

JPRS-CST-89-006

28 FEBRUARY 1989



**FOREIGN
BROADCAST
INFORMATION
SERVICE**

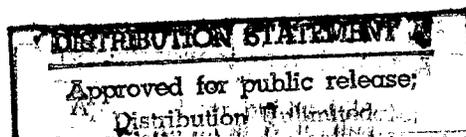
JPRS Report

Science & Technology

China

DTIC QUALITY INSPECTED 3

19980529 108



SCIENCE & TECHNOLOGY

CHINA

CONTENTS

SCIENCE & TECHNOLOGY POLICY

Rise of Nongovernmental Technology Enterprises /Xin Wang; XIANDAIHUA, No 11, Nov 88/	1
Agricultural Science Information, Research, Communication Network /RENMIN RIBAO, 11 Nov 88/	8
Briefs	
Japan Reported Easing Export Restrictions	10
Ministry Reforms S&T Certification Methods	10

AEROSPACE

Analysis of Flame Swinging in High Altitude Nozzle Tested Under Ground Atmosphere /Huang Chongxi; YUHANG XUEBAO, No 4, 31 Oct 88/	11
Computing Model, Critical Load for General Elastic Buckling Analysis of Thin-Wall Stiffened Semirigid Shell Structures Under Axial Compression /Deng Keshun; YUHANG XUEBAO, No 4, 31 Oct 88/.....	12
Model of Composite Solid Propellant Combustion /Zhao Yin, et al.; YUHANG XUEBAO, No 4, 31 Oct 88/	13
On Reduction of Sidelobes in Microwave Imaging of Rotating Targets /Huang Peikang, et al.; YUHANG XUEBAO, No 4, 31 Oct 88/	14

Errors of Output Quantity From Constant Gain Recursive Filter /Wang Yanshun; YUHANG XUEBAO, No 4, 31 Oct 88/	16
Nonlinear Analysis for Static Characteristics of Liquid Propellant Rocket Engine /Guo Kefang, et al.; YUHANG XUEBAO, No 4, 31 Oct 88/	17
Analyses of Equivalent Noises of Various Errors in Terrain Contour Matching System /Peng Jiaxiong, et al.; YUHANG XUEBAO, No 4, 31 Oct 88/	18
Balloon Satellite Update /HANGKONG ZHISHI, No 12, Dec 88/	19
Synthetic Aperture Radar Development /HANGKONG ZHISHI, No 12, Dec 88/	20
Experts Discuss Aircraft Design Issues /Cheng Bushi; HANGKONG ZHISHI, No 12, Dec 88/	21
Changkong-1 RPV Said Equal to Any in Foreign Inventories /WEN HUI BAO, 16 Dec 88/	25

BIOTECHNOLOGY

Study of New Tachykinin From Chinese Green Foul Frog /Tang Yiquan, et al.; ZHONGGUO KEXUE, No 9, Sep 88/	27
Detection of HBV-DNA by Spot Hybridization Using Biotin-Labeled Probe /Teng Xince, et al.; ZHONGHUA NEIKE ZAZHI, No 9, Sep 88/	35
Longitudinal Observation of Vectorial Capacity of Anopheles sinensis in Vivax Malaria Endemic Area /Fan Tianbao, et al.; ZHONGHUA LIUXINGBINGXUE ZAZHI, No 6, Dec 88/	37
Further Studies of Rise, Decline of Plasmodium vivax Gametocyte Viability /Yang Bailin, et al.; ZHONGHUA LIUXINGBINGXUE ZAZHI, No 6, Dec 88/	38
Study of Immunogenicity, Safety, Protective Efficacy of Plasma- Derived Hepatitis B Vaccine Made in China /Nie Jun, et al.; ZHONGHUA LIUXINGBINGXUE ZAZHI, No 6, Dec 88/	39
Study of Infectivity of HBsAg Positive Saliva /Dai Zisen, et al.; ZHONGHUA LIUXINGBINGXUE ZAZHI, No 6, Dec 88/	41

Analysis of Distribution of Shigella Groups in China /Cui Hanying, et al.; ZHONGHUA LIUXINGBINGXUE ZAZHI, No 6, Dec 88/	42
Study of Strain of <u>Brucella canis</u> Isolated From Cow for First Time /Li Yuankai, et al.; ZHONGHUA LIUXINGBINGXUE ZAZHI, No 6, Dec 88/	43
Briefs Gene-Engineered Hepatitis B Vaccine	44
COMPUTERS	
Design Scheme for an Expansible Multicomputer System /Nie Caitao; JISUANJI XUEBAO, No 11, Nov 88/	45
Economies of Scale in Current Computer Industry /Chen Jingxing; JISUANJI SHIJIE, No 45, 23 Nov 88/	55
New Software Systems for Galaxy Supercomputer Vector Linear Algebra Library /Wu Tiebin; JISUANJI SHIJIE, No 41, 26 Oct 88/	64
Plotting Software /Li; JISUANJI SHIJIE, No 41, 26 Oct 88/	65
Fast Fourier Transform Library /JISUANJI SHIJIE, No 41, 26 Oct 88/	66
Software Exports: Current Analysis, Future Strategy Difficulties in Imports/Exports /Yin Zhihe, Yu Jianyi; JISUANJI SHIJIE, No 41, 26 Oct 88/	68
Feasibility, Targets, Strategy /Yin Zhihe, et al.; JISUANJI SHIJIE, No 41, 26 Oct 88/	70
EARTH SCIENCES	
Ash Disposal in Coal-Fired Power Plants Discussed /Fang Zhikang; DIANLI JISHU, No 9, Sep 88/	77
Scientists Call for Environmental Control /XINHUA, 23 Jan 89/	85
FACTORY AUTOMATION, ROBOTICS	
Briefs Embryonic CIMS Developed	86
SUPERCONDUCTIVITY	
Breakthrough in Superconductivity Reported /Jiang Min; RENMIN RIBAO, 20 Dec 88/	87

TELECOMMUNICATIONS R&D

PRC To Increase Posts & Telecommunications Services /XINHUA, 16 Jan 89/	88
Latest Reports on Domestic Fiber-Optic Communications	
Rapid Development in Industry /DIANZI SHICHANG, 24 Nov 88/	89
Details on Optical Cable Laid, Uses /DIANZI SHICHANG, 24 Nov 88/	89
Milestones in Public Optical Communications /DIANZI SHICHANG, 24 Nov 88/	89
Briefs	
Domestically Made Fiber-Optic System	91
State-of-the-Art Fiber-Optic Devices	91

Rise of Nongovernmental Technology Enterprises

40080082 Beijing XIANDAIHUA [MODERNIZATION] in Chinese No 11, Nov 88 pp 4-6

[Article by Xin Wang [2946 2598]]

[Text] Nongovernmental technology enterprises are those enterprises of the non-publicly owned, cooperative, individual and private economic sectors which are based on S&T research, development and service. The decade of the 80's has seen China engulfed in the tide of reform, which has broken the government monopoly on S&T activities and accelerated the industrialization and commercialization of S&T achievements. Nongovernmental technology enterprises have already become a new force on China's S&T front.

According to rough statistics from Beijing, Shanghai, Tianjian, Liaoning, Hubei, Henan, Zhejiang, Jiangsu, Shanxi, and Shenxi, in June 1987 there were 2,304 nongovernmental technology enterprises engaging 53,476 personnel, of whom 21,830 were S&T personnel. As of June 1988, the number of such enterprises had reached 3,760, employing 79,730 people of whom 34,047 were S&T personnel. Within a year there was a sharp increase of approximately 60 percent. For purposes of competition a small number of these enterprises have merged for reasons of economy. Some have developed into external sector enterprises.

The general programs and policies of the first stage of Chinese Socialism, which stress reform, deregulation, and economic invigoration, have provided an excellent external environment and climate for the rise and development of nongovernmental technology enterprises as well as forming macroscopic and microscopic policy environments which promote very rapid development of these enterprises. The following four items are major manifestations of this.

1) Since the Third Plenary Session of the 11th Central Committee, beginning with reform of the rural economic system, the existence and development of many types of economic entities outside the public sector has been permitted and encouraged. This constitutes giving a green light to "nongovernmental enterprise." At the Party's Third Plenary Session, Comrade Zhao Ziyang reiterated in his report that "at present, nongovernmental components of the economy have not been developed too far, but rather are still far short of what is necessary. The urban and rural cooperative

sector and the individual and private sectors of the economy must continue to be encouraged to develop." He also stressed that we must "gradually create a situation in which the people's affairs are handled, in accordance with the law, by the people."

2) In his speech at the National Science and Technology Award Convention in October 1982, Zhao Ziyang clearly pointed out the policy that "Economic construction must rely on S&T and that S&T must be geared toward economic construction." Based on this policy, over the past several years the entire country has been making a maximum effort to establish an operational system characterized by close integration of S&T and the economy. This means combining S&T with business in the context of nongovernmental technology enterprises and the establishment of new basic guidelines for S&T organizations. Only with these guidelines including new types of nongovernmental technology businesses, can vigorous development be achieved in China.

3) Reform of the S&T system has followed the gradual implementation of economic reform. In March 1985, after the October 1984 announcement of the Central Government's decisions regarding reform of the urban economic system, the Central Government made its decisions regarding reform of the S&T system. In January 1987, the State Council issued "Some Regulations Concerning the Further Promotion of the S&T System Reform" which clarified the proposed "adoption of flexible measures with regard to scientific research organizations" and "relaxation of S&T personnel policy." It explicitly stipulates that the development of nongovernmental technology enterprises is to be encouraged and supported. It advocates the use of transfers, leave without pay (with position open until return), and departure from research organizations, colleges and universities, and government organizations by S&T personnel to set up and manage in urban and rural areas technology development, service, and trade entities under various ownership systems. Under these two liberalizing policies, a large number of S&T personnel have left academies, institutes, and schools to set up S&T businesses. The "dual relaxation" policy has begun to open the floodgates of talent to further develop nongovernmental enterprises and has eliminated the concerns of entrepreneurial S&T personnel about what lies behind them.

4) The Third Plenary Session of the 11th Central Committee proposed liberation from old ideas and the seeking of truth from facts in order to create a solid conceptual basis for the generation and development of nongovernment technology enterprises. There are two major manifestations of this: The first is the concept of holding knowledge and capable people in high esteem, as pointed out by Comrade Deng Xiaoping and affirmed at the Central Committee's Third Plenary Session. From this, came the beginnings of the formation of a series of policies with respect to the intelligentsia. These include permitting rational transfer of S&T personnel under conditions in which they can not utilize their full potential. Over the past few years these concepts and policies have won increasing acceptance. The establishment of technology enterprises by S&T personnel is to a greater and greater extent receiving broad understanding and support from society. The second manifestation is the revolution in the thoughts and concepts of the entire society, which has also penetrated the S&T

group. Concepts of commercialization and efficiency, new concepts of value and other new ideas are increasingly being accepted by S&T personnel and reflected in practical operations. The rapid rise of nongovernmental technology enterprises is rooted in the firmament of these kinds of new ideas.

In an appropriate national climate and an advantageous macroscopic policy environment, each local area has created an excellent microclimate and microscopic policy environment for development of nongovernmental technology enterprises. This is a prerequisite for the rise of this type of enterprise. In Zhongguan village, Beijing, the nongovernmental technology enterprises on Electronics 1st Street have developed rapidly. This has its origin in the following situation. As early as the beginning of the 80's, relevant departments of the Haidian District made a great effort to support nongovernmental technology enterprises. Such businesses were granted a 3-year exemption from income tax. From 1983 to the end of 1987, the accumulated loans granted to new types of nongovernmental technology enterprises amounted to approximately 10 billion yuan. When Electronics 1st Street was in the midst of a difficult situation, the Municipality of Beijing, based on in-depth investigation and research, steadfastly supported the nongovernmental technology enterprises and proposed guiding concepts of "positive support, improved guidance, perfected management, well executed service." October 1986 saw the promulgation of "Some regulations regarding management of collective and individual S&T organizations in Beijing" which gave a powerful stimulus to the further development of nongovernmental technology enterprises in Beijing. Recently, the Beijing Municipality has been planning to issue supplementary regulations based on the above regulations to further relax and clarify policy. At present, localities throughout the country are, one after another, issuing regulations regarding promotion of nongovernmental technology enterprise development such as those stipulated by Anwei Province in "regulations on the invigoration of scientific research organizations and relaxation of S&T personnel policy" which requires "positive fostering of collective and individual S&T organizations." Some provinces, including Henan, Liaoning, Jilin, and Shenxi, have made regulations specifically regarding the management of nongovernmental technology enterprises.

In the above advantageous microscopic and macroscopic policy environment, China's nongovernmental technology enterprises have, and are continuing to form the complete operational and management systems suitable to the needs of the development of a socialist commodity economy and which closely integrate S&T and economics.

The following six major deductions can be made:

- 1) The independent policy-making system of integrated dual authority.

The ownership of nongovernmental technology enterprises resides with the internal membership of the enterprise (the entire body, divisions or individuals) while the management policy making authority resides in the internal leadership levels (of which there are many types). This kind

of integrated dual authority system is fundamentally different from the ownership and management policy making systems implemented by those public enterprises currently undergoing reform. Under this kind of system nongovernmental technology enterprises have broken the "iron rice bowl." Benefits are not distributed equally regardless of performance, they are not a part of the government, nor do they receive government funding allocations. They independently decide policy, freely create associations, independently plan investment and manage themselves. They take responsibility for profit or loss and implement a general manager accountability system under the leadership of a board of directors. The leadership has independent policy-making authority over human and material resources and business direction. Staff members should have a strong leadership consciousness and not depend on others to mobilize initiative, positiveness, and creativity. There is a strong internal motive for everyone, of their own free will, to work hard to benefit society, the organization and the individual.

According to a random survey of 22 nongovernmental technology enterprises in Beijing, the degree of independent selection and management of projects and independent collection and management of materials has risen to 99 percent. Independent policy making, regardless of whether it concerns market information and feedback, or, development of new products reflects the basic quality of quick responsiveness required for modernization.

2) An integrated management system characterized by mutual integration of technology, industry and trade and which takes S&T as a guide and source of support.

In order to survive and develop, China's nongovernmental technology enterprises first painstakingly select and prepare their own scientific research and technology development projects and build their business activities on a firm scientific and technological foundation. They depend on exploiting the advantages of S&T and perfect the disposition of their human resources, develop item after item of new technology and new product after new product. S&T is taken as a guide to improve production, while trade centered on technological merchandise is implemented. This type of technology, industry, and trade integrated management system centered on technology can prevent stagnation and internal waste, shorten development time, overcome difficulties in the commercialization of achievements and permit the rapid materialization of S&T and its conversion into practical productive power. According to the survey, during the initial start-up period, trade generally accounted for about 80 percent of the income of the Beijing area nongovernmental technology enterprises. Following the gradual perfection of technology, industry, and trade integration, as of 1987, income from trade had fallen to about 60 percent, while income from technology and production had risen to about 40 percent.

3) Market-guided competition system.

The mechanisms of nongovernmental technology enterprises are agile. They react to the market in a keenly sensitive, rapid manner and abide by

market information (feedback), development and the operation of market mechanisms. This forms a beneficial cycle led by the market. During the operation of this cycle a powerful competitive consciousness is at work. These enterprises strive to put the best product on the market in the shortest time. Based on a survey of 20 S&T enterprises in Zhongguan village centered on nongovernmental technology enterprises, the period from research and development to product market entry for 75 percent of projects does not exceed 1 year.

4) High efficiency human resource management mechanism which selects the excellent, discarding the second-rate.

The success or failure of a business is decided by its human resources. The view of nongovernmental technology enterprises on human resources requires learning combined with management ability. They compete in the pursuit of three key elements, i.e., the courage and resourcefulness of the politician, the brain of the scientist and the shrewd quality of the businessman. A person must be both thoroughly proficient in his field of S&T and understand economics and modern management. He must be skilled at managing, possess many leadership techniques, have concepts of policy and legality and have the ability to integrate creativity and realism. In nongovernmental technology enterprises, talented personnel are highly mobile. Only if personnel management can realize mutual freedom of choice and mutual satisfaction, can stability be achieved. Such constant perfection of the human resource structure causes the developmental stamina of the business to depend on development of intellect, thus adding vitality and vigour.

5) Distribution mechanism linking effort and achievement with benefit.

In order to find lasting and effective internal motive force for their business, the nongovernmental technology enterprises have shattered the "system of equal treatment regardless of performance." They have adopted a distribution mechanism which rewards effort and have combined the mechanisms of competition and incentive. Grades have been delineated, those producing most receive more while those producing least receive less. Management by objective is implemented. Amounts allocated for departmental expenses are linked to income created and individual income distribution is linked to overall profit. According to the survey, there is a 10 fold difference between the highest and lowest incentive awards in some business organizations.

6) Self-accumulating, self-developing and self-restricting development mechanisms.

In general, nongovernmental technology enterprises all perform comparatively well economically. They commonly lack S&T development funds, social welfare funds and group benefit funds. They stress increasing accumulation, increasing and renewing fixed capital, implementing technological reform and return on investment. Regarding regulation of investment of retained

profits, for the most part, investment is in projects with prospects for development, in order to prevent loss of control over consumption of funds and to prevent early maturity of expenses and short term performance.

The above mentioned features of nongovernmental technology enterprises determine their ability to rely on S&T progress to create high economic returns. From an overall standpoint, even though nongovernmental technology enterprises presently still do not play a large role in the national economy, nevertheless, they are a new type of organization, mechanism and standard required by China's urgent drive to cultivate and develop its productive forces. They provide abundant experience and new ways of thinking to the thorough reform of the S&T, economic and even political and cultural systems. New systems and mechanisms particularly appropriate to the basic issues of reliance on S&T progress for realization of economic growth and achievement of high economic returns are provided. Important examples can also be provided for reform of State S&T management organizations and enterprises.

In the intense competition to introduce market mechanisms, a large number of highly effective nongovernmental technology enterprises have come to the fore, e.g., the Sitong Group located in Beijing and led by Wan Rennan, and the Shanghai Modern Information Company established and led by Li Taihang. The latter, Shanghai's first nongovernmental knowledge intensive enterprise, has simultaneously set up the Shanghai Modern Information Technology Research Institute, thus forming two complementary components, i.e., scientific research and management. This company bases itself on its human resources, creating for S&T personnel a harmonious and warm environment and providing excellent working and living conditions for those engaged in technology development. This company very quickly produced accomplishments in plastics, alloys, and high-density, all-purpose color base research, breaking Japan's monopoly on this technology. To date, the company has successively developed 40 scientific research projects. Seven of these filled domestic gaps and one has reached the international forefront. Simultaneous with emphasizing economic returns the company stresses benefit to society. They provided funds to hold the Shanghai Summer Computer Camp and used 80,000 yuan to establish a modern S&T scholarship fund for high school students, for which they received approval from all quarters. This company has become a glorious banner in the Shanghai area. Another example is Jiansheng New Technology Development Limited of Guangzhou. General Manager Chen Jiansheng resolutely threw away a secure position which he had held for 15 years to set up a research institute himself. After shutting himself away for over a hundred days, in June 1986, he completed development of the GBQ-1 model high-speed electronic control device, achieving a key project on which 9 departments and 48 research institutes nationwide had been working. Evaluation by relevant departments and specialists revealed that the device is twice as fast as comparable internationally marketed equipment. Moreover, its revolution is stable, precision is high, reliability is good, bulk is small and production cost is low. It can greatly increase the production efficiency of machine tools and the quality of the products, bringing them to the fore internationally. In 1987, the JS-2000 model stereo equipment

was developed. It is of a distinctive design, with low distortion and strong dynamic and stereo effect. It has the ability to move the effects of a concert into the home. When playing the same audio tape, the effect was superior to that of the very expensive and well-known Japanese Pioneer stereo. The first batch of 1,000 units was sold out immediately. Jie Jia Company of Hong Kong is willing to invest 2 million U.S. dollars in a cooperative production venture. The superior achievements of China's nongovernmental technology enterprises have received a high degree of attention and praise from Party and Government leadership and all sectors of society. In January 1988, at Zhongnanhai the leadership of the Central Government's Secretariat met with the Chairman of the Board of the Association of Nongovernmental Technology Enterprises of China, Chen Shengwu, Deputy board chairman Wan Runnan, and well-known nongovernmental technology businessmen of the capital. They heard reports and affirmed the important role of nongovernmental technology enterprises. During his December 1987 inspection tour of Shanghai, Comrade Zhao Ziyang highly praised Comrade Li Taihang's Shanghai Modern Information Technology Company. He said that the company set up by Li Taihang represents new trends in system reform. This evaluation also applies to the entire group of nongovernmental technology enterprises. The new trend cannot be stemmed, it will inevitably surge forward, creating a tempestuous flood in the reform era.

Agricultural Science Information, Research, Communication Network

40081014b Beijing RENMIN RIBAO in Chinese 11 Nov 88 p 3

[Text] Reporter He Huangbiao reports: In recent years China's agricultural S&T information work has made important progress in document accumulation, information reporting systems, information networks, information research, introduction of an international agricultural data base and training of a professional information contingent. It is estimated that by the year 2000, China will have established a large-scale database containing 1 million agricultural information documents.

The above was learned by the reporter from the National Agricultural Information Conference, convened today in Beijing.

In the wake of the development of economic construction, the information needs of the agricultural system are more and more urgent. At present, China's agricultural S&T information and document system has collected 35.6 million domestic and foreign documents and has begun to set up an agricultural information database. Led by the National Center, seven regional centers have been established in Liaoning, Jiangsu, Hebei, Hubei, Shanxi, Sichuan and Guangdong forming a nationwide agricultural information search network. In unified program of coordination over 50 kinds of agriculture S&T information publications have been established, forming the basis of a reporting system more complete in terms of subjects and more appropriate with respect to categories. The annual volume of information transfer has reached 110,000 documents. As regards mastery of the levels and trends in domestic and foreign agricultural S&T development, avoiding waste caused by duplication of research topics and propagation of advanced production technology and experience, this system has fulfilled an important function and has created very good economic and social returns.

