JPRS 81896

30 September 1982

China Report

SCIENCE AND TECHNOLOGY

No. 175

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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CONTENTS

PEOPLE'S REPUBLIC OF CHINA

ABSTRACTS

NATIONAL DEVELOPMENTS

DIRECTIONAL FLOW PROBLEM OF SCIENTIFIC, TECHNICAL PERSONNEL DISCUSSED

Beijing GUANGMING RIBAO in Chinese 12 Jul 82 pp 1, 4

[Article by Tao Kai [7118 6963] and Ceng Qing [2582 3237]: "On the Question of Directional Flow of Scientific and Technical Personnel"]

[Text] Abstract

The directional flow of scientific and technical personnel is an urgent problem in today's personnel issue that awaits a solution. Science and technology transfer and most importantly the transfer of scientific and technological capability are generally accompanied by the flow of personnel. To accommodate the needs of the national economic readjustment, personnel should flow from heavy industry to light industry, from publically owned enterprise to collectively owned enterprise, from large cities to medium and small cities, from coastal area to inland and from the urban area to the rural area. The approach taken recently by some medium and small cities of developing science and technology potential by the directional flow of personnel and knowledge has had prominent effects. Personnel recruiting activities conducted by personnel and cadre departments are one form of personnel flow activity. It is a supplement to the current personnel cadre system.

The scope of scientific and technical personnel problem is very wide, it includes such issues as personnel cultivation, utilization and management. These issues in turn are intimately related to the policy on intellectuals, the economic system, the personnel cadre system, science and technology policy, educational system and the party's political and ideological work. We believe that, to solve the personnel problem, the urgent problem today is the directional flow of scientific and technological personnel. This problem arose from the following facts: on the one hand the national economic readjustment and development required vast manpower and the phenomenon of supply not meeting the demand was very serious; on the other hand, the stagnation and waste of personnel is quite prevalent but the potential in personnel is very strong. This contradiction came about because, under the long term influence of the "leftist" thought and the bondage of irrational management system, there was no sensible personnel flow in many departments, prefectures and units.

This has been detrimental to the development of the economy and science and technology and to the growth of personnel. Therefore, in order to vitalize the economy and thoroughly carry out the policy of a coordinated development of the S and T, economy, and society "trinity," we must further purge the "leftist" influence, have an overall and correct understanding of the personnel flow problem, put the policy regarding intellectuals on a even solid basis, improve the personnel cadre management system and carry out a guided and organized directional flow of specialists under the guidance of a universal national plan so that the conflict between personnel shortage and economic and S and T development may be resolved.

Directional Personnel Flow from the Viewpoint of Science and Technology Transfer

Science and technology transfer refers to the trade, transplant, import, promotion and popularization of scientific and technological results, information and capability. The most important aspect is the transfer of scientific and technological capability. Generally speaking the transfer of S and T ability is always accompanied by personnel flow and the relationship between the two is very close.

Scientific and technological transfer may take place via a number of channels, among them, the transfer may be from laboratory to production and application, from military use to civilian use, from advanced regions, departments and industries to backward regions, departments and industries, from cities to rural villages and from overseas to domestic. In order to save space and to illustrate the correlation between science and technology transfer and the flow of S and T personnel more directly, we shall focus our discussion on the transfer from advanced region, department and industries to backward region, departments and industries and from cities to rural areas.

Since the Revolution there have been great developments in China's national economy and science and technology. But due to various reasons, the development was very unbalanced between various departments and industries, between cities and villages and between coastal area and inland areas. Take economy, for example, the per capita value of production in Tianjin is only one half that in Shanghai, and for inland areas the figure is even less than one half that in Tianjin. In the machine building industry, the per capita value of production in Tianjin is only 54 percent of that in Shanghai and that in the inland areas is only 58 percent of that in Tianjin. The unbalanced economic development reflected the great discrepancy existed in S and T development between the advanced departments, industries and regions and the backward departments, industries and regions and this discrepancy has aggrevated the unbalance in economic development. Equally serious irrational situations have also existed in the distribution of S and T personnel. For example, almost two-thirds of the engineering and technical personnel are concentrated in the two departments of machine building and metallurgy and all the engineering and technical personnel in light industries combined is less than 15 percent of the total engineering and technical personnel. (Here light industries refer to all the industries that produce consumer products.) The imbalance in economic and S and T development and the irrational distribution in personnel have a mutual causal relationship and makes personnel flow an objective necessity.

