. Only those who recorded creative achievements, or have published important scientific theses will be placed in the files of the talent bank. Scholars who are studying abroad can apply for the right to purchase reference materials, reagents and equipment, and can apply for funding to conduct research after they return to China.

According to the official, returned scholars will be granted priority housing and will receive assistance with many other problems. (Xinhua)

Measures To Foster Young Scientists Discussed

92FE0064D Shanghai KEJI GUANLI YANJIU [STUDIES IN S&T MANAGEMENT] in Chinese No 4, Jul-Aug 91 pp 46-48

[Article by Liu Jiangna [0491 4829 1226] of the Chinese Academy of Sciences Changsha Agricultural Modernization Institute: "Factors Obstructing Growth of Talented Young S&T Personnel and Countermeasures"]

[Text]

I. Factors Obstructing Growth of Talented Young S&T Personnel

Our country historically has been extremely concerned with training skilled young S&T personnel. Recently, Chinese Academy of Sciences [CAS] President comrade Zhou Guangzhao [0719 0342 0664] stressed that "one important item of work in the CAS during the 1990's is continuing to foster the role of key middle-aged personnel and gradually transferring the burdens of scientific research to people who are now young". However, there are still several problems in the present management system and policy measures for skilled young S&T personnel that are not conducive to the rapid growth of a large number of talented young people and the growth of talented young S&T personnel is still subject to restriction and interference by obstructing factors from all areas. This is manifested in:

A. Conservatism in raising job titles.

We analyzed statistical data for 1990 from a certain research institute. This institute had 132 specialized technical personnel under 35 years of age, equal to 38.3 percent of the total number of specialized technical personnel, and one of them had attained a high-level job title (assistant researcher post), equal to 1.4 percent of the number of high-level personnel. There were 10 people who had attained mid-level job titles, equal to 8.2 percent of those with mid-level jobs. This shows that the proportion of specialized technical personnel under 35 years of age in the structure of high-level job titles is too small.

Based on the developmental laws of human intelligence and the regular age laws of the world's prominent scientists, the optimum age range is between 35 and 45 years and the peak is 37 years. This is the golden period for S&T personnel of this age range for those involved in scientific research work to contribute to the nation and they should receive full attention and account for a substantial proportion of those raised to senior researcher, selected as academic leaders and project group leaders, and so on. In certain scientific research institutes, however, in the area of competitive abilities and levels of those promoted to advanced specialized technical job titles, they are still actually in the cast-off situation of ranking according to seniority, with the "elderly going first, middle-aged personnel next, and then the young". There is still quite a market for the ideology of waiting and dependence in which one "waits out the years, accumulates years of effort, waits for promotions, and naturally achieves them when they reach the proper age". Because of their young ages, short working years, low seniority, and so on, many talented young S&T personnel have been excluded from being senior researchers and a situation of true "equal opportunity, equal competition, optimum choices, and destroying barriers to promotions" has not yet truly taken shape.

B. Outdated concepts of skills.

Some middle-aged intellectuals are not positive or enthusiastic about training young S&T personnel, their ideology has stagnated in the closed and backward state of the 1950's, and there is a rather serious attitude of stubbornness and adherence to old ways. In their eyes, university students in their 20's are "young and inexperienced, handle matters weakly, and cannot be trusted". College students in their 30's "have insufficient experience, insufficient seniority, and still require training". In research work on many scientific research projects, they are too busy themselves to get started but still will not transfer them to young people. Some topical group leaders and research office directors deal personally with every matter regardless of its importance. They are full of worries, indecisive, and fearful of using young people and do not dare allow young people to take on heavy tasks. They use young S&T personnel and young university students as "high-level temporary workers" and are frequently concerned only with using young people and unconcerned about training them. The lot of most young people is "sitting in the back during meetings, not being given a turn to speak, and having their names put at the tail end when a project is approved". They have no opportunities for training, improvement, and developing their skills.