In order to provide leadership at all levels with a reference basis for policy making, agricultural S&T information workers are still actively initiating information research. In only 4 years, this has yielded a number of research accomplishments. Of these, 31 have received State and Ministry of Agriculture awards. Moreover, this contingent is continuously growing in strength. Presently, at the provincial level and above, there are 5,700 professional S&T information documentation personnel.

Under the guidance of reform and an open policy, China has successively established a cooperative relationship with the British Commonwealth Bureau of Agriculture and Canada's International Development Research Center. Also, China participates in the United Nations Food and Agriculture Organization's international agricultural S&T information system and has separately introduced an information document magnetic tape database.

To further improve agricultural S&T information documentation work, by the end of the century China will have set up a large-scale database containing 1 million agricultural information documents. Its establishment will facilitate more prompt and systematic supply of required information to all types of users and will constitute a nationwide, functionally more complete and more efficient, modern agricultural S&T information document service system.

Ministry of Agriculture Minister He Kang gave a speech at today's meeting.

Briefs

Japan Reported Easing Export Restrictions--The Japanese government has decided that, beginning next spring, it will adopt a "general permission system" [gaikuo xuke zhidu] for exports of high-tech products to China. Forty products are covered, including computers, integrated circuits, semiconductor equipment, electronic switchboards, printed circuit boards, ceramic fibers, and others. The so-called general permission system is one which conforms to specific criteria of Japanese enterprises, which will be authorized to determine the scope of exports and which will be issued the licenses. Specific projects need no longer undergo evaluation or examination & approval; unnecessary tedious formal procedures can thus be avoided. With respect to Chinese investment and trade and the government's relaxation of export restrictions to the Chinese mainland, Japanese industrial and business circles all feel that bright prospects are in store. [Text] [40080098 Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 46, 30 Nov 88 p 8]

Ministry Reforms S&T Certification Methods--From now on, certification of S&T achievements--research results, new technology, and new products--will no longer require an accreditation meeting, and certification will no longer be distinguished by level [provincial level, ministry level, national level, etc.]. The Ministry of Machine-Building & Electronics Industry has already begun to implement this new certification policy, and the certification methods of the former State Machine-Building Industry Commission, the Ministry of Ordnance, and the Ministry of Electronics Industry are hereby abolished. For major projects of the state, ministries, provinces, autonomous regions, and municipalities directly under the central government, meetings can still be held as needed. For most projects, however, the new rules will allow several forms of accreditation, including testing by a commission of 7-15 experts to certify that achievements meet national or military standards; acceptance checks; and special appraisals and evaluations leading to issuance of certificates. [Summary] [40080108b Beijing ZHONGGUO JIXIE BAO in Chinese 24 Dec 88 p 1]

Analysis of Flame Swinging in High Altitude Nozzle Tested Under Ground Atmosphere

40090032a Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 4, 31 Oct 88 pp 1-9

[English abstract of article by Huang Chongxi [7806 1504 6932] of Shanxi Dynamic Machine Design and Research Institute]

[Text] This paper analyzes the reason for flame swinging in a high-altitude nozzle with a large area ratio which was tested under the ground atmosphere, and describes the mechanism of asymmetrical separation. Through this analysis it is concluded that this flame swing disappears naturally in a high-altitude simulation test and in ground tests with a truncated nozzle. The phenomenon appearing in these tests can be explained through calculating the nozzle flow field, boundary layer separation and heat transfer.

References

1. Summerfield, M., Foster, C.R. and Swen, W.C., "Flow Separation in Over-expanded Supersonic Exhaust Nozzles," JET PROPULSION, 1954, pp 9-10.
2. Arens, M., Spiegler, E., "Shock-Induced Boundary Layer Separation in Overexpanded Conical Exhaust Nozzles," AIAA J, March 1963.
3. Back, L.H., Cuffel, R.F., "Turbulent Boundary Layer and Heat Transfer Measurement Along a Convergent-Divergent Nozzle," Transactions of the ASME, JOURNAL OF HEAT TRANSFER, Oct 1971 pp 397-407.
4. Kliegel, J.R., Levien, J.N., "Transonic Flow in Small Throat Radius of Curvature Nozzles," AIAA J, Vol 7 No 7, 1969.
5. Huang Chongxi, "Calculation of Nozzle Flow Field Characteristics and Influencing Factors," JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS, No 4, 1982.
6. Kudriavtseva, V.M., "Bases for Theories and Calculations of Fluid Rocket Engines," 1983.
7. Fraser, R.P., et al., "Investigation of Supersonic Flow Separation in Nozzles," JOURNAL OF MECHANICAL ENGINEERING SCIENCE, Dec 1959.

Computing Model, Critical Load for General Elastic Buckling Analysis of Thin-Wall Stiffened Semirigid Shell Structures Under Axial Compression

40090032b Beijing YUHAN XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 4, 31 Oct 88 pp 10-14

[English abstract of article by Deng Keshun [6772 0668 7311] of Dalian University of Technology]

[Text] To calculate the elastic stability of the overall stiffened structure of a [guided] missile shell under axial compression, this paper presents a practical finite element model, linearizing the very nonlinear problems and greatly simplifying the overall structure. Based on the computing model presented in this paper, the numerical results of the finite element method are in better agreement with its experimental results.

References

1. Deng Keshun, JOURNAL OF DALIAN UNIVERSITY OF TECHNOLOGY, Vol 25 No 1 p 78.

Model of Composite Solid Propellant Combustion

40090032c Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS]
in Chinese No 4, 31 Oct 88 pp 15-23

[English abstract of article by Zhao Yin [6392 6892], et al., of the National
University of Defense Technology]

[Text] A comprehensive model describing the combustion of composite solid propellants has been developed in this paper. This model discusses in detail the condensed-phase reactions, emphasizes the importance of heat transfer in all forms on the burning surface and proposes that the linear combustion rate of the propellant be expressed by the linear decomposition rate of the inert binder. A large number of concrete calculations has also been made and compared to the experimental data. For the AP/HTPB propellants, the calculated results in which the relative error is less than 10 percent account for 80 percent, while for the Al/AP/HTPB they account for more than 90 percent.

References

1. Condon, J.A., et al., AD-A056892, 1978.
2. Beckstead, M.W., et al., AIAA J, Vol 8 No 12, 1970.
3. Hermance, C.F., AIAA J, Vol 4 No 9, 1968.
4. Li Qiutian, et al., PROPULSION TECHNOLOGY, No 3, 1985.
5. Ye Dalun, "Statistical Handbook of Practical Inorganic Compound Thermodynamics," 1982.
6. Cohen, N.S., AIAA J, Vol 18 No 3, 1980 pp 277-293.
7. Zhao Yin, et al., COMPUTERS AND APPLIED CHEMISTRY, Vol 4 No 1, 1987.
8. Tian Deyu, "Study of Chemical Propellant Energy," 1983.
9. Zhao Yin, et al., JOURNAL OF AERODYNAMICS, Vol 2 No 2, 1987.

On Reduction of Sidelobes in Microwave Imaging of Rotating Targets

40090032d Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS]
in Chinese No 4, 31 Oct 88 pp 24-31

[English abstract of article by Huang Peikang [7806 1014 1660], et al., of the
Ministry of Astronautics]

[Text] This thesis introduces the sidelobe reduction in microwave imaging and some conclusions drawn by foreign scholars. The authors point out that window functions generally used in classical Fourier spectral analysis are not applicable to the microwave imaging of rotating targets. The solutions to the equations, consisting of apodization filter coefficients, are derived. Some examples of the lower sidelobe levels and the image reconstruction with different relative bandwidths are shown by computer simulation. The authors are satisfied with the results of the simulation.

References

1. Graf, G., "On the Evaluation of Doppler Spectra for Radar Cross-Section Analysis and Target Recognition," in Jeske (ed.), "Atmospheric Effects on Radar Target Identification and Imaging," 1976 pp 219-238.
2. Mensa, D.L., et al., "Aperture Synthesis by Object Rotation in Coherent Imaging," IEEE TRANS, Vol NS-27 No 2, Apr 1980 pp 989-997.
3. Mensa, D.L., et al., "Coherent Doppler Tomography for Microwave Imaging," PROC IEEE, Vol 71 No 2, Feb 1983 pp 254-261.
4. Driscoll, W.G., Vaughan, W., ed., "Optical Handbook," McGraw-Hill Book Company, 1978, Chapter 2.
5. Mensa, D.L., "High Resolution Radar Imaging," Artech House, Inc., 1981 pp 135, 181-191.
6. Harris, F.J., "On the Use of Windows for Harmonic Analysis with the Discrete Fourier Transform," PROC IEEE, Vol 66, Jan 1977 pp 51-83.
7. Xu Xiaojian, "Coherent Tomographic Microwave Imaging of Rotating Targets," MA Thesis, 1986.
8. Baha, N., Murata, K., "Filtering for Image Reconstruction from Projections," J OPT AM, Vol 67 No 5, May 1977 pp 662-668.

9. Huang, T.S., et al., "Iterative Image Restoration," APP OPT, Vol 14, 1975
pp 1165-1168.
10. Takaba, K., "Projection Method for Solving a Singular System of Linear
Equations and Its Applications," NUMERICHE MATHEMATIK, Vol 17, 1971
pp 203-214.

Errors of Output Quantity From Constant Gain Recursive Filter

40090032e Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS]
in Chinese No 4, 31 Oct 88 pp 32-38

[English abstract of article by Wang Yanshun [3769 1750 7311] of Luoyang
Institute of Tracking and Telecommunication Technology]

[Text] The error sources of a constant gain recursive filter consist of the errors of the initial estimated value, the input random errors and the filter's prediction truncation errors. The propagation of these errors in the filter results in output errors. In this paper, the covariance matrix of the output random errors and the vector expression of the output truncated errors have been derived, and their norm expressions are given based on the discussion of the norm expression of a matrix power series.

References

1. Huang Lin, "Linear Algebra in System and Control Theory," No 5, Chapter 3, Science Press, 1984.
2. Zhang Jinhui, et al., "Aircraft Experimental Statistics," Vol 2, National Defense Science and Technology Press, 1984 pp 316-319.
3. Wang Yanshun, "Constant Gain Recursive Filters and Their Stability Characteristics," JOURNAL OF ASTRONAUTICS, No 2, 1983.
4. Wage, R.S., "Matrix Iterative Analysis," Chapter 3, Science Press, 1966.
5. Soloman, D.L., "Covariance Matrix for α - β - γ Filtering," IEEE TRANS, Vol AES-21 No 1, 1985.
6. Cantrell, Ben H., "Adaptive Tracking Algorithm," NRL Report 3037, ADA 011122, Apr 1975.
7. Range Commander Council, "Status of Range Safety Filter," AD 782680, 1971.
8. Levine, N., "A New Technique for Increasing the Flexibility of Recursive Least Squares Data Smoothing," BSTJ, Vol 40 No 3, 1961.
9. Pearson, Carl E., "Handbook of Applied Mathematics, 16, Matrices and Linear Algebra," VNR Company, 1974.

Nonlinear Analysis for Static Characteristics of Liquid Propellant Rocket Engine

40090032f Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 4, 31 Oct 88 pp 44-49

[English abstract of article by Guo Kefang [6753 0344 5364], et al., of the Strategic Missile Corps Engineering College]

[Text] The effect of inner and outer interference factors of a liquid-propellant rocket engine on parameters used to be calculated by the linear small deviate method. In this paper, the same calculation is made by the digital computer simulation method of nonlinearity equations. This method can achieve more satisfactory results and high accuracy, and can be used for optimal design.

References

1. Teaching and Research Office 103, "Principles of Liquid Rocket Engines," Vol 2, National Defense Science and Technology Press, 1985.
2. Shenyang Computer Technology Research Institute, Chinese Academy of Sciences, "Standard Computer Calculations," Science Press, 1985.

Analyses of Equivalent Noises of Various Errors in Terrain Contour Matching System

40090032g Beijing YUHANG XUEBAO [JOURNAL OF CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 4, 31 Oct 88 pp 50-56

[English abstract of article by Peng Jiaxiong [1756 0857 7160], et al., of Huazhong University of Science and Technology]

[Text] This paper proposes a method for making each navigation track error, speed error and heading error equivalent as an additive measurement noise. The means and standard deviations of the equivalent measurement noises are estimated by two statistical methods. The quantitative dependences of these numerical features on the fluctuating standard deviation and roughness of terrain are given. They provide the reference and basis for engineering designing.

References

1. Peng Jiaxiong, et al., "Statistical Modeling of Terrain," JOURNAL OF ASTRONAUTICS, No 3, 1984 pp 14-21.
2. Feng Kang, et al., "Numerical Calculation Methods," National Defense Industry Press, 1978 pp 1-12.
3. Liu Degui, et al., "FORTRAN Computations," National Defense Industry Press, 1980 pp 68-71.
4. Cannon, M.W. Jr., "Terrain Contour Matching (TERCOM) Sensitivity to Heading and Ground Speed," AD-A056127, 1978.
5. Chen, C.H., "Statistical Pattern Recognition," Hayden Book Company, Inc., New Jersey, 1973 pp 91-101.
6. Sinha, N.K., Griscik, M.P., "A Stochastic Approximation Method," IEEE TRANS SYST, MAN AND CYBERN, Vol SMC-1 No 4, 1971 pp 338-344.
7. Johnson, M.W., "Analytical Development and Test Results of Acquisition Probability for Terrain Correlation Devices Used in Navigation Systems," AIAA 10th Aerospace Science Meeting, 3, No 72-122, 1972.
8. Peng Jiaxiong, "Local Precision of Transition-type Terrain Correlation Devices," JOURNAL OF ASTRONAUTICS, No 3, 1986 pp 47-53.

Balloon Satellite Update

40080077a Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese
No 12, Dec 88 p 2

[Text] Two balloon satellites dedicated to the study of high-altitude atmospheric density are scheduled to be launched in the near future by a "Long March-4" launch vehicle; they will be orbiting the earth at an altitude of 900 km for more than a year. This will be the first time in this country that a satellite is launched for the sole purpose of studying space environment.

These two satellites are made of lithium-coated polyester material; prior to launch, they are stowed in the rocket in a folded configuration. When deployed at high altitude, they are ejected from the rocket and expanded into 3-meter balloons. Since the two balloons have different area-to-mass ratios, they will travel at different speeds and their orbits will have different decay rates under the same atmospheric conditions. By measuring the changes in the individual orbits, scientists can determine the high-altitude atmospheric density. Currently, this is the only feasible method used in this country for determining high-altitude atmospheric parameters. The two balloon satellites will share the launch of the "Long March-4" with a meteorological satellite.

Synthetic Aperture Radar Development

40080077b Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese
No 12, Dec 88 p 2

[Text] A 20-million dollar "synthetic aperture side-looking radar" was recently built by the Electronics Institute of the Chinese Academy of Sciences after 10 years of development work. On 18 October, in a speech by one of the committee members of the Academy, Lu Baowei, it was pointed out that side-looking radar systems have a wide range of applications such as exploration of mineral resources, terrain mapping, oceanic research, monitoring oil spills, monitoring flood damages, military surveillance, and border patrol. This type of radar has sufficiently strong penetration capability to reveal geographic and geological information covered by vegetation and thin earth layer, and to detect camouflaged military equipment. Operating at different altitudes onboard the aircraft, this radar can illuminate a region on the ground by transmitting radar beams via the onboard antenna, and receive the scattered microwave returns to form a complete image of the illuminated region.

Experts Discuss Aircraft Design Issues

40080077c Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese
No 12, Dec 88 pp 8-9

[Article by Cheng Bushi [4453 0008 2514]]

[Excerpt] During an aircraft design conference held in June 1988, a number of aircraft designers who had worked together in the 1950's had the opportunity to meet once again. Thirty years ago, all of us participated in China's first aircraft design project; today, we are scattered throughout the country. Four of us--Lu Xiaopeng, Gu Yunfeng, Tu Jida, and myself--had been responsible for the overall design of many aircraft produced in this country. Taking this rare opportunity, I gathered my colleagues to discuss a few selected aircraft design issues.

I. Our Views and Experience in Aircraft Design

Cheng: China has been designing aircraft for 30 years now, why don't we share our views on what we've learned and what we think are the proper approaches to aircraft design?

Lu: I am in the process of writing down my thoughts, but so far I only have an outline. My views can be summarized in the following four areas:

1. Aircraft design requires the spirit of self-reliance and complete dedication to our work.
2. A short cut to aircraft design is to develop our own design approach supplemented with imported foreign technology.
3. Aircraft design requires coordinated theoretical and experimental efforts. For example, a design concept must be verified experimentally; the designer must have a good understanding of the technical problems involved in the development and production processes and must coordinate closely with the machine operators.
4. A particular design model should be continuously improved to extend the life of this model.

Cheng: There are two aspects to the idea of continuous improvement. One is gradual improvement of an existing model by absorbing new technologies. When a certain number of new technologies have been incorporated in the model, then a "leapfrog" improvement must take place to produce a new model. Also, an improved new model may sometimes be developed to satisfy new user requirements. However, one cannot expect a new design to be perfect; therefore, a new model should not be rejected just because of a few defects. We must allow a new model to grow after it has been established.

Lu: I agree. We should not develop a new model and then discard it shortly after. This would be very costly to the state.

Cheng: Mr Lu, I remember talking to you 16 years ago about my views on aircraft design. I believe that aircraft design is a huge system engineering task. System engineering is not merely a compilation of specialized knowledge; it involves some higher-level concepts and methodologies, and an integrated way of thinking.

Lu: You have my full support in this regard. We are currently using the techniques you have developed in solving problems of system parameter optimization.

Tu: Aircraft designers must consider all aspects of the project which include technologies, quality control, cost, schedule and production strategy; he must be concerned with not only design issues, drawings, calculations and tests, but also ensuring that the aircraft will be produced on a timely basis. If production schedules are not met, the requirements may be changed to render the aircraft obsolete.

II. Basic Requirement on the Quality of an Aircraft Designer

Cheng: To develop a good aircraft designer requires not only the right environmental conditions but also certain inner qualities. A long-distance runner may not stand out in a hundred-meter dash; but he will show his superior ability only in a marathon race.

Lu: An aircraft designer should have the following qualities: creativity, persistence, ambition, and a sense of responsibility.

Creativity is the quality of possessing truly unique views and bold spirits to produce outstanding results.

Persistence is a quality that is required to overcome the difficulties encountered in aircraft design. This is true not only for Chinese aircraft designers but also for foreign designers. For example, many of the Soviet aircraft models were developed only through the persistent efforts of their designers to overcome political and social turmoil.

Cheng: Aircraft design involves a wide range of different technologies, large-scale production, and very long development cycle. Therefore, it requires complete dedication to the project; "biting the bullet" on the short term is not adequate.

Another issue which I am currently concerned with is how to combine the aircraft designer's specialized problem-solving ability with his system integration ability. The ability to specialized problems is a necessary condition but not a sufficient condition. The ability to solve integrated system problems is related to the designer's thought process and involves the theory of engineering methodology.

Lu: It requires good engineering judgment.

Cheng: Yes, but there are also two aspects to engineering judgment: specialized knowledge and theory of methodology. Specialized knowledge is useful in solving specific, well-defined problems. However, in an actual design process, one must identify or foresee the problems, then analyze and formulate them so practical solutions can be found; this requires training in the theory of methodology. For a complicated problem different people may have different methods of treatment because they often have different objectives and different priorities for the various design considerations. The success or failure of a design project is primarily determined by whether an optimum balance between requirements and feasibility can be reached, not by the technical details. The success of a project depends on not only superior technology but also high standards of integrated system engineering. These types of problems are treated in a new field called "modern design methodology," which is of great interest to me. What other characteristics would you like to see in a modern aircraft designer?

Lu: He must have a scientifically-oriented attitude and a strong desire to find the truth. He cannot let his thoughts be guided by what other people say.

It is also important that he has a strong theoretical foundation in his specialized field. Aeronautical engineering is a continuously evolving technology; one cannot simply use a brute force approach, he must be guided by advanced scientific theories to design a good aircraft.

He must have a strong interest in aeronautics and a strong sense of responsibility. In addition, he must have the perseverance to pursue his goal without being distracted by other temptations.

Cheng: Even within the realm of aeronautical engineering, there are different types of goals. The question is whether a person must have the ambition to conquer the sky in order to become an aircraft designer. To conquer the sky requires the imagination to build all types of flying vehicles. I remember reading an article you wrote 20 years ago, Mr Lu, on the "flying jeep." Obviously your interest in flying was not just limited to aircraft.

Lu: (laughing) Even today, I still think my proposed design was technically sound. The two fans on the vehicle will produce a gyroscopic effect to keep the body stable; unfortunately I could not find a small engine suitable for this vehicle. It seems that you have also engaged in testing sailplanes besides your normal duties.

Cheng: The sailplane project was primarily the work of Wang Zixin and his colleagues; I merely participated in some aspects of the research activities. However, I have tested several other unconventional vehicles such as a multi-purpose aircraft, which I designed in my spare time.

(To Gu) I am an admirer of the U.S. aircraft designer Johnson. He does not follow a rigid procedure in designing aircraft; rather, he adjusts his design techniques according to user requirements. All the aircraft models he designed were one-of-a-kind; that is what I call real aircraft design. While each aircraft was designed to satisfy some special requirements, its performance was always first-class.

Gu: Are you referring to Kelly Johnson? He is really outstanding.

I believe an aircraft designer should have the following qualities:

1. He must have a definite goal in mind. For example, because of his achievements in aircraft design, Kelly Johnson was promoted by his company to a high position. However, he turned down the offer and returned to his job of aircraft design. Once in his youth, he made a speech on a soap box at a local club about aeronautical technology. Ever since, he had devoted his entire career to aircraft design. In this country, chief designer Lu had the idea of designing attack aircraft 30 years ago, and he has been working on this task for the past few decades.