The transfer of scientific and technological capability is essential in the national economic readjustment, in improving economic benefits, in the rationalization of economic structure, in demanding old industries to make technological improvements and in the intellectual renewal of the staff and workers rank; that is to say, the readjustment of the S and T rank and the directional flow of personnel are essential. In order to correct the lack of correlation in the development of capital goods and consumer goods, the irrational distribution of personnel must be systematically changed. It is unimaginable trying to accomplish the tasks of national economic readjustment and technological improvement without science and technology transfer.

China's agriculture production is still in a rather undeveloped state. From 1949 to 1978, heavy industry has grown more than 90 folds, light industry has grown about 20 folds, but agriculture has had only a two fold increase. This situation has greatly affected the national economic development and the improvement of the standard of living of the people. In developing a modernized agriculture production we must take an approach that fully exploits the advantages of traditional Chinese agriculture technology and in the meantime broadly borrows from the results of modern science and technology and the approach must require modest capital investment, consume less energy, and is high in efficiency and favorable to the protection of the ecological environment. The transfer of S and T from cities to countries should include the transfer of S and T capability and S and T personnel. This should not be overlooked.

The unbalanced economic and S and T development in the coastal regions, in the inland regions, in large and medium cities and in remote areas is historical. An important issue in the socialist construction is to gradually reduce this discrepancy. This would be beneficial to the political stability, security in defense and the solidarity and friendship among the various races. To a large extent, the reduction of this discrepancy will rely on the S and T transfer to these areas, including the directional flow of personnel.

To some comrades personnel flow always seems to be a taboo, they seem to view the mere mention of personnel flow as disregarding the organization discipline and obstructing the socialist economic plan and may even be advocating liberalization. Evidently they interpret personnel flow as everybody looking for jobs on their own and disregarding the plan and needs of the state. Aside from the fact that such a phenomenon will not be permitted in our country, this kind of interpretation of personnel flow is partial and superficial. Personnel flow has its definitive scientific meaning, we should try to understand its true meaning; otherwise, a lot of the issues supposedly in the realm of common sense will become hopelessly confusing.

Directional Flow of S and T Personnel Is Feasible

Today the flow of S and T personnel is often accompanied by the transfer of science and technology. Based on the needs of China's national economic readjustment, when science and technology are transferred, the flow of personnel should be from heavy industry to light industry, from publically owned enterprise to collectively owned enterprise, from large cities to medium and

small cities, from the coast to the inland and from urban area to the rural area.

This kind of personnel flow should be conducted in a planned and organized fashion to avoid blindness and anarchy. Of course we are speaking of the overall flow direction and do not preclude personnel flow in the opposite direction due to certain objective needs and subjective reasons. As to the personnel in some remote areas flowing toward the inland, the reasons are complex and specific analyses are required. However, as long as we treasure the personnel and put the policy on solid basis, and maybe adopt some special policy such as attracting large numbers of motivated S and T personnel to construct the frontier with economic incentives and do a good job on the ideological work from a practical viewpoint, the flow direction problem can be solved.

Direction flow of personnel is consistent with the planned economy in socialism, the policy of national economic readjustment and the development plan of science and technology. But what is the probability in realizing such a personnel flow? Based on the current situation in China, we believe it is entirely possible. First, many units today are overstaffed in S and T personnel. These are mostly large research organizations with a high concentration of S and T personnel, institutes of higher learning and industrial enterprises phased out in the readjustment. Secondly the problem of some S and T personnel working on topics not in their specialty is not totally solved. Thirdly, the current structure of the S and T personnel rank is not entirely rational; especially, the "department system" and the "unit system" caused an over supply of technical personnel in some regions, departments and industries and a short supply in others. Fourthly, certain S and T personnel, particularly the medium level and senior level technical people, often have "second specialty" and "third specialty" and have "residual heat" to be tapped after they complete their assigned job. Fifthly, due to historical reasons, the society still has a number of S and T personnel in idle. Besides, a large number of self-taught technical personnel achieving maturity is a force that should not be neglected.