C. Arbitrary personnel training.

Some research institutes do not begin with a long-term strategic view based on their own requirements and the needs of their discipline regarding training of talented young S&T personnel on the job or updating their knowledge in providing goal-based and planned training. Instead, they lack long-term, unified, and comprehensive programs and often rely on personal relationships, are swayed by their emotions, and are subjective and arbitrary. Leaders make appointments for the training indices and indices for going to foreign countries that are assigned by higher levels of authority. In some cases, even though some people are not key professionals, they receive special treatment in the areas of training and advanced study by being able to undergo multiple cycles of training in "professional advanced studies—foreign language training—going to foreign countries for study", and some even receive repeated training. Although young S&T personnel with lively scholarly ideas and substantial development prospects entered institutes more than 10 years before, they have not had a single opportunity for study and training. These people only have energy output in the scientific research work and have no energy inputs, their knowledge is not updated or supplemented, and "blank points" appear in the area of advanced study and training in specialized knowledge.

Some units also use the small amount of education and training funds they receive each year to conduct various types of training classes and specialized license classes for reserve administrative personnel and provide them with diplomas, improper study histories, and higher job titles while at the same time neglecting to improve the personal quality and update the knowledge of large numbers of young S&T personnel.

Because of the lack of the necessary restrictions by systems of regulations and scientific management methods, some skilled personnel who return from training and advanced study treat the knowledge they have studied as capital for skipping notches. Some change professions, some transfer out, and there has even been a serious erosion of skilled personnel that leads to instability in scientific research staffs. In a research office of a certain institute, for example, four scientific research personnel have transferred out in the last 5 years and all of them had received over 4 months of training in specialized knowledge and foreign languages that was arranged and paid for by the institute.

D. Scattering of topical research.

To exist and grow, a research institute must foster its technical advantages, closely rely on the collective wisdom of all of its scientific research personnel, and fully utilize the technical advantages of the group before it can become an impregnable fighting force and form competitive advantages. However, under the shock and pressure of reduced funding every year over the past few years, a phenomenon has appeared in which scientific research personnel have only been willing to assume responsibility for small-scale projects or topics that produce results quickly and provide good benefits in competing for topics and funds. They have been unwilling to take on basic scientific research projects that involve long schedules, produce results slowly, and have limited funding. This has resulted in the scattering of topic personnel, fighting among topics, everyone doing things their own way, and an absence of the required organic integration. A certain institute, for example, had 45 large and small topics in 1990. There were five, equal to 11 percent, that were the responsibility of one person, 12, equal to 27 percent, that were the responsibility on two people, and five, equal to 11 percent, that were the responsibility of three people. It is quite apparent that this sort of topical research work in which stragglers and disbanded soldiers fight in isolation is not conducive to training and developing young S&T personnel, reserving and developing S&T in research institutes, forming reserve forces, and the competitive status of research institutes in scientific research fields.

II. Countermeasures for Accelerating the Growth of Talented Young S&T Personnel

A. Formulate long-term personnel training programs adapted to the characteristics of research institutes.

S&T personnel are the root of a strong nation and the source of pioneering work. If scientific research institutes wish to train large numbers of high- level top-notch personnel, they must formulate long-term personnel training programs and every discipline and every research office must start early on doing good personnel forecasting work. Within a specific time period and range, they must move quickly to forecast and make arrangements for the directors of each research office, the leaders of each discipline, the situation for those topical group leaders who are going to retire, the mixture of each category of personnel engaged in basic research, applied research, and development research, the structural ratio of advanced, mid-level, and low- level personnel among specialized technical personnel, incoming personnel, and so on and give them unified consideration and prepare detailed programs. When research institutes are formulating scientific research activity development programs, they must also formulate the corresponding synchronous development personnel training programs and continuing education programs. There should be clear provision in the programs that young people should account for a specific proportion (one-third or one-fourth) of persons responsible for topics, research office directors, and scholarly assessment organs. Among existing S&T personnel, testing and evaluation methods can be used for specialized technical personnel in the two groups of under 35 years of age and 36 to 40 years of age to select those superior personnel with both ability and political integrity for carrying out directional training to form various arrangements like professional advanced training, foreign language training, or going to foreign countries for study. At the same time, work to test, evaluate, and select, and train key young S&T personnel should by normalized, standardized, and converted to policy.