2. He must keep up with new technologies because aeronautical engineering is a rapidly growing field. Mr Johnson graduated from college during the 1930's, when aeronautical technology was still in its infancy. But later, he designed the SR-71 aircraft which can fly at three times the speed of sound. This is a good example of keeping up with technology through self-education. [boxed passage omitted]

Changkong-1 RPV Said Equal to Any in Foreign Inventories

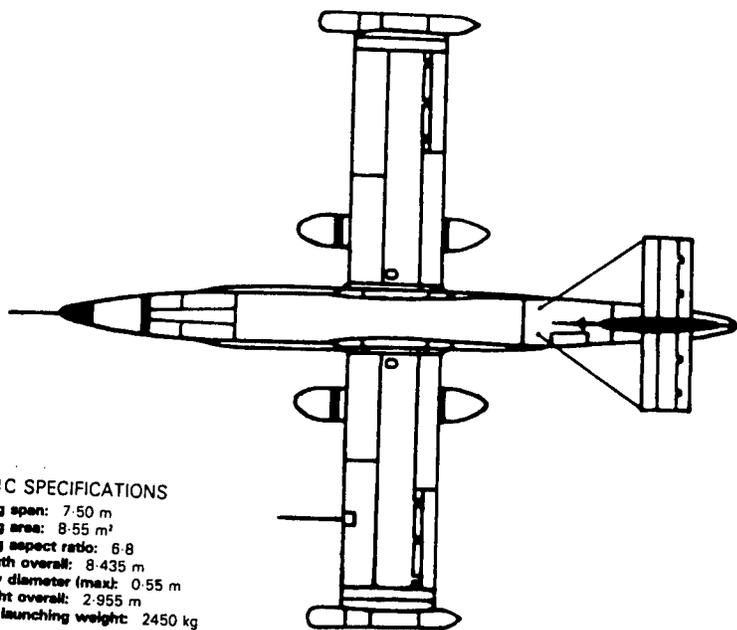
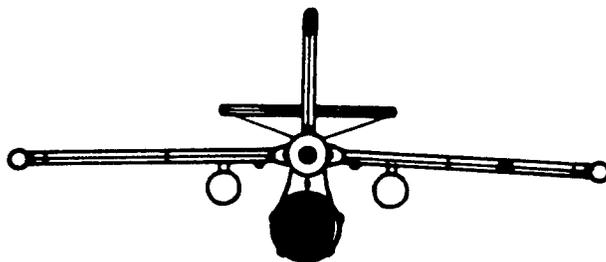
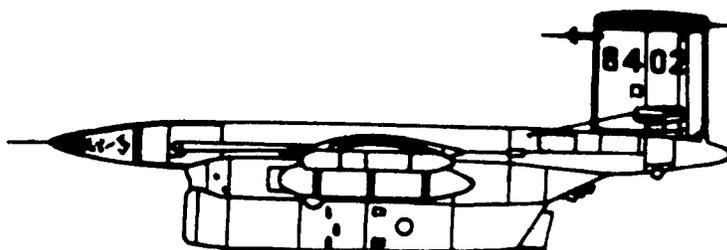
40080106 Shanghai WEN HUI BAO in Chinese 16 Dec 88 p 1

[Text] Nanjing, 15 December--The Changkong-1 minimum altitude remotely piloted vehicle [RPV], developed by the Nanjing Aeronautical Institute, today passed design certification by the State Defense Products Design Finalization Committee and it is held that the overall flight performance [of the RPV] is comparable to any of the same class in the world.

The Changkong-1 is used primarily in evaluation tests for various kinds of guided missiles. For the past 20 years, S&T personnel of the Nanjing Aeronautical Institute have developed the Changkong-1 medium altitude target drone for the testing of air-to-air and surface-to-air missiles. It has been used to gather samples following nuclear tests and as a low-altitude target drone for low-altitude air defense evaluation tests. It has also been used in tests involving high-performance air-to-air missiles and interceptor aircraft as a highly maneuverable drone, and finally in evaluation tests as a very-low-altitude drone for minimum-altitude air-to-air weapons.

The development of the minimum-altitude just certified was begun in 1986. The RPV made its test flight in 1988 and then became operational. It is capable of level flight at altitudes of 50 and 100 meters. The Changkong-1 has tremendous potential for development. It can plan a variety of roles and could be modified as a supersonic target drone.

Three-sided view published in GUOJI HANGKONG [INTERNATIONAL AVIATION]
Beijing, No 1, Jan 1986



CK1C SPECIFICATIONS
Wing span: 7.50 m
Wing area: 8.55 m²
Wing aspect ratio: 6.8
Length overall: 8.435 m
Body diameter (max): 0.55 m
Height overall: 2.955 m
Max launching weight: 2450 kg

Study of New Tachykinin From Chinese Green Fowl Frog

40081012 Beijing ZHONGGUO KEXUE [SCIENTIA SINICA-SERIES B] in Chinese No 9,
Sep 88 pp 967-974

[Article by Tang Yiquan, Tian Shenghai, Wu Shixiang, Hua Jiacheng, Zou Gang (Chinese Academy of Science Shanghai Medicine Research Institute); Wu Guanfu, Zhao Erning (Chinese Academy of Science Chengdu Biological Research Institute); Lu Yian, Zhu Yingqi (Chinese Academy of Science Shanghai Biotechnology Center)]

[Text] Abstract: In this paper Sep-Pak C₁₈ and HPLC are used to separate out a new 14 peptide kinin from material extracted with methanol from the skin of the Chinese green fowl frog. The structure of this peptide has been determined through analysis to be: Asp-Asp-Ala-Ser-Asp-Arg-Ala-Lys-Lys-Phe-Tyr-Gly-Leu-Met-NH₂ and is confirmed by chemical synthesis. This peptide is the longest found among amphibious animal kinins. Its nitrogen and amino acid is very different from the corresponding parts of other Tachykinin-type peptides. Apart from this, the paper also briefly discusses green fowl frog kinin sulphoxide formation during the purification process and the divisions in its chromatic spectrum peaks.

In the past 20 years, over 40 active peptides have been isolated from the skin of amphibious animals. The peptide types found in the skins of amphibians also exist in the viscera and nervous system of mammals, therefore, people have taken a broad interest in them. Research into peptides from amphibian skin has already led to the discovery of some new peptides of the viscera and brain and has provided important data concerning the relationship between peptide structure and activity. A great deal of medical research indicates that amphibian skin peptides have an effect both on metabolism and the central nervous system.^[1-3] Moreover, according to records, amphibian products are useful in treating stomach pain, dysentery, some kinds of inflammation and other diseases.^[4]

Erspamer and his colleagues utilized biological and chromatic spectrum screening methods to select skin extractions from amphibians from a great many localities worldwide for research. However, the skin of various types of frogs from China had not yet been systematically studied. In order to discover new active peptides from amphibian skin and as a next step, from mammals, in 1983 we began research on amphibian skins. Already several new peptides have been discovered.^[2,3] This paper describes a new tachykinin

separated from material extracted with methanol from the skin of the Chinese green foul frog, i.e., green foul frog kinin. This peptide is also the first tachykinin discovered in animals of the Ranidae family.

1. Materials and Methods

1) Tissue extraction

Fourteen green foul frogs collected in October, 1984 from Maowen County in Sichuan were used. After killing they were immediately skinned yielding 210g fresh skin. Five hundred ml methanol and 2x500ml 80 percent methanol were used successively, 3 times to obtain extractions from skin. After filtering the liquid extracted with methanol, it was spun evaporated under vacuum, then freeze dried.^[8] At 4°C, 1.0g of extracted material was dissolved in 45ml 0.1 percent trifluoacetic acid then centrifuged at 4,000r/min for 20 minutes. The supernatant was then passed through Sep-Pak C₁₈ column (Waters Company) at 3ml per column. Before the column were used they were wet with 3.0ml acetonitrile (spectroscopically pure, E.Merck) then rinsed with 10ml water (twice distilled). After the supernatant had been passed through the column each was rinsed with 3.0 ml 0.1 percent trifluoacetic acid, then eluted successively with 3.0ml portions of 15, 35, 60 and 80 percent solutions acetonitrile-trifluoacetic acid (0.1 percent), combined the corresponding elution then freeze dried. The yields of the free-dried corresponding elution were 360, 70, 80, 10 and 1mg respectively. Biological determination was then carried out on each freeze dried sample separately.

2) High power liquid chromatogram (HPLC)

The HPLC instrument and chromatographic column are the Waters series products M-6000A and M-45 pump, M-721 system control instrument, U6K sample entry valve, M-450 chromatograph, M-730 data management device; μ Bondapak C₁₈ (0.78 and 0.35x30cm) and μ Bondapak phenyl (0.35x30cm).

Trifluoacetic acid or heptafluobutyric acid solutions was used mixed with acetonitrile to carry out the chromatography. Each peak element was collected separately and freeze dried for biological determination and chemical analysis.

3) Amino acid analysis

Peptides (1-5n mol) were dissolved in 5.7N hydrochloric acid containing 0.1 percent phenol, after 72 hours of hydrolysis at 110°C an LKB 4400 amino acid analyzer was used to determine amino acid composition.

4) Amino acid sequence analysis

Peptide (1-3n mol) structure was determined in accord with Chang's^[9] DABITC/PITC hand micro sequence analysis. Enzymolysis was carried out as follows: α -chymotrypsin (2.0 μ g, Shanghai Dongfeng Biochemical Reagent Co.) was mixed with peptides (8n mol) in 100 μ l 0.1mol/L N-methylmorphine acetate (pH8.1) at 37°C for 3 hours. Trypsin (1.0 μ g, Difco Lab.) and peptides (4n mol)

were combined under the same reaction conditions. Reverse HPLC was used to separate the peptide sections obtained through enzymolysis. Carboxypeptidase A (CP-A, 2.0 µg, Boehringer) was combined with peptides (3n mol) in 200 µl 0.2mol/L of the above buffer solution at 37°C for 4 hours. Carboxypeptidase Y (CP-Y, 3.0 µg, Boehringer) was mixed with peptides (8.0n mol) in 500 µl 0.05mol/L pyridine acetate solution (pH5.5) at 25°C for 6 hours. Half was then taken for HPLC separation to determine the peptide's C-terminal structure. Basically this method follows Wagner's^[10] "Flop-Out Method." The other half was used for amino acid composition analysis. Discrimination of the peptide C-end section released by CP-Y enzymolysis was carried out under the above chromatographic conditions, based on the chromatogram positions of corresponding synthetic sample peaks.

The oxidized green fowl frog kinin was reduced according to the Floor^[11] method, 0.01mol/L sodium acetate solution (pH6.5) containing 2-sulphydryl ethanol (20 µl) and peptides (10n mol) was reacted at 80°C under nitrogen for 2 hours.

According to the Rusconi^[12] method, Met-NH₂ was oxidized into the sulphoxide of Met-NH₂.

5) Biological determination

Initial biological experimentation was carried out on the ileum vertical muscle plexus of the guinea pig. For details see the report of Wu Shixiang.^[13] A rat anesthetized with ethyl carbamate was used to observe effectiveness on blood pressure. Carotid artery pressure, after passing through a pressure-energy converter, was recorded on a Japanese multielement photoelectric conductor.

2. Results

1) Purification process

The freeze-dried product obtained from the Sep-Pak C₁₈ column and eluted with 35 percent acetonitrile-trifluoacetic acid (0.1 percent) very strongly stimulated contractions of the guinea pig ileum verticle muscle (Figure 1). The chromatogram of this freeze dried material showed peak 12 to be active. When repurified, this peak divided into two (Figure 2). These were maintained for 72.2 and 73.3 minutes respectively. Further HPLC purification indicates that these two peaks are both single color peaks. Peak number 8 is also active and when repurified also divided into two. These were maintained for 61.2 and 63.3 minutes respectively. Peak number 8 is the oxidized form of peak number 12.

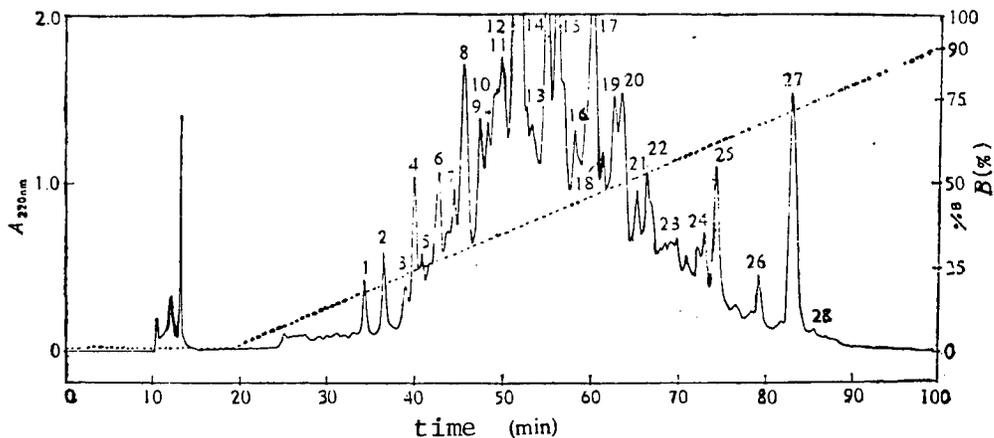


Figure 1. Sep-Pak C₁₈ column high efficiency liquid chromatogram of 35 percent acetonitrile eluate

(specimen: 7.0 mg, chromatographic column: Bondapak C₁₈, 0.78 x 30 cm, current velocity: 1.0 ml/min, solvent systems: A= 5 percent acetonitrile-trifluoacetic acid (0.05 %), B= 60 percent acetonitrile-trifluoacetic acid (0.05 %), linear gradient elution, B (0-90 %), 80 min)

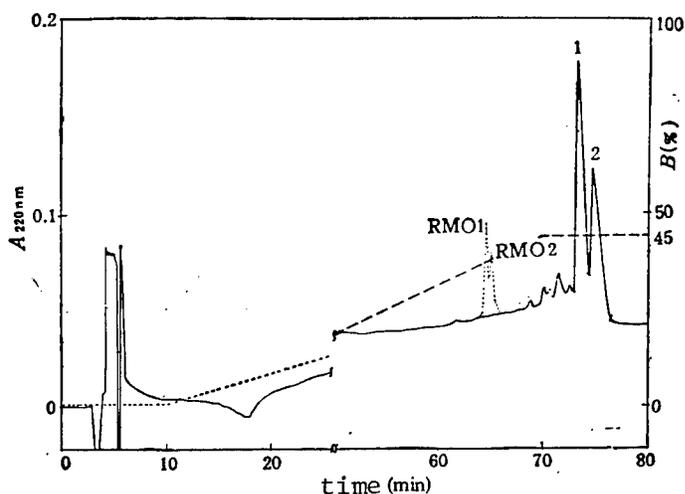


Figure 2. High efficiency liquid chromatogram of the active peaks (8 & 12) from Fig. 1

(chromatographic column: Bondapak phenyl, 0.39 x 30 cm, current velocity: 0.8 ml/min, solvent systems: A= 5 percent acetonitrile-heptafluobutyric acid (0.05 %), B= 60 percent acetonitrile-heptafluobutyric acid (0.05 %), linear gradient elution, B (0-45 %), 60 min)

2) Amino acid analysis

According to estimates based on amino acid analysis of the composition of natural green fowl frog kinin, corresponding synthetic samples, chymotrypsin and trypsin zymolysed peptide sections, each gram of fresh skin contains at least 10^{-6} mol of pure green fowl frog kinin (including the oxidized forms).

3) Amino acid sequence analysis

The sequence of green fowl frog kinin, corresponding synthetic samples, chymotrypsin and trypsin zymolysed peptide sections was determined by hand, according to the DABITC/PITC degradation method. This yielded definite results to the second amino acid residual group from the end. The residual group of the C-terminal of each zymolysed peptide is composed of the corresponding peptide section amino acid.

From segments of green fowl frog kinin chymotrypsin and trypsin enzymolysis products obtained from reverse HPLC separation, we know that both have the same peptide section. This is because neither is pure, both contain some of the other.

Green fowl frog kinin does not react at all with CP-A, indicating that its C-terminal is sealed. However, when CP-Y is used and Gly, Met-NH₂, Leu and Tyr are obtained, these amino acids all correspond to the chromatogram peaks of standard samples, and to the amino acid composition analysis (but, if enzymolysis time is 1 or 4 hours amino acid release will not occur). Apart from this, amino acid analysis of the zymolysed products indicates that the amino acid release speed is Met-NH₂ > Leu > Gly > Tyr. During amino acid analysis Met-NH₂ appears between the Arg and NH₃ peaks. Moreover, most of the Met-NH₂ through oxidation becomes the sulphoxide of Met-NH₂. The latter's peak appears between Phe and His (verified with standard samples). However, on the HPLC diagram which separates CP-Y digestion products, the sulphoxide of Met-NH₂ is still not seen. This could possibly be explained by Met-NH₂ oxidizing to the Met-NH₂ sulphoxide during the process of amino acid analysis.

The chromatogram of the green fowl frog kinin CP-Y enzymolysis products indicates peaks 6-8 contain the following amino peptide sections: 6, Asp(3) Ala(2) Ser(1) Arg(1) Lys(2) Phe(1); 7, Asp(3) Ala(2) Ser(1) Arg(1) Lys(2) Phe(1) Tyr(1) Gly(1); 8, Asp(3) Ala(2) Ser(1) Arg(1) Lys(2) Phe(1) Tyr(1).

Summarizing the above results, it can be decided that the partial structure of the C-terminal of green fowl frog kinin is -Phe-Tyr-Gly-Leu-Met-NH₂.

The primary structure of green fowl frog kinin is Asp-Asp-Ala-Ser-Arg-Ala-Lys-Lys-Phe-Tyr-Gly-Leu-Met-NH₂. This structure has already been confirmed by corresponding synthetic samples obtained through the liquid phase method (Lu Yian, awaiting release). First, the synthetic product and the natural product have the same amino acid composition. Second, the synthetic product completely coincides with peak number 1 in both the corresponding HPLC system and another HPLC system. Finally, in the simultaneously implemented biological determination, they have similar biological activity.

Peaks 1 and 2 in the high efficiency liquid chromatogram were determined to be the same through amino acid composition analysis of enzyme separated sections. We still do not know what structural difference between them is causing two peaks.

In Figure 1, peak number 8 (or figure 2 RMO1 and RMO2) after reduction by α -sulfhydryl ethanol, two peaks were obtained under Figure 2 HPLC conditions. These peaks were maintained for the same length of time as peaks 1 and 2 in Figure 2. RMO 1 and RMO 2 both have the same amino acid composition as green foul frog kinin and the sequence from 1-13 is also identical. Apart from this, analysis using CP-Y to digest and subsequently reintegrate amino acid composition confirms that the C-terminal of RMO 1 and RMO 2 is the sulphoxide of Met-NH₂. Therefore peak 8 in Figure 1 is the sulphoxide of peak 12. The ratio of oxidized green foul frog kinin (sulphoxide) to its natural form is 1:3.6.

4) Biological determination

Both green foul frog kinin and peak 2 of Figure 2 produce a rapid, powerful contracting effect on guinea pig ileum vertical muscle plexus specimens. After rinsing, rapid relaxation occurs. When a solution antagonistic to P-material, [D-Arg¹, D-Phe⁵, D-Trp^{7,9}, Leu¹¹]-P material,^[14] is used the contraction function of green foul frog kinin is selectively blocked. After subcutaneous injection of a rat with green foul frogkinin, a marked reduction in blood pressure was observed. These results all match the biological activity of tachykinins. A detailed explanation of the pharmaceutical applications of green foul frog kinin will be given in another paper.

3. Discussion

Figure 6 lists the many types of tachykinins already discovered. After comparing the structures of each kinin, it can be learned that green foul frog kinin has several dissimilarities. The components of this peptide include two Ala residual groups with very strong capacity for alpha helix formation, while the alpha helix blocking Pro residual group is absent. This peptide is the longest of the known amphibian tachykinins. These special characteristics indicate the possibility that this peptide has certain new biological functions. Research regarding the physiological functions and the relationship between the structure and activity of this peptide is being implemented.

The green foul frog kinin C-terminal methionine residual group easily oxidizes into methionine sulphoxide during the purification process. Other methionine containing peptides such as P-material,^[11] leaf frog peptide and TPH-13^[12] exhibit the same phenomena.

Under phenyl base column HPLC conditions, peak 12 in Figure 1 or its sulphoxide produce two peaks as in Figure 2. Research into TPH-13^[12] and PGLa^[19] reports the same phenomenon. Synthetic TPH-13 and the natural product both produce peak division during HPLC. However, regarding PGLa, during HPLC separation its synthetic sample peak time is the same as that for the first

References

1. Erspamer, V. and Melchiorri, P., Neuroendocrine Perspectives (Eds. Muller, E. E. and MacLeod, R. M.), Vol 2, Elsevier Science Publishers B V., 1983, 37-106.
2. Erspamer, V., *Comp. Biochem. Physiol.*, 79C(1984), 1.
3. Nakajima, T., *Trends Pharmacol. Sci.*, 2(1981), 202.
4. Jiangsu Academy of New Medicine, Dictionary of Chinese Medicine, Shanghai Science and Technology Publishing House, 1979, Shanghai, 1174, 1226, 1652, 2610.
5. Hua Jiacheng, Wu Shixiang, Tang Yiquan, Zhang Huizhi, Zou Gang *Acta Biochimica et Biophysica Sinica*, 17(1985), 171.
6. Hya Jiacheng, Tang Yiquan, Tian Shenghai Wu Shixiang, Zou Gang, *Journal of Biochemistry*, 1(1985), 185.
7. Tang Yiquan, *Journal of Amphibians and Reptiles*, 4(1985), 99.
8. Montecucchi, P. C., de Castiglione, R. and Erspaner, V., *Int. J. Peptide Protein Res.*, 17(1981), 316.
9. Chang, J. -Y., *Methods in Enzymology* (Eds. Hirs, C. H. W. and Timasheff, S. N.), Vol 91, Academic Press, New York, 1983, 455-466.
10. Wagner, R. N., *J. Chromatogr.*, 326(1985), 399.
11. Floor, E. and Leeman, S. E., *Anal. Biochem.*, 101(1980), 498.
12. Rusconi, L., Perseo, G., Franzoi, L. et. al., *K. Chromatogr.*, 349(1985), 117.
13. Wu Shixiang, Zhao Dandan, Zou Gang, *Progress in Biochemistry and Biophysics*, 3(1979), 77.
14. Lu Yuan et al., *Journal of Biochemistry*, 2(1986), 23.
15. Conlon, J. M., Dacon, C. F., O'Toole, L. and Thim, L., *FEBS Lett.*, 200 (1986), 111.
16. Buch, S. H. and Vurcher, E., *Trends Pharmacol. Sci.*, 7(1986), 65.
17. Lazarus, L. H., Wilson, W. E., Gaudino, G. et al., *Peptides*, 6, suppl. 3(1985), 295.
18. Rusconi, L. and Montecucchi, P. G., *J. Chromatogr.*, 364(1985), 390.
19. Andreu, D., Aschauer, H., Kreil, G. et al., *Eur. J. Biochem.*, 149(1985), 531.
20. Lundaues, E. and Greibrokk, T., *J. Chromatogr.*, 149(1978), 241.