It is fair to say that these are "uncondensed" intellectual resources existing in the society, or, potential strength in S and T. Directional flow of personnel and knowledge may concentrate and develop such potential so that it may make useful contributions to the four modernization. In recent years some medium and small cities have obtained prominent results in developing the S and T potential by directional flow of personnel and know-how. Good results have been obtained in Changzhou and Xuzhou in Jiangsu province, Xiangfan, Yichang and Shashi in Hubei province and in Siping in Jilin province. They first broke down the departmental and industrial boundary on a city wide scale and make uniform rational use of the S and T personnel based on the needs of the national economic readjustment and S and T development and the principle of matching the specialties. They then transferred a group of urgently needed S and T personnel from outside, mostly from personnel congested big cities and units. This is followed by recruiting retired engineering and technical personnel and experienced technicians from outside to teach special knowledge

on a contact basis to solve technical problems. Finally, idling S and T personnel in the society are absorbed. Their initiatives have promoted the transfer of science and technology and economic development. The economic progress made by these cities has attracted national attention.

There is yet another advantage for such practice, namely, it promotes the Party's policy on intellectuals. Under this policy, cases of unfair and false persecutions are reversed and economic and living difficulties of intellectuals are solved. Such a policy is very necessary and there are still a number of urgent problems in this area waiting to be resolved. One thing the intellectuals cannot stand is that their knowledge and know-how cannot play a full role in the socialist construction. Many intellectuals share the same feeling: as long as the party trusts them and relies on them and let them fully develop their specialty and contribute to the people's cause, they would not mind even if they have to live with some hardship. Many S and T personnel held up in big cities felt delighted and enthusiastic about their work after they were transferred to places like Changzhou and Xiangfan and became key member of the technical team. Some of the S and T personnel working in Shanghai, even though their housing problem was solved and even after they had three consecutive pay raises, still wish to leave the big cities and go to some arduous places so that they can do some useful work. The mentality of longing for big cities and easy life does exist among the intellectuals, but only in rare cases. It is incorrect to draw a sweeping conclusion that all the intellectuals in China are stubbornly hankering after big city life.

Recruiting Is One Form of Personnel Flow

S and T personnel flow takes many forms; for example, S and T personnel recruited from outside units on joint appointments or as advisors to provide periodic guidance for local factory and mine enterprises, communes, farms, research organizations and institutes of higher learning; short term academic trips and lectures; technical consulting service on various subjects and academic exchange activities; organizing inter-regional, interdisciplinary and interdepartmental research; and organizing extra-curricular research organizations on a collective ownership basis. All these methods have been found effective. The government has also instituted a number of tentative guidelines in this area.

Of all the different forms of personnel flow, recruiting is considered one of the feasible methods. Based on the experience of some medium and small cities, recruiting may be carried out in the same city such as recruiting and employing idling S and T personnel or self taught talents in the society or it can be aimed at S and T personnel in large cities who meet the urgent local needs and they may be hired with an attractive compensation. Such practice benefits both units and amounts to killing two birds with one stone.

In order to improve the S and T cultural standards of the whole nation, measures must be taken in many other areas concurrent to the development of school education. For remote regions and medium and small cities, practical and feasible economic methods should be taken to recruit engineering and technical

personnel, experience technicians and even research personnel from coastal regions and from medium and large cities (mainly large cities) in order to promote the development of the remote areas and small and medium townships.