Beginning in the 1990's, evaluations of new entering personnel should be carried out in strict accordance with the relevant documents and requirements to select and employ the best ones. For example, S&T personnel involved in research work should have a Master's degree or higher. Scientific research personnel engaged in technical work should have an undergraduate degree or higher. S&T personnel involved in S&T auxiliary and experimental work should have a study history at the polytechnical or higher level.

Moreover, trial utilization should be implemented for new entering personnel and the decision on whether or not to keep or release them should be made based on their indications and all other aspects after a specific period of time.

B. Create the environment required for personnel growth.

Those superior quality young S&T personnel who are selected should be given the pressure of burdens and assigned tasks. In their scientific research practice activities, allow them to sing the lead and shoulder large beams. In the state's projects to attack key S&T problems, key topics, and academy-level key topics, allow them to become topical group leaders and persons responsible for topics, and provide them with specific manpower, financial, and materials rights. They should also be provided with a specific number of researchers and assistant researchers, serve as their guidance professors, and provide them with guidance and assistance in work and their professions. In addition, we should also provide better experimental conditions and scientific research facilities, and allow them to receive training, accumulate experience, and develop their skills in practical work.

Make an appropriate increase in the expenditures invested in funds selected by institute directors, continue to foster the role of funds selected by institute directors in supporting and subsidizing top-quality young S&T personnel to take the initiative in boldly undertaking scientific research work.

C. Organize regular scholarly exchange activities.

Surveys show that 95 percent of our young S&T personnel feel that all types of academic conferences and scholarly activities are the best opportunities for them to strengthen their relations with the outside world, obtain information, increase understanding, grasp knowledge, and improve themselves. Thus, there should be regular academic activities of all sorts, inviting renowned scientists and specialists to present scholarly reports, foster academic democracy, exchange scholarly ideas, invigorate the academic atmosphere, evaluate and select superior theses, and provide specific awards. At the same time, we should also assign young S&T personnel with high foreign language levels and good specialization qualities to participate in relevant international and domestic academic conferences, actively participate in all types of scholarly groups, reinforce horizontal and vertical relationships, create conditions, provide opportunities, send them to foreign countries for advanced training, inspections, and visits, open up their field of view, and make them continually broaden and supplement their specialized knowledge in their own fields and in related disciplines, raise scientific research levels and creative abilities, immediately grasp relevant domestic and international scholarly trends, understand scholarly development trends in China and foreign countries, and continually update their knowledge.

D. Implement public and equal personnel competition.

Regarding the raising of specialized technical job titles, we must destroy the ideology of ranking according to seniority and implement the principle of integrating openness, equality, competition, superior choices, and evaluation of appointments. For the raising of specialized technical job titles once each year, individuals submit applications, personnel departments examine their qualifications, and then the research office and topical groups make recommendations and describe the situation to the institute's specialized technical job title raising assessment committee, which then submits a report on the work of those who have submitted applications, and responds to the thesis and conducts foreign language testing. Then the job title assessment committee and academic committee award points for each item including the technical and professional levels of those who have applied, their achievement and award situation, foreign language levels, theses published, translated work situation, work attitude, size of contributions, scientific research ethics, and other areas, eliminate conventional selections for raising, and increase the transparency of technical job title raising. On this foundation, gradually perfect the special approval system for assistant researchers under 35 years of age and researchers under 45 years of age who have made prominent contributions, creations, and discoveries. Perfect quantitative evaluation programs for raising the evaluation of appointments of all categories of personnel, establish and perfect an S&T personnel permanent appointment grade- setting system and term examination system, implement a junior appointment, dismissal, probationary appointment, and continued appointment system to give superior quality personnel the opportunity to struggle upward and subsequently-hired personnel the motive force for vigorous pursuit, and form an equal competition situation of "1,000 sails competing to go upstream".

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SPRINGFIELD VA 22161

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