Detection of HBV-DNA by Spot Hybridization Using Biotin-Labeled Probe

40091014i Beijing ZHONGHUA NEIKE ZAZHI [CHINESE JOURNAL OF INTERNAL MEDICINE]
in Chinese Vol 27 No 9, Sep 88 pp 557-559, 588

[English abstract of article by Teng Xince [3326 2450 4595], et al., of the
Institute of Hepatology, Beijing Army General Hospital]

[Text] A spot hybridization technique with a biotin-11-duTP-labeled probe
and then a ^{32}P - α ATP-labeled probe was used to test serum samples from 86
patients for the presence of the hepatitis B virus (HBV)-DNA.

Serum samples from 79 (91.9 percent) of the patients yielded the same results
when tested for the presence of HBV-DNA by spot hybridization with either of
the two probes, while HBV-DNA was detected in four patients with the biotin-
labeled probe alone and in three cases with the ^{32}P -labeled probe alone.
Both probes could be used in spot hybridization tests to detect as few as 4 pg
of cloned HBV-DNA. These results indicate that the biotin-labeled probe is
at least as sensitive as the ^{32}P -labeled probe for the detection of serum
HBV-DNA. The hybridization procedure using the biotin-labeled probe was
specific, as shown by consistently negative results for 50 patients without
markers of HBV infection. There was a good correlation between serum HBV-DNA
and HBe markers and between serum HBV-DNA and Dane particles.

This study shows that the spot hybridization technique using the biotin-labeled
probe is specific, sensitive, reproducible and convenient. It is especially
suitable for researchers who obtain ^{32}P - α ATP from abroad, since the radio-
activity of the ^{32}P - α ATP often decreases substantially before it arrives at
its destination.

References

1. Rigby, P.W., et al., "Labeling Deoxyribonucleic Acid to High Specific Activity in vitro by Nick Translation with DNA Polymerase," J MOL BIOL, Vol 113, 1977 p 237.
2. Scotto, J., et al., "Detection of Hepatitis B Virus DNA in Serum by a Simple Spot Hybridization Technique: Comparison with Results for Other Viral Markers," HEPATOLOGY, Vol 3, 1983 p 279.

3. Denhardt, D., "A Membrane Filter Technique for the Detection of Complementary DNA," *BIOCHEM BIOPHYS RES COMMUN*, Vol 23, 1966, p 641.
4. Berman, J.W., et al., "Amplification of the Biotin-Avidin Immunofluorescence Technique," *J IMMUNOL METHODS*, Vol 36, 1980 p 335.
5. Guesdon, J., et al., "The Use of Avidin-Biotin Interaction in Immunoenzymatic Techniques," *J HISTOCHEM CYTOCHEM*, Vol 27, 1979 p 1131.
6. Kendall, C., et al., "Utilization of the Biotin/Avidin System to Amplify the Sensitivity of the Enzyme-Linked Immunosorbent Assay (ELISA)," *J IMMUNOL METHODS*, Vol 56, 1983 p 329.
7. Teng Xince, et al., "Use of Method of Elimination to Diagnose Non A/B-Type Hepatitis--Serum HBV-DNA and Relationship to Dane Particles," *CHINESE JOURNAL OF INTERNAL MEDICINE*, Supplement 24, 1985 p 10.

Longitudinal Observation of Vectorial Capacity of *Anopheles sinensis* in Vivax Malaria Endemic Area

40091014b Beijing ZHONGHUA LIUXINGBINGXUE ZAZHI [CHINESE JOURNAL OF EPIDEMIOLOGY] in Chinese Vol 9 No 6, Dec 88 pp 325-327

[English abstract of article by Fan Tianbao [2868 1131 1405], et al., of Shandong Institute of Parasitic Diseases]

[Text] This paper reports the results of a longitudinal observation of the vectorial capacity of *Anopheles sinensis* in transmitting tertian malaria. This work was done over the past 10 years, from 1975 to 1984, in a rice cultivating region in southern Shandong. The field test was primarily verified. In the quantitative analysis of the contributing factors, the method of field caught mosquitoes of human blood index, the results of the precipitin test and the rise or decline of tertian malaria were identical. The biting rate count was conducted using the dusk human net method, with the number of *Anopheles sinensis* found in the first 3 hours divided by 2.5. The results are consistent with practice. This report discusses the effect and influence of the environment and social factors, including meteorological conditions, the used of insecticides in rice fields and the anti-malarial technical measures used.

References

1. Deng Da, Qian Huilin, "Malaria Mathematics and Epidemiology," Henan Provincial Public Health and Epidemiology Station.
2. Fan Tianbao, et al., "Observation of Seasonal Variation of Vectorial Capacity of *Anopheles sinensis* in Transmitting Tertian Malaria in Rice-Producing Area of Southern Shandong," CHINESE JOURNAL OF EPIDEMIOLOGY, Vol 3 No 4, 1982 p 218.
3. Qian Huilin, et al., "Survey and Quantitative Analysis of Factors Constituting Vectorial Capacity of *Anopheles sinensis*," JOURNAL OF PARASITOLOGY AND PARASITIC DISEASES, Vol 2 No 1, 1984 p 3.
4. Deng Da, et al., "Use of Vectorial Capacity in Quantitative Analysis of Trends in Tertian Malaria Epidemics in the Huanghuai Plain," CHINESE JOURNAL OF EPIDEMIOLOGY, Vol 6 No 2, 1985 p 70.
5. Qian Huilin, et al., trans., "Discussion of Hematophagic Characteristics of *Anopheles* from 1971 to 1978 and Related Human Serological Indices," FOREIGN MEDICINE, PARASITOLOGY SERIES, No 4, 1981 pp 162-170.

Further Studies of Rise, Decline of Plasmodium vivax Gametocyte Viability

40091014c Beijing ZHONGHUA LIUXINGBINGXUE ZAZHI [CHINESE JOURNAL OF EPIDEMIOLOGY] in Chinese Vol 9 No 6, Dec 88 pp 329-331

[English abstract of article by Yang Bailin [2799 2672 2651], et al., of the Institute of Parasitic Diseases, Chinese Academy of Preventive Medicine, Shanghai]

[Text] This paper deals with the infectivity of gametocytes for Anopheles sinensis in two cases artificially infected with vivax malaria. The results obtained in this study indicate that the mosquitoes become infected on the first day of the illness and that the percentage of infected mosquitoes reaches a peak 2 to 8 days after the first appearance of clinical signs. The infectivity then declines obviously. The average oocyst count tends to peak in each participant on days 3 to 6, while on day 7 it falls abruptly and remains fairly low, without fluctuation, until the acute symptoms subside through the immune response of the host.

The authors suggest that the data recorded here provide the most favorable time to obtain Plasmodium vivax infection in mosquitoes, and this information has been of value in experimental investigations in which a large number of sporozoites is required.

References

1. Jeffery, G.M., "Infectivity to Mosquitoes of Plasmodium vivax and Plasmodium falciparum Under Various Conditions," AM J TROP MED HYG, Vol 9 No 3, 1960 p 315.
2. Yang Bailin, et al., "Experimental Study of the Viability Cycle of Plasmodium vivax Gametocyte," JOURNAL OF PARASITOLOGY AND PARASITIC DISEASES, Vol 2, 1984 p 238.
3. Hawking, F., "The Biological Purpose of the Blood-Cycle of the Malaria Parasite Plasmodium cynomolgi," LANCET, Vol 20, Aug 1966 p 422.
4. Cantrell, W., et al., "Changes in the Infectiousness of Gametocytes During the Course of Plasmodium Infections," J INF DIS, Vol 78, 1946, p 153.

Study of Immunogenicity, Safety, Protective Efficacy of Plasma-Derived
Hepatitis B Vaccine Made in China

40091014d Beijing ZHONGHUA LIUXINGBINGXUE ZAZHI [CHINESE JOURNAL OF
EPIDEMIOLOGY] in Chinese Vol 9 No 6, Dec 88 pp 332-335

[English abstract of article by Nie Jun [5119 6511], et al., of the Department
of Epidemiology, First Military Medical College, Guangzhou]

[Text] A total of 96 adults who were confirmed to be negative for all HBV sero-markers were injected with plasma-derived hepatitis B vaccine intramuscularly and intradermally (90 and 6, respectively) in a randomized, double blind, placebo-controlled trial. The vaccine was injected at 0, 1 and 6 months, and was followed up for 7 months. At 7 months after the first injection, the anti-HBs seroconversion rate in the intramuscular injection group was 86.7 percent, while in the intradermal group it was 76.2 percent, and the anti-HBs GMTs were 115 and 96 mIU/ml, respectively. There were no significant differences in either the anti-HBs seroconversion rate or the anti-HBs GMT between the two groups. The HBV infection rates in the vaccinated and placebo-controlled groups were 2.0 and 17.6 percent, respectively, with the protective rate of the vaccine being 88.6 percent. No serious side effects in the vaccinated group were observed.

References

1. Hollinger, F.B., et al., "Response to Hepatitis B Vaccine in a Young Adult Population," in Szmuness, W., et al., ed., "Viral Hepatitis," Franklin Institute Press, Philadelphia, 1982 pp 451-466.
2. Crosnier, J., et al., "Randomized Placebo-Controlled Trial of Hepatitis B Surface Antigen Vaccine in French Haemodialysis Units: I Medical Staff," LANCET, Vol 1 No 8218, 1981 p 454.
3. Szmuness, W., et al., "Hepatitis B Vaccine: Demonstration of Efficacy in a Controlled Clinical Trial in a High-Risk Population in the United States," N ENG J MED, Vol 303 No 15, 1980 p 833.
4. Lelie, P.H., et al., "Immunogenicity and Safety of a Plasma-Derived Heat-Inactivated Hepatitis B Vaccine (CLB)," AM J EPIDEMIOL, Vol 120 No 5, 1984 p 694.

5. Zoulek, G., et al., "Evaluation of a Reduced Dose of Hepatitis B Vaccine Administered Intradermally," J MED VIRAL, Vol 14 No 1, 1984 p 27.
6. Nagafuchi, S., et al., "Development of Skin Reaction to Hepatitis B Vaccines in Man," MICROBIOL AND IMMUNOL, Vol 28 No 2, 1984 p 257.
7. Kashiwagi, S., et al., "Development of DTH Skin Reaction to HBsAg in Individuals Immunized with HB Vaccine," MICROBIOL AND IMMUNOL, Vol 28 No 12, 1984 p 1355.

Study of Infectivity of HBsAg Positive Saliva

40091014e Beijing ZHONGHUA LIUXINGBINGXUE ZAZHI [CHINESE JOURNAL OF EPIDEMIOLOGY] in Chinese Vol 9 No 6, Dec 88 pp 336-338

[English abstract of article by Dai Zisen [2071 1311 2773], et al., of the Department of Epidemiology, First Medical University of the PLA, Guangzhou]

[Text] The HBsAg and HBV DNA in saliva from 80 asymptomatic HBsAg carriers and 43 HBsAg positive hepatitis B patients were detected by RIA and by a simple spot hybridization technique. The results showed the positive rates of HBsAg and HBV-DNA in the saliva collected from HBsAg carriers were 38.8 percent (31/80) and 2.5 percent (2/80), respectively, and were 51.2 percent (22/43) and 7.0 percent (3/43), respectively, from the hepatitis B patients. The results of an autoradiograph from a dot-blot of saliva and serum samples by simple spot hybridization showed that the consistency of the saliva samples was much lower than that of the serum samples.

The above results, both the positive rate and the consistency of the HBV DNA, did not support the general view that HBsAg positive saliva is a very important vehicle in the transmission of HBV. As for the source of HBV DNA in saliva, the possibility of localization and replication of HBV in the salivary gland should be investigated further.

References

1. Berminger, M., et al., "An Assay for the Detection of DNA Genome of Hepatitis B Virus in Serum," J MED VIROL, Vol 9, 1982 p 57.
2. Bencroft, W.H., et al., "Transmission of Hepatitis B Virus to Gibbons by Exposure to Human Saliva Containing Hepatitis B Surface Antigen," J INFECT DIS, Vol 135 No 1, 1977 p 79.
3. Scott, R.M., et al., "Experimental Transmission of Hepatitis B Virus by Semen and Saliva," J INFECT DIS, Vol 142 No 1, 1980 p 67.
4. Alter, H.L., et al., "Transmission of Hepatitis B to Chimpanzees by Hepatitis B Surface Antigen-Positive Saliva and Semen," INFECTION IMMUN, Vol 16 No 3, 1977 p 928.
5. Mecquarrie, M.B., et al., "Hepatitis B Transmitted by a Human Bite," JAMA, Vol 230 No 5, 1974 p 723.
6. Krugman, S., et al., "Infectious Hepatitis: Evidence for Two Distinctive Clinical, Epidemiological and Immunological Types of Infection," JAMA, Vol 200 No 5, 1967 p 365.

Analysis of Distribution of Shigella Groups in China

40091014f Beijing ZHONGHUA LIUXINGBINGXUE ZAZHI [CHINESE JOURNAL OF EPIDEMIOLOGY] in Chinese Vol 9 No 6, Dec 88 pp 339-341

[English abstract of article by Cui Hanying [1508 3211 5391], et al., of the Central Railway Anti-Epidemic Station, Wuhan; Li Guoguang [2621 0948 0342] of the Department of Epidemiology, Tongji Medical University, Wuhan]

[Text] The authors isolated 155,122 strains of Shigella from different areas in China and reviewed them for 37 years (1949-1985). Analysis shows that the percentage of Subgroup B of the total isolations was the highest (80.5 percent) before the 1980s, but decreased in the 1980s (68.5 percent). Both 2a and 1b within Subgroup B were epidemic subtypes, but 1a and 2b have tended to rise recently. The obvious recent increase in the proportion of Subgroup A in the northwest and south central areas of China suggest that environmental contamination and poor sanitation involving the drinking water in these areas might explain this phenomenon, which also might be associated with a variation in the virulence of the bacteria. The Health Authority should pay attention to its prevention and cure. The ratio of Subgroups B to D in East China was the lowest, and it appears that some relationship exists between this phenomenon and the cultural-economic level in certain areas.

References

1. Soesenberg, M.L., et al., "Shigellosis in the United States: 10-Year Review of Nationwide Surveillance, 1964-1973," AM J EPIDEMIOL, Vol 104, 1976 p 543.
2. Blaser, M.J., et al., "Shigella Infections in the United States, 1974-1980," AM J EPIDEMIOL, Vol 147, 1983 p 771.

Study of Strain of Brucella canis Isolated From Cow for First Time

40091014g Beijing ZHONGHUA LIUXINGBINGXUE ZAZHI [CHINESE JOURNAL OF EPIDEMIOLOGY] in Chinese Vol 9 No 6, Dec 88 pp 342-344

[English abstract of article by Li Yuankai [2621 0337 0418], et al., of the Institute of Epidemiology and Microbiology, Chinese Academy of Preventive Medicine, Beijing]

[Text] This paper deals with a survey of brucellosis among 50 cattle using a rough B. canis antigen serologically. Eventually there were 11 positive reactors (>1:80), with the highest titer of 1:640. One strain of B. canis was isolated and has been identified with the spleen of a reactor cow.

References

1. Shang Deqiu, et al., "Report of First Isolation in China of Brucella canis," CHINESE JOURNAL OF EPIDEMIOLOGY, Vol 5 No 6, 1984 p 345.
2. Shang Deqiu, et al., "Survey of B. canis Brucellosis in Five Provinces and Districts," JOURNAL OF REGIONAL DISEASE OF CHINA," Vol 6 No 3, 1987 p 129.
3. Li Yuankai, et al., "Survey Report on the First Discovery of B. canis Brucellosis in a Certain Province," CHINESE JOURNAL OF VETERINARY MEDICINE, Vol 14 No 2, 1988 p 10.
4. Lin Jinguang, et al., "First Isolation of B. canis in Fujian," JOURNAL OF DISEASES COMMON TO HUMANS AND ANIMALS IN CHINA, Vol 3 No 3, 1987 p 30.
5. Huang Zhixiong, et al., "Survey Report on B. canis in Guangxi," GUANGXI MEDICINE, Vol 9 No 6, 1987 p 289.
6. Regional Disease Prevention and Treatment Bureau, Ministry of Public Health, "Selections from Foreign Data on Brucellosis," Beijing, 1982 pp 35-54.
7. Joint FAO/WHO Expert Committee on Brucellosis, "Sixth Report," Geneva, World Health Organization, 1986 p 111.
8. Carmichael, L.E., et al., "Brucellosis Caused by Brucella canis--An Update of Infection in Animals in Humans," WHO/Bruc, No 80, 1980 p 361.

BRIEFS

Gene-Engineered Hepatitis B Vaccine--The first Chinese-made high purity, high efficacy, and high safety gene-engineered hepatitis B vaccine has been developed and manufactured jointly by the Virology Institute of Chinese Academy of Preventive Medicine, the Changchun Institute of Biological Products, and the Chinese Institute for the Control of Pharmaceutical and Biological Products of the Ministry of Public Health. Surveys show that in China the incidence of hepatitis B ranks top among epidemic diseases, and the hepatitis B surface antigen (HBsAg) carrier rate reaches 8.8 percent. Annually, about 1 million newborn are infected with hepatitis B, and there are about 100 million carriers of the virus. Today, vaccine immunization is still the most effective way to prevent the disease. Because of limited blood resources, the Chinese-made vaccine derived from blood cannot meet demand. After 7 years' research on mammalian cell applications in developing HBsAg gene-engineered vaccine, researchers at the Virology Institute of the Chinese Academy of Preventive Medicine succeeded in establishing the hepatitis B virus recombinant DNA plasmids which were then applied as mammalian cell transformers to clone the high-yield HBsAg cell line. The specifically cloned cell line can produce 5-7.5 mg HBsAg per liter of culture media. In July 1988, 84 children received the newly developed high-immunity vaccine. Three months later, 100 percent of the children immunized built up antibodies against the cloned antigen. The efficacy of the new vaccine immunization was remarkably higher than that of blood-derived vaccine. The new vaccine has been put into large-scale production by the Changchun Institute of Biological Products of the Ministry of Public Health and has been evaluated by the Chinese Institute for the Control of Pharmaceutical and Biological Products. [Summary] [40081016 Beijing GUANGMING RIBAO in Chinese 3 Dec 88 p 1]

Design Scheme for an Expansible Multicomputer System

40080072 Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese
Vol 11, No 11, Nov 88 (manuscript received 9 Nov 86) pp 641-649

[Article by Nie Caitao [5119 6846 3447]: "The Design Scheme of a Versatile and Expansible Multicomputer System"]

[Excerpts] Abstract: This paper discusses problems concerning the design of an interconnection network for parallel computer systems. We also describe a design scheme for the B-HIVE multicomputer system. This scheme uses a simple, flexible means to achieve a high-performance multicomputer system.

I. Introduction

With the continued exploitation of fields of computer applications, parallel processing has become an unavoidable technology for enhancing the performance of computers. At present, this is even more true with the advances in VLSI technologies because it is already economically feasible to use interconnection networks to connect innumerable processors and memory modules to form a parallel processing system.