Recruiting talents is nothing new. China has practiced recruiting in the early stage of the national construction. For example, in the early 1950's, the department of industry of the then northeast people's government has organized a very large recruiting team and recruited a large number of on-the-job technical personnel and university graduates inside Shanhaiguan and has had a very good effect on the recovery and development of the northest industry. The recruiting under discussion here, just like before, is not recruiting at will; instead, it will be uniformly planned by various local governments and conducted through personnel departments. Although some units advertize in newspapers and on radio broadcasts for information transmission purposes, all the recruited personnel are transferred through the normal personnel procedure after negotiating and obtaining permission from the original unit. It is therefore an organized and guided activity and not a free market for personnel. It does not contradict the current personnel system; instead, it supplements the present personnel system.

Directional flow of personnel is a new issue in the personnel problem we now face. As long as we carry it out in a realistic, organized and planned fashion, it would promote the growth of personnel and the development of S and T and national economy.

9798
CSO: 4008/208

COORDINATED DEVELOPMENT MODEL OF SCIENCE AND TECHNOLOGY, SOCIAL SCIENCES

Beijing RENMIN RIBAO in Chinese 23 Jul 82 p 5

[Article by Zhou Zuhua [6392 4371 5478], Li Xiuguo [2621 4423 2654], Zhou Wenyan [6392 2429 1750], Cao Qingyang [2580 7230 7122] and Yan Zhichao [7051 1807 6389]: "An Enquiry Into a Model For Harmonious Development of Science and Technology and Economic and Social Sciences"]

[Text] The historical trend for contemporary social development is a coordinated development of science and technology and economic and social sciences. In China an issue that requires serious investigation is how to find a specific approach, based on the basic situation in China, to realize a harmonious development of S and T and economic and social sciences.

A review of the progress toward modernization in some developed nations indicates that a universal and imperative model does not exist. The situation of any nation always encompasses merits and shortcomings and advantages and disadvantages. A more successful development strategy is based on the manpower, financial and natural resource conditions and the industrial and agricultural basis, communication and transportation, scientific potential, education level and traditional advantages of a nation. The strategy is to determine the science and technology that the nation under discussion should emphasize and having the potential of success, to establish the complementary industry and to obtain the optimal economic and social benefits. We shall call this approach coordination for advantages.

At the end of the eighteenth century, the capitalistic revolution in Britain swept away the feudal obstacles, led to the development of the capitalistic agriculture and provided great amounts of industrial material. Together with the traditional technological advantages in its textile industry, English products had a wide domestic and overseas market. The industrial revolution in England was therefore led by the technological innovation in textile industry, backed by the development of the engine and quickly formed a series of superior science and technology and industry. It enjoyed enormous economic benefits and occupied the hub of "world factory." Germany did not follow the British approach in its own industrialization. Based on its advantages and unique position and its inventions and innovations in the field of generator, internal combustion engine and organic chemistry, Germany established a series of new industries in electricity, internal combustion engine and chemistry.

This move had allowed Germany to lead the world in S and T and in economic strength during late nineteenth century. Japan has limited land and natural resources but abundant manpower, so it paid special attention to the development of manpower (labor as well as intelligence) and the development of science and technology education. On this basis, Japan selectively imported advanced production technology, modified it and added their own innovation and formed their own S and T and developed a series of superior industries such as automotive, chemical, and steel industries, achieved superiority in international trade and enjoyed sound economic benefits.

The approach taken by Britain, Germany and Japan was not to do many things at once; instead, they formed a series of coordinately developed advantageous technology and industry that suited their national situation which in turn led to the development of other technology and industry and realized the transition from underdevelopment to development. It is fair to say that coordination for advantages is the footing of development strategy for underdeveloped nations.

Coordination for advantage is a complete chain and its center link is the development of advantageous technology. In choosing a development strategy for S and T development, one should naturally take the current overall development characteristics and trend into account and identify the possible breakthrough points and "rich areas" that might bring fruitful results. However, to solve the strategy problem of a nation's S and T development, it is not enough to confine the considerations solely on the S and T system itself. Because of the elevated status and the expanded function, modern science and technology has become an enormous force of promotion for economic and social development. Its direction, scope and speed of development are constrained by the needs of social development and the conditions it provides. Therefore, the discussion of S and T development strategy cannot be confined only to science and technology but should be investigated in terms of the needs and potentials in science and technology, and economic and social sciences. To develop an advantageous S and T, coordination and overall arrangement must be carried out for S and T and economic and social sciences.

Based on the above viewpoint and the basic situation in China, we believe that we should start from our resources and other conditions, select a series of industry and associated S and T for priority development and for an advantageous industry and technology that is characteristic of the Chinese situation.

China has many superior mineral resources. For example, China has the world's largest resources of tungsten, antimony, and rare earth elements. Reserves of tin, lead, zinc, nickel, aluminum, molybdenum, vanadium and titanium are also among the highest in the world. Nonferrous metals are a great advantageous resource in China. Because they are indispensible in defense, industry, pioneering science and technology, and the livelihood of the population and there is a great demand on them both domestic and foreign, the market is very wide. For this reason, a series of advantageous industries should be formed. The crucial link between favorable mineral resources and favorable industry is a superior S and T, which is precisely our weak link. We can no longer stay at the level of exporting ore for foreign exchange. We should establish an

advantageous industry of nonferrous metals. The crucial step is the reinforcement of S and T research and development and the establishment of a continuous chain from prospecting, mining, dressing, refining, extensive processing to product manufacturing based on new technology, method, equipment, procedure and product variety. Only then can the advantageous resources be fully developed and utilized and the advantageous industry can then be established and the products will have an edge on the market. The development and utilization of coal and petroleum resources should be handled in a similar fashion.

China has many unique economically advantageous regions. For example, Hainan Dao, located in the tropical and subtropical zone, is suited for planting many tropical crops of high economic value and has many precious botanical specimens and rare animals. It is also rich in grass land and aquatic resources and has unique natural conditions and outstanding advantages. But, due to a number of reasons, these advantages are not only undeveloped, there may even be a possibility of gradually losing them. To develop this wonderful island and make it an industrial crop zone, we must develop the associated science and technology, in addition to having a correct policy. As long as we coordinate the harmonious development of S and T and economic and social sciences according to the needs of the development task, the day will come when this island will have great prosperity.

China also has some historical and traditional advantages. For example, the silk of Suzhou and Hangzhou, the china of Jindezhen, Chinese herb medicine all over the country, handicrafts of various places, the world famous Chinese food, superior ancient culture and famous scenic spots and places of historical interest. All these are unique creations of the Chinese people and have an international reputation. But, in today's rapid progress of S and T, if we were to stick to the established practice and not using modern technology to change the technical basis and add luster to the traditional advantages, the development of traditional advantages will be greatly limited and we may even lose some of the traditional advantages. We must strengthen the effort of scientific research and technical development in these areas so that the traditional advantages may ascend to a new level and we may continue to maintain our advantages. Development in this area may form a unique industry that combine S and T and arts. It may mold the results of modern S and T and the wisdom of the Chinese nation, absorb a great labor force with modest investment and produce good economic and social benefits.

On the whole, the culture, education and S and T in China are relatively underdeveloped, but there are advanced regions centered around big cities that have their own advantages. We should make full use of the abundant talents, rich information and literature, sophisticated equipments and facility and the strong problem-solving ability of these areas and develop some technology-intensive industries centered around research units and universities to produce competitive products to play a leading role in China and to strive for an advantageous position on the world market.

Of course our advantages are not limited to the ones mentioned here and there are more industries and technologies that we should develop. We have merely enumerated some examples. The basic idea is that we should develop all the potential advantages, enhance the existing advantages, actively create future advantages, develop a variety of advantageous science and technology, establish various advantageous industries and seek the optimum economic and social benefits.

9698
CSO: 4008/208

SEOUL PAPER DISCUSSES CHINA'S NUCLEAR ENERGY PLAN

Seoul WONCHARYOK SANOP in Korean No 5 May-Jun 82 pp 52-54

[Article: "Communist China's Nuclear Power Plan"]

[Text] The Southweat Research Institute (SWRI) is a secret nuclear research center located near Chengdu, deep in China's heartland.