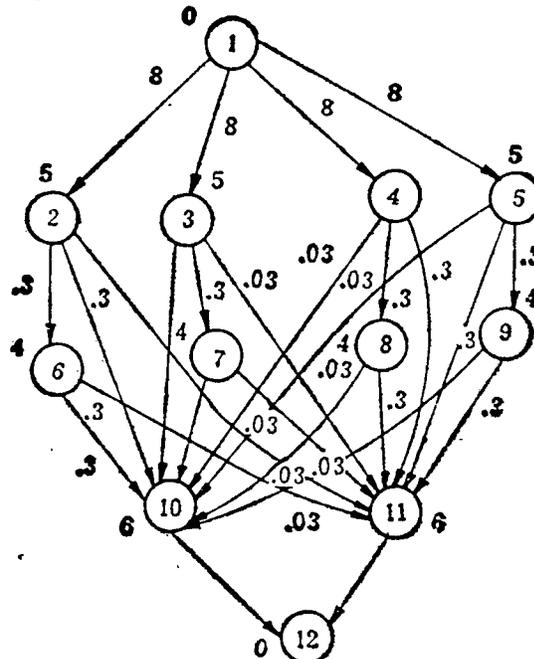


Figure 2: CFG [Computation Flow Graph] for Dynamic Figure Analysis

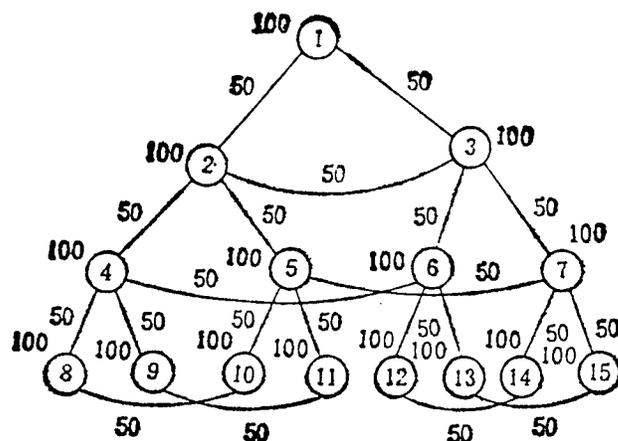


Figure 3: CRG [Computing Resources Graph] for a Super Tree Structure

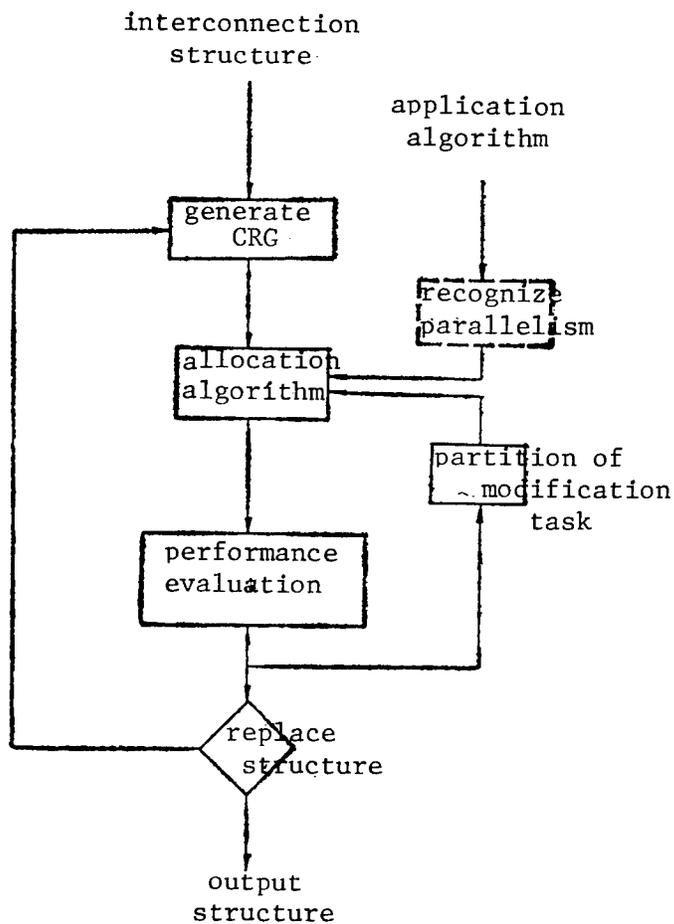


Figure 4: Evaluation Method for Overall Performance of the Interconnection Network

IV. An Actual Example of the Design of a Multicomputer System--the B-HIVE.

The primary motivation for developing the "B-HIVE" multicomputer system was to resolve problems with real-time signals and with real-time image processing. In many fields the likes of weather forecasting and the analysis of dynamic images [4], the input data can be seen as a continuous stream of data, while the process of processing it may be understood as a group of related sub-tasks. Characteristics of the objective of the application forced design of the B-HIVE to have areas in which it is totally different from the designs of other systems. The calling of all sub-tasks and allocation of the processor are determined beforehand, and communications modes and the circuits for transmission of data in the network are also arranged before the routines at a node execute. One routine segment will statistically allocate the node computer, the routine that has been loaded onto the node computer will repeatedly accept data, and then this will process large quantities of data in a pipelined fashion. The processor is only allocated once as the system is executing, so that within a relatively long period no new task is allocated to the processor. When the node computer has accomplished its task, it is not allocated a new task, but rather the same routines are set to processing a new data group. In addition, we will determine the work of allocating management and tasking for the entire system, thereby simplifying design of the nodes.

Generally speaking, implementation of this project can be largely divided into two stages. The first stage uses existing processors in accordance with the format of the ALPHA interconnection network to make up a 24-node system, which reduced the time needed to develop a sample machine and provided a working environment for intense study. The second stage determines the next step in research goals on the basis of the first stage. These goals include:

--replacing the node computers with a simple stream of processors, where this stream of processors will quite efficiently execute algorithm source code that has to do with data signals and image processing, thereby constituting one layer of structure.

--realizing node design in VLSI technology.

--implementing the automatic detection of parallelism.

--further enhancement of the operating system functions on the basis of a more detailed understanding of the demands of applications.

1. Selection of an interconnection network

As described above, the B-HIVE is primarily used for the processing of real-time images and real-time signals. Consequently, the least time in overhead is an important index. By its strength of being able to meet the application

demands, the ALPHA interconnection network was selected to be the basis for this system structure. The ALPHA structure [5] can be seen as a Hypercube structure having a space of r degrees, where there are n_i nodes on every direction i , and where a node on a particular direction is connected with all other nodes in that direction.

Simulation by means of the ALPHA structure and other interconnecting structures (such as Binary Cube, Binary Tree, CCC, Fully Connected, Hypertree, Mesh, Ring, and Star) using the evaluation method, described earlier, proved that the ALPHA structure is a better candidate. A 24-node ALPHA structure is shown in Figure 5.

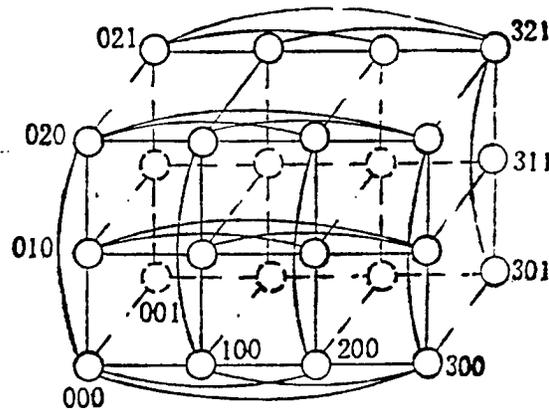


Figure 5: An ALPHA Structure With 24 Nodes (4X3X2)

2. Node design

Each node in the system is composed of two processors, one applications processor (AP) and one communications processor (CP). Since their execution functions are different, the APs can be of a different structure, while the CP structures will be identical. When it is not necessary for the AP to intervene, the CP will use packet switching to accomplish communication among the processors. To better support the communications function, the CP will be designed with RISC technology. Figure 6 shows the structure of the B-HIVE node processors. For any communications request, the I/O controller can allocate an available buffer, which then allows transmission of the data packet to be done under DMA [Direct Memory Access]. After transmission of the data, the controller will analyze the packet header before issuing the appropriate activity command.

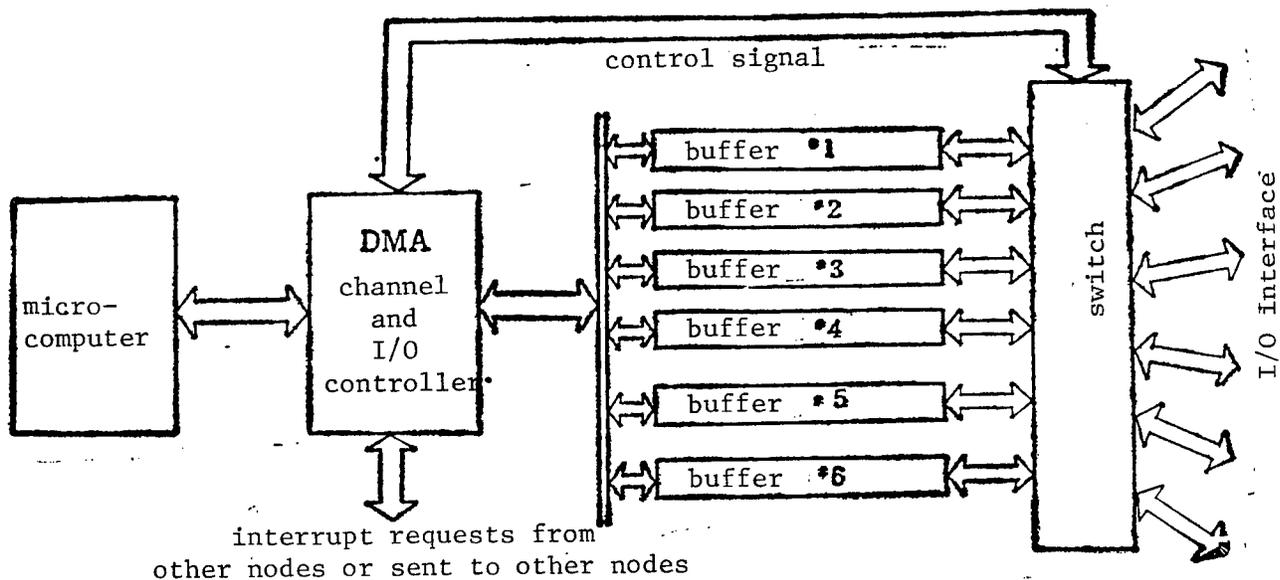


Figure 6: The B-HIVE Node Structure

3. Developing algorithms appropriate to the ALPHA structure

Reference 6 describes a dual algorithm called 'ASCEND' (or 'DESCEND'), and this algorithm may be described as shown in Table 1.

Table 1. The ASCEND Algorithm

```

Proc      ASCEND
  for  $j \leftarrow 0$  Step 1 until  $j = k - 1$ 
    do for each  $m_j$   $0 \leq m < n$ 
      Pardo if  $bit_j(m) = 0$  then
        OPER ( $m, j; T[m], T[m + 2^j]$ )
      fi .
    odpar
  od
Corp     ASCEND

```

Here, $bit_j(m)$ is the coefficient of the binary expression 2^j in $m = \sum_{j=0}^{k-1} bit_j(m)2^j$.

The ASCEND algorithm is quite general, and use of this algorithm can better resolve the many problems such as Fourier transformations, collation, and data rearrangement [6]. The facts have shown that the interconnection mode most capable of implementing the ASCEND algorithm is the N-Binary Cube. Due to characteristics of the ALPHA structure, the N-Binary Cube may be seen as a special instance of it [5]. For this reason, we deduce that the ALPHA structure is also one structure that is compatible with the ASCEND (DESCEND) algorithm, and also that using collation as an example explains the efficiency of the algorithm in the ALPHA structure.

Given that N is the number of processors, then the product of L_i can be expressed as

$$N = L_r \times L_{r-1} \times \dots \times L_1 \quad (1 \leq i < r)$$

Here, r is the space dimension of the structure.

The form the ASCEND algorithm takes in the ALPHA structure may [be] described as in Table 2.

Table 2. The ASCEND Algorithm in the ALPHA Structure

```

Proc  ASCEND
  for i ← 1 step 1 until i = r
    do for each x: 0 ≤ x < n
      Pardo if  $L_i = 2^a$  then
        OPER (x, i; T[x], T[x'])
      fi
    odpar
  od
corp  ASCEND

```

In this expression, a is a positive interger; x and x^1 are nodes in the ALPHA structure.

$$x = (x_r, x_{r-1}, \dots, x_{i+1}, x_i, x_{i-1}, \dots, x_1) \quad x' = [x_r, x_{r-1}, \dots, (x_i + 2^{a-1}), \dots, x_1]$$

4. System software

System software is composed of several portions, which with the exception of the running kernel, reside within the master processor.

a. Considerations for the design of the operating system

The design of multicomputer operating systems is a rather complex matter. But when solving any particular problem, it is completely possible to simplify the design of an operating system in accordance with the characteristics of the application. In the special applications environment with which we are faced, because allocation and dispatching of the sub-tasks only occurs once during operation of the system, the data transmission paths need not be changed, occurring as they do over intervals that are quite long in terms of the rate at which data is input. Consequently, the basic requirement for the operating system is how to perfectly implement the job of static allocation to the processors of the sub-tasks. This decision allows first-level management tasks in the processors to be postponed until we have a more detailed understanding of the requirements of the application objectives. The further result of this kind of processing method is what allows all management problems concerned with concurrency (such as synchronous requests and process wake-ups) to be carried out by the communications processor.

Software for the communications processor is done in a simple hierarchical manner. Here, the majority of source code operations are transmissions of data blocks among the application processors, and the highest level of transmission of those data blocks is message handling, which accomplishes the transmission of data among symbolic addresses and also provides a means of process synchronization.

b. Compiling routines

Programmers should use programming languages that are strong in concurrency and that provide concurrency for routines. When the compiler routines receive routines written in these languages, and also concentrate the data transmissions relevant between sub-tasks, as well as information also related to this, they construct a CFG-compiled output of processor allocation algorithms that include a target program segment and an estimated value for the time of calculation of each segment and quantity of data transmitted, as well as describing relational graphs of relations among these program segments. Reference 2 provides a method for estimating time requirements for each program segment, and additionally can treat each translated routine as a standard, which provides an empirical estimating method for execution time.

At the first stage of this project we will revise a Modula-2 compiler to meet the demands of parallelism. Then in the second stage the point of development focus will be primarily on self detection and exploration for parallelism.

c. Allocation routines

Allocation routines will investigate related circles, calculation times, and quantities of data transmitted. Then, this information will be used to

allocate the data and routine segments to the nodes. At the same time, the allocation routines will also determine the locations of routine bottlenecks upon which to make recommendations regarding the merging or further break up of routine segments. This information will be fed back to the compiling program, consequently generating a group of new program segments and relevant features.

Allocation routines include the following parts:

i. Associated matrices generate modules, and the associated matrix shows, for interconnected topological structures, whether or not there is a physical connection between nodes. If there is a physical communications link between nodes i and j , then the elements of the link matrix $[i,j]=1$; otherwise, $[i,j]=0$, and the elements of link matrices for each node form associated matrices of an interconnected structure.

ii. The CRG generates modules, and for CRGs from multicomputer systems we choose processing capacity to be the performance index for node processors, which specification should be provided by the designers. Another group of specifications for the CRG are the communications passbands for the links, which are derived from the link information given by the modules generated by the associated matrices used by the modules generated by the CRG. Among the associated matrices, there are direct physical connections between node pairs for which elements of the associated matrix are $[i,j]=1$, and the passbands for these links are provided by the designers. For those node pairs where the associated matrices have elements $[i,j]=0$, it is stipulated that its information must be transmitted along the shortest path between that node pair. The frequency band of that logical link will contain the frequency band of the smallest physical link in that transmission path. Using this method, we can determine the values of the frequency bands for all physical links and logical links in the CRG, consequently obtaining the CRG we desire.

iii. Allocated modules, where allocated modules used the so-called "greed" algorithm, where the CFG is reflected in the CRG. The basic principles of the algorithm are as follows:

--Begin the allocation from the highest level of the CFG, then proceed by level.

--As far as what happens between each level of the CFG, the node with the strongest capacities for calculation and communication in the CRG should be allocated the tasks of the initial level; and for all nodes placed within the same level of the CFG, the transmission results should be provided to the nodes at the lower levels, and precedence is given those nodes having the greatest quantities of communications.

--Already-selected CRG nodes should be eliminated from new cycles of allocation.

--Continue to execute the process just described until the sub-tasks within the CFG have been completely allocated.

d. The connection routines

When the connection routines are being allocated to the processors by routine segments, this determines the basic calls for these routines. The results of certain program segments will possibly be used by some other routines, and when these routine segments have been allocated to the processors, the target addresses of the data packets are already known.

e. Loading routines

The loading routines will place the routine segments at each processor, and will initiate their execution.

f. The run-time kernel

The run-time kernel will support the operation of routines at the nodes. This includes accepting routine segments, and accepting the commands to initiate routine execution that come from the host computer, as well as commands to stop routine execution. In addition, they will also support basic I/O and communication between nodes.

Figure 7 shows relevant software concerns.

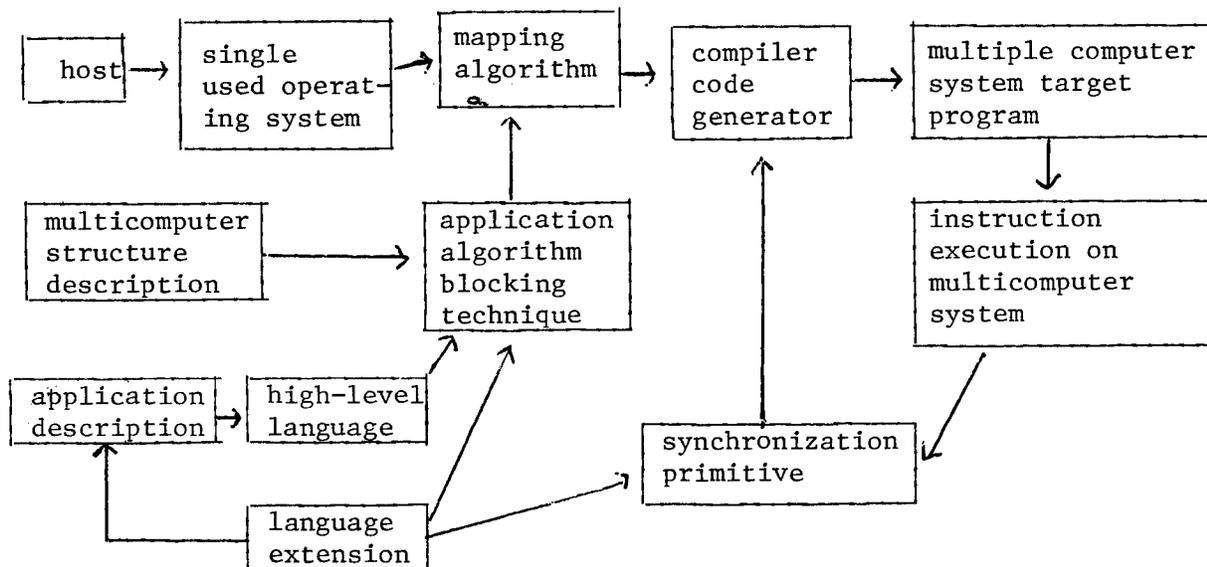


Figure 7: Software for the B-HIVE System

In the routine modules that we have described, because the linking routines and the loading routines are tasks that execute normally, system demands on the run-time kernel are very simple, and therefore are not difficult to implement. It is only necessary to concentrate one's precision in the allocation of routines and in the development of coding the routines, and this will undoubtedly shorten the software development. The overall evaluation method will simplify and make more precise the selection of interconnection networks. Consequently, we have reason to believe that the design of the B-HIVE will bring a flexible, easily implemented method to implementing high-performance multicomputer systems.

References

- [1] T.-Y. Feng, "A Survey of Interconnection Networks," *Computer*, 12(1981), 12-27.
- [2] R.R. Oldehoeft, "Program Graphs and Execution Behavior," *IEEE Trans. on Software Engineering*, SE-9:1(1983), 103-108.
- [3] Kai Hwang and Faye A. Briggs, *Computer Architecture and Parallel Processing*, published 1984 by McGraw-Hill Book Company.
- [4] D.P. Agrawal and R. Jain, "A Pipelined Pseudoparallel System Architecture for Real Time Dynamic Scene Analysis," *IEEE Trans. on Computers*, C-31:10(1982), 952-962.
- [5] D.P. Agrawal and L.N. Bhuyan, "A General Class of Processor Interconnection Strategies," *Proceedings of the 9th International Symposium on Computer Architecture*, 90-98, April 1982.
- [6] Franco P. Preparata and Jean Vuillemin, "The CCC--A Versatile Network for Parallel Computation," *Communications of the ACM*, 5(1981), 300-309.

Economies of Scale in Current Computer Industry

40080078 Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 45, .
23 Nov 88 pp 46, 48-9

[Article by Chen Jingxing [7115 2417 6821], Computer Economic Information Network of the Industrial and Commercial Bank of China: "On Economies of Scale for China's Fledgling Computer Industry"]

[Text] The computer industry is a new high-technology, high-intelligence, and high-value-added industry that has caught the attention of people in our time. As science and technology have grown so abruptly over the past 40 some years, the computer industries of the developed nations have grown to a considerable scale to become a mainstay industry of the national economies. China is a developing socialist nation, and how the theory and practice of the preliminary stages will direct the growth of China's computer industry will be a major event in deciding the progress of China's future economic take-off and "four-way modernization," and is as well a problem clearly in the minds of people today.

I. The current situation in the computer industry and prospects for its growth

In recent years, the computer industry in China has maintained the principle of "bring in, assimilate, develop, and innovate" in keeping with the idea of "building industries upon need." This practice has resulted in considerable results, for there has been a 30.1 percent rate of annual growth in the computer industry, some 20 percent higher than the annual rate of growth for other industries throughout the country over the same period, and the following three changes have appeared in production, marketing, and applications.

A. The preliminary scale of computer manufacturing

During the period of the Sixth 5-Year Plan, China founded 21 microcomputer production and assembly lines having an annual designed production capacity of some 200,000 units. There are also 12 firms with microcomputer factories producing 10,000 and more each year. By the end of 1987 there were more than 146 computer enterprises throughout China, and their gross industrial output value was 2.02 billion yuan, a growth of 150 percent and 480 percent, respectively, over their values for 1981. The proportional growth rates for production from 1982 through 1987 were 21.35 percent (1982), 64.2 percent (1983), 94.2 percent (1984), 9.8 percent (1985), 22.1 percent (1986), and 46.6 percent (1987), which shows a pulsating forward growth. At present, microcomputers have grown from single products to series of products, and an

optimum type has begun to emerge. As the quality of microcomputers produced in China has continued to improve, the concerns of users have progressively diminished, and for this reason in the competition with imported computers for dominant position, domestically produced computers have captured an 85.6 percent market share. Since last year, under the stimulus of reforms of the economic system, areas the likes of Beijing, Shanghai, Guangzhou, Jiangsu, and Zhejiang have formed a number of computer group companies integrating scientific research, development, production, marketing, and service; these companies transcend area and ownership. For example, the "Changjiang" and "Changcheng" [Great Wall] consortia were the first groups to have two bases, in both the north and the south. This has changed the isolationism of the computer manufacturing enterprises, where research and production had been divorced, and there was a situation of low quality and repetitious efforts. The resolution of this problem has played an important role in opening up both the domestic and international computer markets.

B. High technology development zones are just forming, with computers at the forefront

China's computer services at present are such that factories market their own products, plants make contact with stores, service is via intermediaries, and computer stores are the normal channel and means of marketing. Computer services went through the 1984 "microcomputer fad," and then after the closings, halting, merging, and realignments of 1986, have entered a stage of relative stability. This is chiefly reflected in science and technology industrial parks that continue to be built, as for example the Beijing "Zhongguancun Electronics Street," which has become China's largest microcomputer and components market.

C. As fields of application have increased, there has been progressive in-depth development

Microcomputers are at the heart of computer applications in China, and from 1981 through 1987 there was an average annual increase of 81.3 percent in the numbers of installed computers, and by the end of 1987, 259,000 microcomputers had been installed throughout China, a growth of 36.7 percent over 1986. Computer development projects have grown from some several hundred achievements to more than 20,000, and computer scientific and technical personnel have increased from 20,000 to more than 100,000. The dissemination and application of computers have already made themselves known within the national economic reconstruction and various areas of daily life, to varying degrees, and this is generating revolutionary effects upon production, exchange, consumption, and daily life.

If we take a long look at the current condition of the computer industry and of its developmental trends, as well as its effects upon the national economy, we can see the following rules: going from labor-intensive industries toward capital-intensive industries, thence to technology-intensive industries, is the inevitable result of changes in social production structures and the progress of history. In China at present, labor-intensive traditional industries stand in the principal positions, and although there

are ups and downs along the way, prospects for the growth of the computer industry are unquestionably optimistic. For the period of the Seventh 5-Year Plan, the state has determined that the principle objective of computer applications will be the 12 major projects, 10 applications systems, and 8 major fields of applications. This shows that computer applications in China will go from the small in scale to the large, and will continue to expand.

II. Some problems concerning the economies of scale for the computer industry

In the situation where we have a socialist commodity economy, the production of a particular product is certain to grow to a considerable scale before it can have a share of the market, or can gain greater economic results, and in a similar fashion, the computer industry will also take this route before it can grow much larger. To this end, we should diligently study the following problems:

A. We should study just what are the economies of scale for the computer industry.

By "the computer industry" is meant the industry that produces and provides information and that accumulates, stores, processes, controls, and transfers equipment, software, manpower, and technological services in the process of applying computer technology to realize the creation of economic and social information. Economies of scale for computers arise when enterprise units bring about increased economic results as achieved through reductions in costs for the unit because those units expand the scales of production operations. For another perspective, it is equilibrium between investment and output, and then growth.

We can see from the real situation that high costs are an important obstacle for the development of the computer industry. For example, if it will cost about 100,000 yuan for one microcomputer and such peripherals as 2-3 terminals, and if production enterprises use microcomputers for doing comprehensive management, that cost would occupy a large proportion of fixed assets; and if the costs of funding are too great, in the current situation where funding is extremely tight, the majority of small-to-mid-sized enterprises will be unwilling to use their limited funds for the development and application of computers. In addition, if we are to expand our product exports, high costs will keep us from being competitive internationally. Therefore, only by great reductions in product costs and selling prices can we better expand the computer marketplace.

The computer is a high-technology product, but high technology is invariably accompanied by high risk, as for example if one oversteps the production capacity of the current stage and the capacity of the marketplace to absorb one's products, when that would certainly lead to overstocking and losses. According to statistics from pertinent departments, there is at present some 25 billion yuan worth of computers in China that have yet to be utilized. Therefore, if we are to expand the scale of production for computers, we must pay close attention to the results of scale, and allow scale to be discussed together with results. This will prevent uneconomic scales, which would affect the growth of the computer industry.

B. We should study the effects of changes in the economies of scale on the computer industry.

At this current stage, although China's computer industry has certainly grown, it remains in a weak operational status. There is a large gap when compared to that of developed nations in Europe, such as West Germany, England, and France. When compared to other domestic electronics products, computers still greatly trail televisions.

The improvement in social and material lives is an important factor in optimizing the scales of production for the computer industry, allowing them to directly enter the realm of personal consumption. Changes in the economies of scale for the computer industry will also be restricted by non-economic factors. Last year, for example, because of the scale at which the state greatly reduced the funding of fixed assets, and the corresponding reductions in financial budgeted expenditures, where some units could originally have purchased a medium-to-large computer, they are now only able to buy a smaller one, which has restricted both microcomputers and their peripheral equipment.

Conditions for the changes in scales of economy for the computer industry: first, changes in the scale of user acceptance and factors restricting growth; second, development and innovation by industry personnel. The former is the foundation of change, while the latter is the motivation for change. In a large country such as ours, where there is a vast arena for computer applications and where a huge potential market languishes, there is great attraction for those persons who are intent upon the cause of computers to go exploring.

C. We should develop an evaluation index by studying the economies of scale for the computer industry.

In developing the computer industry, we must diligently discover and determine an evaluation index for the economies of scale, and this index might be:

1. Proportion of output value: this would indicate the proportion of computer yield within the overall output value of society. Current gross output value of computers in Japan is 4 trillion yen (approximately equivalent to 30 billion US dollars), which is 1.2 percent of the gross output of that society, while for Chinese society the computer yield is only 0.1 percent of our social gross output. Computer products in Chinese society have been investment commodities for a considerable time in our history. Demand for them has grown at a rate equal to the growth of the gross value of fixed asset investments. If we figure 8.6 percent as the rate of growth for computer funding, by the year 2000 the scale of computer operations could be 34.9 billion yuan, which would be 1.2 percent of gross social output value and more or less the level in Japan during the mid 1980s.

2. The rate of generated income from exports: by this is meant the proportion of income generated from computer exports within the gross value for computers. In the world at present, the computer market is quite brisk, and estimated gross world computer sales in 1987 were 167 billion US dollars, within which the American and Japanese market shares were 51.8 and 17.3 percent, respectively, while their generated revenue from exports were 36.3 and 28.1 percent respectively. Computer exports in China for 1987 were only 45 million US dollars, which is only 0.03 percent of total computer sales throughout the world, and the proportion of export-generated revenues was 8.3 percent. With our continued implementation of an export-oriented strategy, we can expect a rise in the proportion of revenue generated by computer exports.

3. The proportion of applications coverage: by this is meant per capita quantities or value of ownership. There are currently some 259,000 microcomputers in China for a per capita value of 3.7 yuan (approx. 1 US dollar), which is spread across industry, commerce, banking, posts and telecommunications, and health; and since each 100 workplaces has only two computers, we can see that the rate of coverage is quite low. For 1987, the values of installations per capita in Japan, Australia, Canada, and Western Europe were 20, 50, 28, and 20 US dollars, respectively, which were 20, 50, 28, and 20 times that for China. According to predictions by relevant departments, if figured according to average values, by 1990 there will be 630,000 microcomputers in use in China, valued at 8.44 billion yuan, a per capita value of 2.1 US dollars. After 1990 the average annual rate of growth will be 5.8 percent, so that by 2030 the rate of coverage could reach that for Europe or Japan during the mid 1990s.

4. The per capita rate of taxable profits: this refers to the annual per capita tax revenues generated from the computer industry. After the blow from imports during 1986, the computer industry in China experienced severe setbacks in production, sales, and applications, but because of protection offered by state policies there was a rebound in 1987. According to statistics from 40 key computer enterprises throughout China, annual per capita tax revenues were 2,958 yuan, which can be compared to the 6,708 yuan rate for the broadcast television industry, which means that each year each person would generate 3,750 yuan less in tax revenues from computers. Based on the demand for the economy of scale for the television industry, if the rate of tax revenues for the computer industry is to reach 6,708 yuan, the average rate of growth for same would have to be 11 percent, in which case that rate would not be reached until 1995.

Based on the foregoing analysis, the progress of growth for the computer industry is determined by the level of productive forces. In this initial stage of China's socialism, where the material productive forces of economic operations are undeveloped, the ground to be covered in opening up the domestic computer market will not be too great. We estimate that by the early 21st century, we can reach the levels of the developed nations during the mid 1980s.

III. The general plan for the growth of the economies of scale for the computer industry

The difficulty and problem with which the computer industry is currently faced is that economic results have not been great, and that therefore we must get rid of the many restricting factors and in good time draw up a general plan for the growth of the economies of scale for the computer industry.

A. By relying upon major cities of the computer industry, we should open up zones for the export industry, should gather our forces of growth, and should become more deeply involved in both domestic and foreign markets.

Scientific and technical personnel in the computer industry are the most concentrated (the density is 2.6 that of other industries), and those areas for production of computers in China are largely prime areas for the exchange of information with outside interests and for the exchange of material goods. There, too, the conditions for real S&T capacity, industrial bases, and investment environments are superior. Therefore, this transformation into an export-oriented industry is not only necessary, but is also quite possible.

Developing an export-oriented economy is a roundabout strategy for the development of China's economy. We are now looking at this from an overall point of view, for when an economy is backward, natural and semi-natural economies have a more important position. Therefore, we must divide our development of the computer industry into two steps: first, areas where the level of forces of productivity is higher and where the framework for the distribution of the computer industry has already been formed, should be first to take advantage of the opening to the outside by bringing in advanced foreign technology and producing attractive products with excellent cost performance ratios. At the same time, in areas where there have been better economic results, together with enterprise units with contract operations and personal responsibility systems, we should make strong efforts with computer applications, by which we might expect to accumulate funds, enhance our power of growth, and summon forth the demand for "quantity" from our computer industry and an improvement in "quality." The second step is when the computer output value for the entire country reaches 1.2 percent, revenues from exports reach 26 percent, and per capita from taxes on profits reach 7,000 yuan or more, and when computer applications can be expected to have become common over a large area throughout the country.

B. By concentrating on applications to spur development and by enhancing the effort to add intelligence to traditional products, we will be causing computer products to grow into consumer products.

The industrial and applications sectors are the two wings by which the computer industry will take to the air, and therefore, we must continue to implement the correct principle of "concentrating on applications to spur development" and to continue to advance models of development for the industrial and applications sectors that cull the best from what is

traditional. From traditional means of operational management and traditional concepts of technology we must search out a way to rely upon computers to transform traditional industries and the renewal and upgrading of products.

We can see from our experience over the past few years that the application of computer technology in factory enterprises has primarily been manifest in the revolution of the "three Cs" (computer-aided design, computer-aided manufacturing, and computer-aided management). In addition, it has shown its hand as well in the areas of banking, railways, posts and telecommunications, and large scale commerce.

Developing products with on-board intelligence and the Zhonghua ["China"] Learning Machine are breakthrough options we can choose. Urban dissemination of televisions in China has reached 90 percent, and some homes have one or two radio/cassette recorders, but we have the capacity to manufacture 25 million TV sets each year and 10 million radio/cassette recorders. If we use the TV set as the monitor for the computer and the radio/cassette recorder as the storage and language system for a computer, this would allow the TV, radio/cassette recorder, and the few-hundred-yuan Zhonghua Learning Machine to comprise a complete modern "learning system," the equivalent of hiring a home teacher for one's child. This would be a definite drawing power for modern schools and some families, and in this way we could expand the use of the computer from a simple investment product to a consumer product. This would break new ground for the growth of the computer industry.

C. By consolidating and developing new technology experimental areas we can move the computer industry to the head of new technology industries, eventually forming markets of scale for the computer industry.

Under the guidance of the national "Torch Plan," a group of high-technology development zones are unfolding in regions having some of the better bases for such activity. Facilitation of the "Torch Plan" will take the computer industry to a new world, producing a new dominant position. At present, the new technology development areas exhibit the following characteristics: the first is that computer specialties in the development zones have become concentrated, which better suits customer demand, allowing them to distinguish among them and to compare. Consequently, this has brought about more competition among computer operations units, which has improved the ratio of product price to performance. Second, this has created a mini-atmosphere conducive to the computer marketplace, and has brought about growth in the demand for high technology and for computer customers. Third, this has strengthened the management of computer industry populations, and relations have been established with the international markets, which has quickened the pace of growth toward an export-oriented economy.

The "Zhongguancun model" has become the new form in the public eye during the restructuring, and this form continues to be perfected in light of experience. It is the track by which to include computer commodities within the new order of a socialist commodity economy and will organically integrate fund markets, together with complementary sales and services. With the local city

governments leading the way, as far as system structure is concerned, the General Office of the Leading Group for Development of Electronics Industry, the State Science & Technology Commission, and the State Education Commission will form committees coordinated by scientific and technical enterprises. These will formulate policies of computer operations management and relevant rules and regulations, and will have sole responsibility for the planning, command, coordination, and management of computer markets.

The establishment and development of the "Zhongguancun Electronics Street" was not only due to objective conditions, but was due also to a self-generated internal demand and was an inevitable consequence. All areas of China, but foremost among them the computer industries in the coastal cities, should follow "the Zhongguancun model to combine local advantages into development zones for high and new technologies and for the computer industry that exhibit local characteristics, and that will progressively promote the final formation of computer markets of scale as they form computer and new technology economic networks by which to work together."

D. Make full use of the mechanism of state policies to provide policies of different slants for different times.

Growth of the computer industry is currently faced with a critical period. The prices of raw materials and components continue to rise, exchange rates are on the increase, and after entering into contracts, enterprises must still plan for raises in staff wages and benefits. As this is happening, increases in computer costs and declines in profits are an inevitable occurrence. If we do not take corresponding measures, the computer industry will decline from what was originally described as "high profits" to micro-profits, and even to losses and closures. Guidance by the state is a starting point for the initial stage of the growth of the computer industry, and therefore in addition to providing special tax breaks to the computer industry, as well as relaxing requirements concerned with computer costs, the state must currently also formulate the following preferential policies:

First, the state must thoroughly resolve the conflict that results from the implementation of an enterprise economic responsibility system within a contract operations responsibility system, as well as problems when promoting the integration of enterprise technological progress, the modernization of management, and benefits for higher echelons of enterprises. For enterprise units where economic results have been above average, consideration should be made for determining computer development and applications, to allow the "software mission" to be "restricted by available hardware," and consequently to establish contracts over the long run as realization of a spirit of sacrifice for the grand goals of enterprises.

Second, in already-established high technology development and experimental areas, we should create a relaxed environment, attract capable people from both within China and without to these areas to run high S&T enterprises of all sorts or to open windows, and encourage foreigners to build factories in the development areas and to participate in reconstruction; for computer manufacture in the development areas can result in direct contacts with markets outside China, and then when conditions are right, we must establish independent import/export companies.

Third, we should establish mechanisms to encourage computer dissemination and application, which would constitute a driving social force. We should provide monetary rewards to individuals (including leaders) who have outstanding results in computer applications, greater rewards going to those of greater accomplishments. The sources for these reward funds can be from interest-paying loans allocated each year by the state, from enterprise excess revenues and retained profits, and can also be drawn from new gains from those computer applications.

E. Banks should rely upon the unique strengths of finances and information to provide a series of coordinated services for the computer industry.

Having the powers that derive from funds and broad contacts, from being well informed, and from quick responses, banks can provide the computer industry with a series of coordinated services. Those services can be stock system "bank consortia" or "science and technology banks," and the gathering of funds for short-term loans for these science and technology parks and for high technology development.

Funds for short-term loans in foreign currency are an important external factor as the computer industry grows towards an export-oriented economy. Therefore, specialist banks should establish offices of foreign exchange trade--strong footholds to serve as pivots in developing the resources from within China and from outside China that carry two different price tags. At the same time, they can provide an entire line of coordinated services for things like opening accounts, loans, and closing accounts, and can be fast and efficient for such services in international banking as fixed-period currency conversion and long-range credit certified discounts.

In addition, in accordance with their own strengths, banks should continue to enhance existing channels of information; through surveys and research on computer industry production and operations activities, when some enterprises that have completed installation of imported production lines are not producing results, the banks can do new evaluations and demonstrations regarding aspects of equipment, technology, products, markets, and funding to compel enterprise to improve their production line contingency strengths and to meet production goals and measures on time.

New Software Systems for Galaxy Supercomputer

Vector Linear Algebra Library

40080065a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 41,
26 Oct 88 p 18

[Article by Wu Tiebin [0702 6993 2430]: "A Vectored Linear Algebra Library
Created From a Scalar Library"]

[Text] The Galaxy computer vectored linear algebra library is a restructuring of algorithms from the scalar linear algebra library of the Galaxy Model I (YH-I), and is a redesign and development based upon parallel algorithms. The source for the YH-I scalar linear algebra library is the linear algebra library for the Cray-1, which is said to be a model of American structured program design. It is an example of high quality programming, has received unanimous praise from a majority of engineers and technicians in the United States, and continues to be employed by users. But because the scalar library is slow, it cannot make full use of the efficiency of the Galaxy computer. It was decided at a software conference of the Commission of Science, Technology, and Industry for National Defense to require development of a high-speed vectored linear algebra library for the YH-I and YH-II to meet most of the needs of users of these YH computers.

The researched and developed Galaxy vectored linear algebra library has 160 subroutines and functions, among which are 32 special purpose modules; 128 are subroutines that are directly callable by users to solve various problems of linear algebra; 40 modules are used for solving real-type linear algebra problems; there are 20 assembly routines in 3,200 lines of code; there are 140 vectored FORTRAN routines in some 3,000 lines of code; and there are also more than 6,000 lines of testing routines, for a total of about 40,000 lines of code. The primary contents of the YH vector linear algebra library are matrices such as real, complex, and dual precision matrices, general band matrices, general symmetric matrices, symmetric positive definite and semi-positive definite matrices, symmetric positive definite band matrices, triangle matrices, tridiagonal matrices, symmetric positive definite tridiagonal matrices, rectangular matrices, and Hermite matrices, all of which are used for the calculation of various linear algebra problems such as matrix resolution, estimating condition numbers

for matrices, solving corresponding linear algebra groups, and solving for inverse matrices and determinant values. Methods of usage include parallel computation by the LU resolution of main columnar elements, the parallel computation of Cholesky decomposition, the parallel computation for the diagonal primary element method, and parallel computation for the QR method of resolution, many algorithms among which are results of the advanced research of recent years.

Experts evaluated the system as follows: The algorithms of the vector algebra library are advanced, there is a full complement of different types, program structure is clear, and the routines are precise, efficient, and highly applicable. In the process of developing this system, with the prerequisite of ensuring the accuracy and reliability of the routines, their convenience and readability, their universality, and the completeness of their functions, researchers closely integrated these things with the characteristics of the YH computers. To the fullest measure possible, they have made the most of vector components, used advanced algorithms, transformed existing algorithms, and greatly improved operational efficiency. For example, for a characteristic value of $n = 300$, the operating speed of the vector library is 13 times that of the scalar library. The technical materials and files in this library are complete. The development of this library is of an advanced domestic level.

The YH vectored linear algebra library is widely usable for scientific research, engineering design, and data calculations. It can be used for rapid solving of various problems in linear algebra, and will generate clear economic results in actual applications.

Plotting Software

40080065a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 41,
26 Oct 88 p 18

[Article by Li [rest of name unavailable in original; 2621 ...]: "Plotting Software for Use on Connecting Drum-Type Plotters"]

[Text] The YH computer used by the Mianyang Southwest Computing Center was not provided with plotting software, so it could not be determined whether calculation results were accurate. For this reason, this institution decided to develop plotting software for the YH computers (YH-PLOT), the particular objective for which was the GP5400 drum plotter connected to the VAX that front-ends the YH computer. This was to be an even higher grade of plotting software than that for the electrostatic plotter (YH-SL). At the time of design, full consideration was taken of compatibility with YH-II software, which means that it can be a component of plotting software for the Model II series of YH computers and that it has made a contribution to the generous applications software for the YH-2.

The source code for the GP5400 plotting software contains 5,000 lines of FORTRAN, and after parallelization of the algorithms and expansion of functions, the quantity grew to more than 6,500 lines. There are more than

400 lines of code making up the interface routines for peripheral operations; in addition, the programmers redesigned the GP5400 drivers, which they then wrote into a 128K EPROM.

Experts involved in the evaluation felt that the plotting software successfully transformed and implemented the large number of specification and equivalence statements, character variables, and logical operations in the GP5400 source code. In addition, such effective work has been done on the improvement of algorithms and on expansion of functions. This software has not only the functions of the original program, but has also enhanced the curve functions (grid, histogram, polygon), as well as curve smoothing and contour plotting. For algorithm design, they have made full use of parallel processing techniques. For example, in smoothing and contour plotting, the parallel techniques they use are all different from the dot matrix parallel algorithms previously developed for the YH electrostatic plotter, and are in fact a completely new effort. The degree of difficulty for the design of the interface routines between the YH host and the VAX peripheral was somewhat greater, and hard command interpretation is completely correct. The effort on the 32-bit from 64-bit data compression is especially noteworthy and quite valuable. The YH-PLOT plotting software is of an advanced domestic level of technology. It has been in use at the Southwest Computing Center for more than a year, where operation is stable, results have been excellent, and users are satisfied. This has been an exemplary contribution to the full use of the domestically produced YH computers. The software is quite usable. It can see widespread application in complex fields of research such as petroleum exploration, atmospheric physics, air dynamics, and atomic energy research, and will serve the relevant responsible departments and research units.

Fast Fourier Transform Library

40080065a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 41,
26 Oct 88 p 18

[Article by Cai Lizhang [5591 2621 7022]: "Efficient FFT Library"]

[Text] After introduction of the YH computers, the National Defense University of Science and Technology prepared three fast Fourier transform (FFT) routines. But users were inconvenienced by the fact that the sampling rate was limited to a second order square. To solve this problem and to meet the needs of petroleum exploration and atmospheric reporting while improving the computational efficiency of the YH-I computer, this institution decided to research and develop a group of high-efficiency FFT routines, which became the FFTPACK library of routines for the YH-I, and which in future will be configured for the YH Model II computers as general software for the YH-II series.

The Computer Institute of the National Defense University of Science and Technology was given the task of developing a library of FFT routines for the Cray-1 in October 1986, and after a year and a half of hard work has completed that task. The National Defense University convened an

evaluation conference on 24 September 1988 in Changsha, where the library passed an institution-level technical evaluation.

This FFT vector library provides vectored FORTRAN routines for such areas as one-dimension FFT's, real data fast sine and cosine transforms, and two-dimension FFT's that can be computed in parallel via single or multiple channels and that correspond to the real or complex data of bases from 2-5 to that of any factor. There are a total of 27 independent function modules, 9 modules among which are concerned with multiple channel real and complex data FFT's and two-dimension FFT's, and were developed independently.

Experts involved in the evaluation felt that the contents of the FFT library are quite rich and varied, that it is quite usable, has wide ranging application, is highly precise, and retains the merits contained within the Cray-1 FFT routines. During the process of developing this library, researchers closely integrated it with the characteristics of the YH computers, adopted various advanced technical measures, and vectorized to a high degree, all of which has created a fast, efficient software library.

Software Exports: Current Analysis, Future Strategy

Difficulties in Imports/Exports

40080065b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 41,
26 Oct 88 pp 36, 38

[Article by Yin Zhihe [3009 1807 7729] and Yu Jianyi [0060 1696 5939]: "The Current Situation Regarding China's Software Production and Software Exports"]

[Excerpt] [Passage omitted]

The Current Situation Regarding Software Exports and Existing Difficulties

According to statistics, over the past few years China has amassed more than 5.2 million items in software exports, the value of which was 3.8 million U.S. dollars in 1986, but a considerable portion of that was income from the labor of data input, and the amount is inconsiderable in view of world software markets. Exports of software are faced with several problems, which can largely be divided into three areas: First, although world software markets are developing quickly, if we are to become part of that and gain a firm foothold, the state must exert a great deal of effort in planning and support; in this effort of formulating planning recently it has dealt with the many existing problems in areas such as selection of points of concentration, determination of policies concerning tax revenues, the procedures for imports and exports and for the movement of personnel, the retention of foreign currencies and their use, and with loans and funding. Second, because the software industry is still in a process of formation, there is as yet no set of policies and methods for the management of software exports, nor is there a uniform channel for same, and in fact everything depends entirely upon reporting to higher authorities by lowest level units and upon their approval for each and every matter. There are simply no reasonable management methods nor clear channels for export. Third, competition is currently fierce in international markets, where India, South Korea, South-east Asia, and Taiwan are proving a great threat to China's software exports, while in recent years we have been for the most part simply sitting back and waiting for business. We have had no independent regular market operations activity, nor have we had a long-term stable foreign representation and agent mechanism, all of which adds up to problems in market operations.

As far as software exports are concerned, we once did both a general survey and a particular survey of 297 import/export items in the Beijing region, from which we processed more than 4,500 items of data. Nearly 75 percent of the software products among these were system software and software tools, while the key to growth in the software industry lies in the depth and breadth of computer applications. China imported 20 percent of its applications software this year, so the problem is obvious. Modes of import are largely licensing and object code, while only 12 percent includes source code and the transfer of rights to publication. This is not in keeping with China's principles of growth by importation, assimilation, and innovation. In fact, only 1 percent of the software we import gives us the right to resell it, and, as much software gets brought in over and over again, this leads to great waste. Seventy-eight percent of software is purchased randomly, and not much of it is suited to actual use, as there is almost none that is directly connected to applications. More than 52 percent of the software imported already exists within China, and this reflects a certain degree of blindness in importing activities. There are also discrepancies between supply and demand within China. On the one hand, there are many software personnel working hard at finding software projects, while on the other hand more than 50 percent of imported software has been brought in without anyone tasked to develop it. After detailed analyses of certain software, we conclude that we could have developed it completely on our own (but of course there are other factors involved).

As far as the export of software is concerned, the situation is as follows: 80 percent of software products for which the rights of publication can be transferred are sold on a commission basis instead of by direct sales; the income from these is thereby divided by half.

Gross generated income has been 2.5988 million U.S. dollars (1.3 million U.S. dollars was accounted for by the number of items in the survey), and this software was only 11 percent of the software sold domestically, for which the total was 250,000 RMB.

Per capita generated currency for each man year involved was 7,630 U.S. dollars (for each man year added to these projects, currency generated would be increased by at least 1,000 U.S. dollars), and in addition 6,000 yuan was added in output value.

Total funding in RMB for the currency generating software just described was 23,000 yuan, an average of 550 yuan per man year (but does not include the income in wages of software personnel).

We can see from the results of the figures just presented that in a situation where there is no concentration of distribution of the various kinds of export software products, they have yet to comprise a dominant position; the scale of export software is not large (70 percent of software programs have code in fewer than 20,000 lines, while more than 80 percent of software development efforts take fewer than 4 man years); information for development units is not timely, as there is often a lack of contact with external commerce; nearly 70 percent of software is commissioned or developed

jointly, and without self-generated software there is nothing to sell; the profits from most software go to foreign business agents; problems encountered by development units still include low pay, lack of authority to use foreign currency, no protection for publication rights; and procedures to exit and reenter the country are too troublesome, etc. But of course there is a happier side, too: In this current situation of many problems and difficulties, export software has reached a level of 7,630 U.S. dollars per man year (plus 6,000 RMB), which fully exhibits our potential for export, as well as the fact that our software products have a high added value.

The overall situation regarding the import and export of software may be summarized in the statement that the software import/export business is extremely uneven. There is a lack of demand for high level software, the majority of which demand is filled by imports, while the capacity for producing high level software as part of low level software has yet to find a suitable outlet.

Feasibility, Targets, Strategy

40080065b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 41, 26 Oct 88 pp 40, 42

[Article by Yin Zhihe [3009 1807 7729], Zhang Xinhua [1728 2450 5478], and Qin Guiming [6009 2710 2494]: "The Fundamental Course by Which To Develop China's Software Industry"]

[Excerpt] [Passage omitted]

The Feasibility of Developing China's Software Exports

The broad international software export market:

As we have just described, the international software market is very expansive and future prospects are excellent. As the computer industry grows and computers are used more intensively and broadly, there will be a steady increase in demand for both quantity and quality of software products. Developed nations in the Americas, Japan, and Western Europe must come up with a large number of software technicians to satisfy the demands of market growth, and this is also an important consideration for software exports from China. Experiences with software exports by developing nations and regions such as India, South Korea, and Singapore can provide us with excellent lessons.

The favorable aspects of the international marketplace:

- 1) The constant rise in value of the Japanese yen, the Taiwan dollar, and the South Korean won has caused production costs of the software products from these nations and regions that have been in dominant positions in the international software market to rise, which has affected the competitive capacities of their software products in the international marketplace.
- 2) Friction between the economies of the United States and Japan has brought

the values and selling prices of Japanese software products into unfavorable positions. 3) The internally closed systems of Eastern Europe and the Soviet Union, as well as the restrictions of COCOM, have created voids in some markets within these countries, and the demand from these markets is considerable. 4) The protectionism of South America has also created some imbalances in the proportions of supply and demand for software products, so that market is quite large. 5) Developed nations are in the process of seeking out Asian countries with low wage scales to be partners in cooperation. 6) The devaluation of the U.S. dollar and the rise in value of the West European currencies have also brought about good opportunities for exploiting the West European software markets.

The attention and support of central authorities and of relevant departments at all levels:

The facts have shown that with the attention and support of central authorities and of relevant departments at all levels, over the past few years the software industry has grown rapidly in China, and software exports have become significant. For example, Qinghua University has cumulatively generated more than 3 million U.S. dollars in foreign exchange, for which the per capita output value is quite high; also, according to a survey of 17 major software development units in the Shanghai region, 26 software products had been exported from 1982 through early 1986, directly generating foreign currency worth 400,000 U.S. dollars; development of Sino-foreign cooperation has generated exchange worth 300,000 U.S. dollars, and while still in a situation lacking uniform software export groups and management structures, self-development has proceeded. Enthusiasm is currently high among software development groups throughout the country, and they also have high significant capability. Therefore, it would be a very wise choice to make software exports a point of breakthrough for the output of high technology from China, and will stimulate the growth of the software industry.

It [China] possesses a significantly dominant position.

There are some 7,000 [large] computers within China and some 200,000 micro-computers, which constitutes a considerable hardware resource. At the same time, we also have significant manpower resources and intellectual advantages. When compared to developing nations, and especially to India, there is an advantageous situation regarding China's developing software industry and software exports. We Chinese are quite good at mathematics and logical thinking, so in our pursuit of software efforts we have a certain natural advantage. We have rich and varied resources in skilled personnel, and according to statistics have about 40,000 people working on software. Approximately 20 percent of them are working on software exports, which is a considerable number (there are only 3,000 in Singapore so engaged, only some 5,000 in South Korea, and more than 6,000 on Taiwan). Although the level of our software technology is behind that of developed nations, it has nevertheless attained a respectable level.

For reasons having to do with the nature of software itself, when the software profession is compared with other currency-generating industries in

China, the greater economic results can be seen, and there is a greater proportion of output from investment.

According to incomplete statistics, in China's domestic market where software prices are completely unreasonable, there is bound to be greater economic results from the export of software than from domestic sales. It is definitely not like the situation with some export products that "lose money by exporting," for software exports cannot lose money, there can only be questions of more or less money being made. The software industry could completely become the industry most efficient in generating foreign currency. Feasibility reports from the Beijing Associated Software Company budget show investment to output proportions for software products at 1:6, which is far greater than the 6:1-9:1 that holds for normal industries. Because software has the greatest scale of economic results and because production links can be ignored, even when we compare domestic laterally associated industries, we see that software exports have an enormous advantage. That conclusion is based upon the following factors: 1) There are only the two links of development and circulation for software products, so production links may nearly be ignored. This feature is predicated by the "copyability" of software, wherein also lies its greater scales of economic results. 2) Software production expends the least amount of resources, and 75 percent of the costs of software lie in output for labor. In other words, software expends intellectual resources. Intellectual resources differ from other resources (such as in whether the resources are regenerative), and they are resources that are self-accumulating. They can never be accessed too often, nor can they be used up. And because a person's intellect becomes stronger the more it is used, the more it is used the greater are the accumulated experiences. 3) The per capita output value of software and its results from investment are very high. In the United States, software technicians have annual output values of more than 100,000 U.S. dollars, in Japan it is 60,000 U.S. dollars, and software has in addition a high added value. 4) In opposition to hardware, software is developed rather more quickly, and the software industry differs from that of other industries in that it is less often slowed down by conditions of development in other areas. 5) Software products can be transmitted via electronic media, and may be sent as well through telecommunications or satellite.

The benefits of skilled personnel abroad:

There are many persons of Chinese ancestry working abroad, and especially in the United States, and they are outstanding in the software industry. They are well versed in business matters and are thoroughly familiar with market conditions. Together with that fact, because of China's liberalized policies in recent years, we have many graduate students doing research abroad. These people can all be seen as a considerable strength in software development and for the transmission of information, and are another resource of skilled personnel that can be used.

To be sure, we should be aware that no matter what our advantages, they are only potential, and they might only be temporary. For example, as our software tools increase in sophistication, the demand for general programmers

will diminish and that for high-level programmers will increase. As it happens, we lack high-level personnel, so we most certainly cannot have too optimistic an attitude toward our advantages. For this reason, what we are currently faced with when developing our software exports is the question of how to correctly and innovatively formulate our growth strategies.

Developmental Goals and Strategies for Software Exports

In short, our developmental goals are: to accumulate funds, train personnel, and exploit international markets through software exports, to bring along domestic software markets, to hasten the formation and growth of China's software industry, and to allow this basic industry that is the software industry to play a more positive role in the growth of the national economy and to make its contribution to the realization of the four modernizations.

If we are to realize the strategic goal of stressing software exports as a means of stimulating the growth of the domestic software industry, we must make good use of timely opportunities and use all our advantages to facilitate the rapid growth and maturation of domestic software enterprises, allowing them to become production organizations as early as possible, as well as principal forces in product development and in technological innovation. Only by relying upon large numbers of enterprises that are flexible and fully dynamic and vital (this includes state-run enterprises, as well as enterprises operated by such civilian-run service units as colleges, universities, and institutes) can the growth of the software industry be truly a "generator," and only by working toward the strategic measures for software exports can they truly become real.

It is our belief that there are four aspects to realizing the strategies of growth:

1. Set Up Special Software Industrial Zones

In light of the fact that this country cannot provide large quantities of funding and that there is much domestic software that awaits development, to be able to effect the smooth progress of software exports we must select some suitable entities (as for example software enterprises or groups) to make up populations specializing in software exports that are located in a few areas with obvious advantages (such as Beijing, Shanghai, and Guangzhou). On the subject of these software enterprises and groups, the state will provide clear preferential policies and remuneration (as for example the appropriate authority for acting and trading outside China), as well as discreet and strict, yet flexible, restraints. We call this sort of population a "special software industrial zone." The preferential policies and remuneration would be only for use within the special zone, while the appropriate restraints would cause it to become a true special software industrial zone that is export-oriented. We must resolve problems in the following two areas for these special industrial zones:

a. Structure of organizations: For the most part, they will be coordinated management departments, the establishment of which would resolve the

situation currently existing whereby software export activities lack industrial coordination, and this would avoid on the one hand the passive attitude that waits for business to come, and on the other the lack of communication that keeps prices down and that brings about an outflow of profits. Then, there would be two or three departments of foreign trade, where these departments would be composed of management personnel who understand software operations, as well as of people who have experience in doing business abroad. There would also be a group of enterprises that focus on the development of export software to which the state should provide the authority to deal abroad and other necessary support, and that would enable them to recognize opportunities for rapid decisionmaking and for effectively making proper arrangements concerning relevant matters both within China and outside it. This would serve to develop international software markets and rapidly put a new face on the software export situation.

b. The relations between software enterprises and existing departments: Some entities and software enterprises or groups that are working in software development should make a special effort at handling their relations in all areas. These entities should focus on software enterprises, leaving those units from institutions and institutes that are strong in technology as technology reserves, and they should develop software products by engineering and commercializing the scales of production. They should form either loose or tight associations as they choose. And as for the problems of relations between special industrial areas and other sectors, the basic principle is that preferential remuneration is given only in the special industrial zones to maintain stability and independence for a particular period. At the same time, there should be mutual coordination with other sectors and a smoothing of relations.

2. The Focus for Exporting Software Products

Because of restrictions of manpower, materials, finances, and the domestic software technology situation, as well as of the immediate environments, in the process of software exporting, if we are to develop software products in a planned and focused manner that requires little funding, short turnaround times, and quick results, we must sketch out plans for exporting software products. The first category of software (because current software names are not uniform, nor are they determinative, we will provisionally use this kind of name) is directly and closely allied with hardware, and system software makes up a large portion of this category. Experience over the years has taught us to recognize that from a long-range viewpoint the state must exert great effort in determining to resolve the problems of the Sinicization of system software, for this directly affects the facilitation of publishing rights for China's software. Just looking at it from the point of view of generating currency from software exports, this category must solve the problem of "substituting for imports." But from the overall point of view of growth strategies for software exports, this first category of software should not be the focus of export software products. The reason is that the first category is so closely bound to hardware that since China's hardware industry is quite weak, this kind of

product cannot be dominant for us, but naturally we cannot ignore the importance of this first category of software. The third category of software differs from the first in that its chief characteristic involves the applying country's management systems, customs, educational background, and scale of literacy. Enterprise management software and banking and financial systems software are all part of this category. Since we are not familiar with conditions abroad and because of the demand for stricter control regarding communication and exchange, languages, and leaving the country, development of this third kind of software is also not our forte. This kind of software can be developed by those of Chinese ancestry and those who have gone abroad for study, who are abroad and who are more familiar with foreign situations. We can also pay close attention to accumulating experience, but for the present it cannot be a focus for export software products. So where then should our efforts lie?

The focal point of our products should be what we are calling the second category of software products, namely, that which is not intimately connected to hardware nor is involved with matters that have nothing to do with software technology but are rather matters of the social sciences and are therefore things with which our software personnel are not comfortable. Even though we cannot provide a coherent definition for this second category of software, we feel safe in presuming that software such as software tools, character processing software, artificial intelligence software, and CAX(X=D,I,M....) software belong to this group. This is what we should concentrate on as software export products.

3. Three Stages of Development

a. The current stage concentrates on exports of labor. This will be maintained for a period of time to better gain experience, to facilitate relations of all sorts both within China and outside, and to prepare technologically. But based upon some recent phenomena in the export of software labor, we must pay more attention to the progressive raising of the levels of that labor we export. We cannot simply write code, because that would be cheapening our labor force and we would have no way to master software engineering and commercializing techniques. Data conversion may be seen as the greatest component of this process.

b. On the foundation of the first stage, we can give full play to the enthusiasm of software technicians who have now had some experience, and we can raise their wages and increase our use of them in a measured and planned way. There are three modes of development for export software during this stage: The first is joint funding, where the foreign element of joint ventures has done a systematic analysis abroad, as well as the writing of files, which the Chinese element then enters, and the coding of which is the Chinese responsibility to be undertaken in China; the second is contractual, where the foreign plant or business contracts for certain tasks to be performed by us Chinese, and where we do the systematic analysis and coding in China according to the contract; and the third is the mode as agent, where we seek out a suitable foreign plant or firm to be our agent and that will be responsible for marketing on our behalf. We select

outstanding software from among that which we already have, and after suitably preparing it, make it available to international markets. The risk is small with this mode, but several problems must be resolved having to do with the recognition of rights of transfer.

c. The third stage is similar to that of certain internationally successful companies, where there is an analysis of needs in international markets, where we design our own software products, and then develop, manufacture, and sell products that have a market or that can be commissioned. But this stage is certainly not one that is self-protective and that develops independently, but one that simply emphasizes our role, where the degree of cooperation and reliance upon a foreign commercial interest is less than that of the first and second stages. This mode produces high results and is highly motivating, but the risks are greater. It requires an acute market analysis, systematic design, and a marketing and service contingent. It may be said that the first stage is the infancy of software product export, that the second stage is the adolescent stage, and that the third stage is the adulthood. Of course, in the actual process of development these three stages can alternate with each other, so the problem is that leadership must propel this development with goals and recognition.

4. The Problem of Funding

We believe that the state should provide appropriate funding support for software exports. By "appropriate" we mean that when it comes to software exports, while we cannot go begging to the state for large amounts of money, at the same time neither can we be subject to the other extreme, where we ask for no state funding support at all. Even when the state does not provide special funding support, after software export efforts have gone through a cycle of self-sufficiency, they can still mature. But if there is sole reliance on developing software exports through a self-initiated "snowball effect," the tendency will be to lose good opportunities to have an even greater presence in the markets. Therefore, when the state can provide significant funding support, this will greatly speed up the growth of software exports, consequently promoting the development of China's software industry.

We have discussed above the strategic problems of developing software exports. Because of restrictions in expenses, personnel, data, and conditions, we have restricted our descriptions. It is our belief that these four areas are feasible and that the key problems are some existing difficulties for software exports, as for example in how to adopt some realistic policies that will enable growth strategies to achieve their predicted results.

Ash Disposal in Coal-Fired Power Plants Discussed

40081007 Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese Vol 21 No 9,
Sep 88 pp 2-5

[Article by Fang Zhikang [2455 1807 1660], Electric Power Planning and Design Institute: "Current Status and Future Development of Ash Disposal in China's Fossil-Fired Power Plants"]

[Text] With the rapid development of the electric power industry and the steadily increasing scale of power plants, the problem of ash disposal has been coming increasingly to the fore. In particular, by the end of the century, when China's total installed capacity will be about 240 million kWh, including 160-180 million kWh of fossil-fired generating capacity, the annual output of ash and slag will be about 160 million tons, and ash disposal will become increasingly pressing. If the problem is not skillfully solved, it will directly affect the safe operation of the power plants.

For the past few years, ash-disposal design specialists have been investigating future techniques of ash disposal. An analysis of the operation of current ash disposal systems at the country's power plants indicates that low-concentration transport of ash no longer presents any major problems, and that the main equipment is satisfactory and has a long operating life: for example, the wear-resistant parts of pH-type pumps have lifetimes of up to 2000-3000 hours, and even longer in some plants. The key problem to be solved in the future will be high-concentration transport of ash and slag, and, where feasible, vigorous development of comprehensive ash utilization.

I. High-Concentration Ash and Slag Transport Is the Trend of the Future

The continual increase in power plant capacity and single unit capacity has resulted in two primary problems for power plant ash disposal. One is the increasing difficulty of choosing suitable large ash storage sites near power plants. It is becoming necessary to choose locations rather far from the plants: for example, the ash dump for the Banshan power plant in Hangzhou is about 26 km from the station, so that the ash disposal system can no longer make use of the usual ash slurry pumps or ash pumps for long-distance transport. The second problem is that when power plant capacity is increased, there is usually a scarcity of water. As a result, the use of high-concentration long-distance transport of the ash and slag from large power

plants is an objective need and in addition a necessary development trend. High-concentration ash and slag transport has the following advantages over low-concentration transport.

A. The maximum attainable operating pressure of current positive-displacement ash slurry pumps is 60-80 kgf/cm². They can transport high-concentration ash over distances of 35-40 km, entirely meeting current and future needs; this is equivalent to replacing two of low-concentration pump transport stages in series and adding one or two booster pumping stations. As a result, high-concentration transport not only greatly simplifies ash disposal systems and can save large sums on capital investment and operating and maintenance costs, but in addition is convenient to operate and manage.

B. Large power plants use considerable amounts of water, and the ash disposal systems account for a large percentage of their water use. If low-concentration transport is used, some localities where water is in short supply will have difficulty in building power plants or will have to invest increasing amounts to develop water supplies. Water conservation not only has economic value, but is also closely related to power plant site selection. In addition, developing subsurface water sources or using groundwater can result in conflicts with agricultural water use. As a result, the only way to save water is to use high-concentration ash transport. For example, a 2 X 300-MW generating unit would have a boiler steam generation capacity of 2,000 tons/hour, an ash output of 80 tons/hour, and a slag output of 10 tons/hour. Compared with the currently used low-concentration ash transport, which has an ash-to-water ratio of 1:15-1:20, the 1:1.5-1:2 ratio in high-concentration systems would save about 15 tons of water per ton of ash produced, i.e., 1,200 tons of water per hour, or (with 6,500 hours of operation per year), about 7.8 million tons of water a year.

C. In addition to saving on capital investment and water, the use of high-concentration ash slurry transport also saves in-plant power consumption. Again considering the example of a 2 X 300 MW unit, preliminary estimates indicate that the annual electricity saving would be about 518 kWh.

To summarize, saving capital investment and energy is of strategic significance for national economic development and offers macroscopic benefits to society and the economy. Every kilowatt-hour of electric energy can increase national economic output by 5 yuan (on a national average), producing a considerable social benefit. Thus, from every viewpoint, high-concentration ash and slag transport merits vigorous dissemination and constitutes the future trend in hydraulic ash disposal.

II. Current Status of High-Concentration Ash and Slag Transport in China

Starting in the early 1970's, the electric power design departments studied high-concentration transport technology in this country and abroad, related it to the distinctive characteristics of China's powerplant ash disposal systems, and gradually began to adopt high-concentration ash slurry transport systems; some power plants also transported ash and slag. Their operation

in the subsequent period has yielded excellent economic benefits and provided valuable experience, paving the way for future vigorous development of this technology. To date, 30 electric power plants in China with a combined capacity of about 10,000 MW are using high-concentration ash slurry transport systems, and the great majority of large and medium-size power plants now being designed also use these systems. Although earlier high-concentration transport equipment had many problems and its operation and overhaul involved a good deal of trouble, the ash disposal designers investigated methods of solving these problems, adopted specific measures, and in addition got the relevant departments to accelerate their development of suitable specialized equipment for ash and slag transport. Current progress indicates that this effort has begun to bear fruit, and there is no question that it has advanced high-concentration transport technology. Below we describe several high-concentration ash and slag transport systems in use in China.

A. Oil-Sealed Pump Ash Disposal Systems

The metallurgical industry first imported oil-sealed pumps from abroad in the early 1970's, using them in the tin mines in Hunan for the transport tailing slurries, where they produced good results. Several production plants in this country immediately began to produce copies, and our electric power system also made use of these pumps. As of the end of 1987, more than 100 oil-sealed pumps had been put into operation nationwide. Although these pumps proved to have many problems in operation, they also made a contribution to opening up and developing high-concentration transport technology.

As a result of equipment and system factors and coal ash characteristics, the oil-sealed pumps produced in the first few years had short service lives; while a few power plants they had lifetimes of up to 500-700 hours, at the majority of plants they had lifetimes of about 200 hours, and in some cases the situation was so bad that a part a day had to be replaced as a result of wear. Since the Hangzhou Ash Disposal Conference in early 1985, relevant offices in our ministry have shared the labor in a cooperative effort to perfect oil-isolated pumps. The joint efforts of the design, production and research departments resulted in definite progress and gradually increased the operating life of the pumps. For example, those in use at the Yaomeng power plant can operate continuously for about 500 hours, while the continuous operating life of those at the Banshan plant has increased from 3 days to 300-400 hours. The quality of the pumps produced by some plants used to be rather poor, which caused a number of problems. Since 1986, many manufacturing plants have undertaken improvements and have made efforts to improve the pumps that were already installed; these efforts have unquestionably helped improve safety at power plants.

B. Ash Disposal Systems With Water-Sealed Pumps

In the early 1980's the former Ministry of Machine Building and the Ministry of Water Resources and Electric Power jointly commissioned the Research Institute of Hoisting Machines of the Ministry of Machine Building and the Hebi General Machine-Building Plant to cooperate in developing a water-sealed pump. They developed a horizontal model which underwent operating

tests at the Chengde Lianhe River Power Plant. Although water and ash leakage problems interrupted the tests, these organizations went on to design and test a vertical water-sealed pump. In the latter half of 1983, the first model was installed at the Luoyang power plant. It was commissioned at the end of the year, and in May 1984 the former Ministry of Water Resources and Electric Power [MWREP] and Ministry of Machine-Building and the Henan Province science and technology committee evaluated it. In September 1986 the science and technology office of MWREP and the Electric Power Planning Institute jointly held a conference to summarize and disseminate information on vertical water-isolation pumps and expressly made efforts to improve these pumps in order to pave the way for their extensive use. The water-sealed pump at the Yaomeng power plant has now been in operation for more than 1,000 hours, and more than 20 pumps have been or are being installed at the Shijingshan, Datong'er, Jinzhushan, Zhengzhou, and Benqi power plants and elsewhere. Operating experience at the Luoyang fossil-fired power plant indicates that these pumps have great promise, but the water-sealed pumps also have several problems, such as low efficiency of pump assemblies (generally around 60 percent); in addition, water and ash leakage problems have not been fully solved, and at startup they are somewhat slower than ordinary centrifugal pumps and positive-displacement pumps.

C. Water-Jet Plunger Pump Systems

Starting in 1982, the Electric Power Construction Institute of MWREP began to plan a positive-displacement pump laboratory, and in 1982-1984 it designed and developed a water-jet plunger pump. In 543 hours of tests with ash slurry, this pump proved suitable for ash slurries; component wear was slight when the flush apparatus was operating normally. Based on this preliminary result, the relevant offices agreed to carry out trial production of two prototypes. In the second quarter of 1985 the Electric Power Construction Institute completed the design of the PZNB 100/2.5 and PZNB 100/4 water-jet plunger pumps, and their trial production was undertaken respectively by the Baoji Water Pump Plant and the Dalian No 523 plant. The PZNB 100/4 pump was tested at the Huangtai power plant in Shandong and the PZNB 100/2.5 pump at the Yong'an power plant in Fujian. After 1500 hours of trial operation and debugging, the two pumps passed their technical evaluations. The PZNB 100/4 pump has clear advantages over oil-sealed pumps. After a year's experience in 1987-1988, it has been further improved, and it is now highly suitable for ash slurry transport.

D. High-Concentration Mixed Ash and Slag Disposal Systems

Some Chinese power plants are now using mixed ash and slag disposal systems with oil-sealed pumps; because the rated intake particle size of these pumps is up to 1mm, with brief increases to 2-3mm, the slag must be crushed and ground fine, making it necessary to install a set of slag grinding equipment. Although use of the slag grinding systems has increased investments and operating expenditures, in overall terms such systems have many desirable aspects. The current transport concentration generally reaches about 30 percent.

The (Woman) series-pump mixed ash and slag disposal system. Since the 1980's, when the Shijiazhuang Water Pump Plant imported a centrifugal ash and slag pump design from the Woman company in Australia, it has trial-produced more than 20 new products and have put them into lot production. In the last few years, increasing numbers of power plants the power industry system have been using the Woman pump, and according to incomplete statistics, more than 300 such pumps have been ordered or put into operation at more than 40 power plants; they are operating stably at the great majority of plants, with very good service life of the wear-resistant parts. In particular, these pumps are usable for high-concentration transport of ash and slag slurry. Use of 4 Woman pump stages in series allows an ash slurry to be transported at a concentration (by weight) of 35-40 percent.

Below we briefly describe the operating characteristics and problems of the auxiliary equipment of high-concentration ash and slag transport systems.

1. In high-concentration ash and slag transport systems, the slurry production equipment is critical to high-concentration transport. Currently used concentrators and mixing tubes generally can reach concentrations of only 25-30 percent, resulting in low efficiency, and are also subject to malfunctions.
2. The shaking screens generally used in the ash and slag classification stage or slag separation and grinding systems are subject to numerous problems; they generally experience spring breakage and screen damage.
3. The quality of valves of various types is poor, with frequent jamming.
4. Various types of pumps, such as axial-seal pumps, flush pumps, and water circulation pumps used in ash removal systems are of rather poor quality, causing much difficulty in operation and maintenance.
4. Various types of pumps, such as axial-seal pumps, flush pumps, and water circulation pumps used in ash removal systems are of rather poor quality, causing much difficulty in operation and maintenance.
5. The quality of various types of instruments and gages is rather poor, e.g., flow meters, ash level meters, concentration meters, pressure gages and the like; they malfunction shortly after installation at the majority of power plants, making it difficult for attendants to monitor operation.

There are many problems with equipment for high-pressure ash and slag transport, and, as in the case of oil-sealed pumps, they are not exclusively design and quality problems: there are also problems with suitability. As a result, in addition to solving the problems involved with the main machinery, the development of auxiliary machinery must be taken seriously; otherwise it will be difficult to assure safe operation of the entire system.

III. Development of Dry Pneumatic Ash Disposal in China

A. Experience With Pneumatic Ash Disposal in China

It was not until the mid-1950's that Chinese power plants began to use pneumatic ash disposal systems. At the time, it was primarily negative-pressure pneumatic systems with steam air ejectors that were used. But these systems had rather low output and could be used for transport only over short distances. They were subject to serious wear, safety and economic characteristics were poor, and most systems were limited to use in medium and small-size power plants. In addition, owing to limitations imposed by the historical conditions at the time, pneumatic ash removal developed rather slowly. After the 1960's, as the comprehensive utilization of powdered coal developed, ash disposal design specialists assimilated the experience of other departments, related it to the distinctive characteristics of power plants and began to develop new equipment. For example, 10 years' operation of the model CB box-type pneumatic transport system, which was developed at that time by the East China Electric Power Design Institute and produced by the Zhejiang Electric Power Overhaul Plant, has indicated that its characteristics are excellent, its operation is largely safe and reliable, its output can reach about 20 tons per hour, and its maximum transport distance may be as great as about 1500 m; it has now become a mature main transport device of pneumatic ash disposal systems. According to incomplete statistics, more than 60 plants in China are already using this equipment. In addition, in the last 10 years, in order to meet the requirement for comprehensive utilization of powdered coal ash, the design units have made major efforts to design a variety of pneumatic ash removal systems, and although some problems still remain to be solved, the systems are essentially satisfactory. The following main types of pneumatic ash disposal systems are now in use in China.

1. Negative-Pressure Pneumatic Concentration, Positive-Pressure Box-Pump Transport

These devices use vacuum pumps or Roots blowers to produce a negative pressure, which draws the ash from the disposal-unit hopper to a transfer bin, from the bottom of which it is passed by a feed unit into the box pump, after which compressed air is used to transport it to the user.

China already has some experience in operating negative-pressure pneumatic collectors, and although their output is low and there are still some problems with the equipment, overall they meet the needs of medium and small-size power plants.

2. Air-Sluice Collection, Positive-Pressure Box-Pump Transport

An air sluice is used to collect ash in the bottom of the ash hopper, after which it is fed to the pump and transported to the user. Currently, the Gaojing, Junliangcheng, and Menxing power plants are using systems of this type. Operating experience in China indicates that the air sluices still have some deficiencies, but owing to the simplicity and convenience of operating and maintaining the systems, and the cheapness of their manufacture, they are still a promising type of equipment.

3. Blower Collection, Positive-Pressure Box-Pump Transport

In these devices, the ash in the bottom of the ash hopper is transferred by a feed mechanism into the blower unit, from which it is transported to the pump, then transported outside or to an ash bin. A few power plants are still using such systems. They are not particularly well suited to current operating conditions in China, and the power plants state that the fan vanes and housings are subject to serious wear.

4. One-Step Positive-Pressure Box-Pump Transport Systems

Some plants use the feed mechanism of the ash hopper to drop the ash directly into the pump, after which compressed air is used to transport the ash to the ash bin or to the user in order to satisfy the building materials industry's need for comprehensive utilization of powdered coal ash. Most of the power plants using these systems are of medium and small size, but they are also in use in a very small number of large power plants.

More than 60 power plants are using the model CB box-pump equipment. The operation of these devices is still satisfactory, but there are still numerous problems with some of the components, the service life is still rather short, and the control systems must be made more reliable.

B. Importation of Ash-Removal Equipment and Technologies From Abroad

In the past few years, China has imported certain ash disposal equipment and technologies from abroad: they have included positive- and negative-pressure pneumatic ash disposal design technologies and equipment manufacturing technologies from the Allen company (United States); the Jiangyou and Luohuang projects have imported air sluice systems and equipment from the French A'ersitong [phonetic] company; and a Fujian project imported negative-pressure pneumatic ash disposal systems and equipment from the Mitsubishi Company in Japan. In general, only the importation and assimilation of advanced technologies and equipment suited to China's circumstances will yield the expected results. Nearly a year's operating experience with the set of negative-pressure pneumatic ash-disposal system in a 300-MW unit at the Shiheng power plant has consistently been normal, but certain problems that arose at the beginning of operation further indicate the need to act with reference to China's circumstances in order to assure that foreign technologies can be used in China.

C. Development Trends in Pneumatic Ash Disposal

1. In the importation of foreign pneumatic ash disposal technologies and equipment production technologies, we must make a major effort to assimilate and improve them, and especially to relate them to China's circumstances; we must not copy indiscriminately. While operating a negative-pressure pneumatic ash-disposal system on one of its 300-MW generating units, the Shiheng power plant discovered that in some respects it was not suited to China's real circumstances. For example, in the United States a bag filtration speed of 1-1.2 m/sec is used, while the usual speed in China is 0.6-0.8 m/sec;

rather large variations in the quality of coal burned in Chinese power plants and in the amount of ash produced resulted in serious wear of the filter bags. As a result, future designs should use flow speeds of 0.6-0.8 m/sec.

2. Existing pneumatic ash disposal equipment must be continuously improved so that it is suited to pneumatic ash disposal systems and assures equipment quality, expansion of the range of equipment specifications in order to meet the ash disposal needs of large, medium-size and small power plants.

3. Further research on the principles of pneumatic ash disposal is needed in order to understand all observed phenomena. We must gradually change over from low-concentration transport to high-density transport of dry ash. In addition, ash-disposal design must be geared to the comprehensive utilization of ash and slag, meeting its needs in as wide a range of applications as possible.

In addition to meeting the needs of comprehensive utilization of ash and slag, pneumatic ash disposal can also pave the way for future high-concentration ash slurry transport. For example, the high-concentration slurry-producing equipment at the Shiheng power plant can give a slurry concentration (by weight) of about 40 percent; thus, pneumatic ash disposal has even broader applications prospects.

Scientists Call for Environmental Control

40101009 Beijing XINHUA in English 1306 GMT 23 Jan 89

[Text] Beijing, January 23 (XINHUA)--Scientists are calling for measures to control China's deteriorating ecological conditions and for ways to coordinate economic development and environmental protection, "HEALTH NEWS" reports today.

According to an environmental seminar sponsored by the Chinese Academy of Sciences, the area of China's arable land declined by 33 million hectares between 1957 to 1980.

Polluted farmland amounted to 5.8 million hectares in 1980 and the figure is expected to reach 9.3 million hectares by the end of this century, accounting for 10 percent of China's total farmland.

The forest area is decreasing at an annual rate of 1.8 percent and by the year 2000 the area covered by forest will have diminished from the present 12 percent of total land area to 8.3 percent.

About 1.3 million hectares of grasslands are eroded each year, and of China's 92,000 kilometers of rivers, about 20,000 kilometers have become polluted.

Today's "GUANGMING DAILY" reports that more than 200 experts attending the seventh conference of China's forestry association have appealed for protection of China's forest resources.

They have suggested that the state encourage the development of forest areas and repay investment in them.

People living in forest areas should be dispersed and measures taken to protect the old forests in Northeast and Southwest China, they say.

They have also suggested that China allocate 13 million to 16 million hectares of forest areas for the cultivation of fast-growing trees and employ scientific and technological methods in their development.

Briefs

Embryonic CIMS Developed--An integrated production system--the first model of its type in China--developed by the Shanghai Metallurgical & Mining Machinery Plant passed technical assessment on 22 October in Shanghai Municipality. This key project in the Seventh 5-Year Plan unites various segments such as product design, manufacturing technology, production planning, sales, and materials management into an integrated data-sharing system: an embryonic computer integrated manufacturing system (CIMS). The system integrates CAD/CAM and MRP-II [Management Resources Planning] software systems. Hardware consists of a four-workstation Sabre 5000 networked system (internal memory 3MB/workstation, total external memory of 750MB) and one HP [Hewlett Packard] 3000/48 (internal memory 3MB, 48 terminals, external memory over 1500MB). There are 7 main varieties of CAD/CAM software for the Sabre 5000; in addition, there are a total of 19 application software packages, including HP's MM/3000 and PM/3000 management application software, electrostatic dust-removal Chinese materials standard conversion and strength computation software, MPS1, and CAPP. Major Chinese modifications of the imported MRP-II software have been carried out, including expansion of the MPS module and establishment of a plant-wide central database (for almost 30,000 kinds of spare parts; for about 15,000 kinds of raw materials, semi-finished products, and externally purchased parts; for 2500 firms and customers; and for over 30,000 work-routine records) with over 1000MB of internal memory. [Summary] [40080089a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 45, 23 Nov 88 p 1]

Breakthrough in Superconductivity Reported

40080090 Beijing RENMIN RIBAO in Chinese 20 Dec 88 p 3

[XINHUA report by Jiang Min [1203 2404]: "China Makes a Breakthrough in the Research of Bismuth-Series Superconductor Materials"]

[Text] Shenyang, 19 Dec (XINHUA)--Measured by Beijing University on 15 December, a kind of filamentous material with a diameter of 0.5mm, which the laser superconductor research group of the Institute of Metals Research of the Chinese Academy of Sciences had made from the high-temperature superconductor materials of bismuth, strontium, calcium, and copper oxides by the "laser annealing pedestal pulling method," had a critical current density of 1,800 amperes per square centimeter under the temperature of liquid nitrogen. This is the highest numerical value reached by bismuth-series superconductor materials in the temperature zone of liquid nitrogen.

It was last July that the laser superconductor research group of the Institute of Metals Research of the Chinese Academy of Sciences accepted the task of tackling the major problem of "raising the critical current density" entrusted to them by the State Superconductor Commission. In less than 6 months, under the leadership of Deputy Institute Director Li Yizhi, the scientists and technicians of the research group made preparations for the setting up of a high-temperature superconductor laboratory and succeeded in making major headway.

PRC To Increase Posts & Telecommunications Services

40100028 Beijing XINHUA in English 1509 GMT 16 Jan 89

/Text/ Beijing, January 16 (XINHUA) -- China will add 800,000 telephones in its urban areas and 12,000 long distance telephone lines this year.

And by the end of next year, the country's total number of telephones will reach 13.5 million, said an official from the ministry of posts and Telecommunications at a press conference here today.

He said that last year 849,000 switchboard lines were installed in urban China, while the country's total length of long distance cables increased by 1,350 km.

Meanwhile, postal express delivery services have been expanded to 56 foreign countries and regions, and are available in 172 chinese cities.

The official pointed out that long distance telephone lines in coastal areas, and medium-sized and large cities elsewhere, are generally overburdened. Last year, he cited, the country's total length of long distance lines increased by only 19.85 percent, but the use of the services rose by 32 percent.

More modern technology and equipment will be introduced to the country's postal and telecommunications services in the oncoming two years, said the official.

By 1990, the official pledged, 40 percent of the country's domestic long distance phone services will offer direct dialling, while international direct calls will be available in all major hotels, airports and ports in open coastal areas and large cities.

Latest Reports on Domestic Fiber-Optic Communications

Rapid Development in Industry

40080099 Beijing DIANZI SHICHANG [ELECTRONICS MARKET] in Chinese 24 Nov 88 p 1

[Article: "China's Fiber-Optic Industry Developing Rapidly"]

[Text] China's fiber-optic communications industry is a new force suddenly coming to the fore--it is rapidly beginning to show talent in the communications field. The total length of domestically manufactured optical cable actually laid has now reached 1000 km, or about 5000 km of optical fiber. Adding in imported optical cable circuits, a total of over 5000 km of optical cable has now been laid in the country. Wuhan, Shanghai, Tianjin, and other cities have emerged as powerful research and production centers, and 120 [work] units with over 10,000 scientists and engineers are now directly involved in fiber-optic communications research and production. As of the present, the nation has a total of 37 municipal telephone networks using fiber-optic communications technology, and 8 provinces and municipalities are constructing long-distance optical communications lines.

Details on Optical Cable Laid, Uses

40080099 Beijing DIANZI SHICHANG [ELECTRONICS MARKET] in Chinese 24 Nov 88 p 2

[Article: "China's Fiber-Optic Communications Industry Beginning to Take Shape"]

[Excerpt] [Passage omitted] Statistics show that, in all optical cable in completed fiber-optic communications lines, the amount used in public communications networks--primary and secondary trunklines and municipal local telephone repeater lines--has now surpassed 3100 km, while another 2000-odd km of optical cable has been installed in special-purpose systems for railroads, electric power, industrial and mining enterprises, television broadcasting stations, etc. [Passage omitted]

Milestones in Public Optical Communications

40080099 Beijing DIANZI SHICHANG [ELECTRONICS MARKET] in Chinese 24 Nov 88 p 2

[Text] The first Chinese-made municipal telephone multimode short-wavelength experimental system (8Mbps [DS2], 18 km) was opened up in 1979 in Shanghai.

The first Chinese-made municipal telephone multimode short-wavelength operational system (8Mbps, 14 km) was completed in 1982 in Wuhan.

The first Chinese-made multimode long-wavelength 34Mbps [DS3] operational municipal telephone system was opened up in 1983 in Wuhan.

The first Chinese-made single-mode 140Mbps [DS4] municipal telephone experimental system was completed in 1988 in Wuhan.

The city that has laid the most municipal telephone optical cable is Beijing: about 260 km.

The province that has laid the most municipal telephone optical cable is Guangdong Province: about 400 km.

The first city to use optical fiber throughout as the [only] transmission line is Dongguan, Guangdong Province: a 137-km-long system.

The city that has laid the most Chinese-made optical cable is Wuhan: about 62 km.

The currently longest imported optical cable trunkline is the Guangzhou-Hong Kong line (140Mbps, 217 km) [operational 21 Oct 88--FBIS].

The currently longest Chinese-made overhead multimode optical cable trunkline is the Wuhan-Jingzhou-Shashi project (34 Mbps, 244 km) [see JPRS-CST-88-016, 29 Aug 88, p 105].

Briefs

Domestically Made Fiber-Optic System--Located in the northwest part of the town of Shatoujiao in Shenzhen on the border of Hong Kong, the Wutong Mountain Tunnel--China's first highway tunnel outfitted with modern equipment--includes a domestically made fiber-optic closed-circuit television monitoring system. After 1 year's operation, this system has contributed to the creation of about 20 million yuan in economic benefits. The tunnel, constructed by the Ministry of Machinery & Electronics Industry's Shanghai Transmission-Line Research Institute, has 30 fixed-focus pickup heads arranged on the tunnel's two inner side walls and [a total of] six all-weather pickup cameras at the ends of the tunnel. Chinese-made four-core optical cable is used for transmitting the control signals, which regulate entry of vehicles into the tunnel. [Summary] [40080089b Beijing ZHONGGUO JIXIE BAO in Chinese 29 Nov 88 p 4]

State-of-the-Art Fiber-Optic Devices--A state-of-the-art single-mode fiber-optic connector and coupler, developed at a government expense of US\$1.8 million, were perfected a few days ago by the Ministry of Machine-Building & Electronics Industry's Shanghai Research Institute 23. With the successful completion of this state priority high-tech project, the institute is becoming one of China's major research and production centers for fiber-optic passive devices. Through absorption of imported technology, the institute has developed first-rate, high-precision products; commercialization of these products not only will satisfy domestic needs for the next 3-5 years, but can also result in a highly marketable export. [Summmary] [40080108a Shanghai WEN HUI BAO in Chinese 19 Dec 88 p 1]

- END -