Until quite recently SWRI was closed to all foreigners, but in early November last year a visit to the center and observation of the new 125 MWT High-flux Engineering Test Reactor (HFETR) which began full capacity operation on 16 December 1980 were permitted.

SWRI belongs to the Second Machine Industries Ministry which is responsible for Communist China's military and civilian nuclear planning.

The construction of this research center began in 1960, but construction progress was delayed until 1977 due to the Cultural Revolution.

HFETR was required to be completely planned, designed, and built to go into operation solely by the Communist Chinese without any external help.

SWRI's main goals are as follows: research on 3 percent low enrichment nuclear fuel and 90 percent high enrichment nuclear fuel; HFETR operations; research on reactor physics, thermo- and hydro-dynamics, reactor structural dynamics, welding technology, radiation barriers, and loss-of-collant accidents (LOCA); design of the Communist Chinese standard 600 MWEPWR which can be built with Chinese technology; research on hydrochemistry, radiation chemistry, and analytical chemistry; continuing improvement of the capabilities of the SWRI computers. In the computer research office there are two kinds of the latest computers, the model DJS-6 and the model TQ-6.

The Shanghai research center, which is one of the research centers belonging to Communist China's Academy of Sciences, is designing a 300 MWe PWR plant and is said to have a rough actual-size model. The SWRI is designing the newest standard 600 MWe PWR and is also studying the design of a high speed reactor. Also, the reconstruction of the heavy water research reactor (HWRR-1) at a nuclear power research center near Beijing is quite important. The reconstruction began in January 1979 and by October 1980 the reactor had

recovered full capacity. The reconstructed HWRR-1 was increased from 10MWt to 15MWt and the maximum thermal neutron flux also has increased about 20 percent. The new design is said to be able to produce three to five times as many radioactive isotopes as before.

The HFETR uses multi-rod nuclear fuel elements of 30 percent enriched uranium, and is a pressure container style reactor using light water as its decelerant and coolant and beryllium as its reflector. Its generating capacity is 125 MW, and the maximum thermal neutron flux (0.6MeV) is 6.2 x $10^{14}n/cm^2sec$. This reactor was designed primarily for research in the radioactivity of the materials and fuels of power reactors. It is equipped with a sodium loop in order to study high speed reactor physics. Also, the reactor core was designed considering experiments in the hot gas cooling reactor category. The test reactor previously built in Communist China had maximum radiation channels of 110 mm in diameter; by comparison, the maximum radiation channels in this new reactor are 230 mm in diameter and the diameter of most channels is 150 mm.

In order to develop research into the activity of irradiated fuels, a series of high level hot cell and radio-chemistry laboratories are attached to the reactor; also the reactor is designed to produce highly radioactive cobalt for medical use and has equipment that can do neutron radiation analysis. Also, the equipment can irradiate transplutonium elements.

It appears that the Communist Chinese State Science & Technology Commission regulates and controls the production of radioactive isotopes at this new type reactor. Among its various research institutes in Beijing, this committee has a radiation center that studies irradiated foodstuffs. The current capabilities of this center are somewhat limited and the cobalt used in its current facilities is brought in from Canada.

On 19 October 1981, Vice-premier Yu Qiuli stated that Communist China must continue to emphasize the development of domestic coal and hydropower resources while exploring the potential of oil, natural gas, nuclear power and alternate energy. Also, regarding nuclear power he emphasized the time to push by stages research, design, and construction of nuclear power plants, seen as important energy sources, and in preparation for future development he urged that Communist China begin medium and small-scale nuclear power plants as electricity generating projects to build experience, gain skill, and train manpower.

The State Energy Advisory Committee is composed of 52 specialists in coal, mining, electricity generation, petroleum, and nuclear power. This committee is responsible for policies and measures for the development and use, and conservation of energy resources and also investigates the feasibility of joint projects, including foreign funds. This committee has five sub-committees for coal, oil, electricity, nuclear power and new energy sources.

Also, the State Scientific and Technological Commission has an independent nuclear power committee; this committee is composed of 38 nuclear power specialists and science administrators, and is made up of small committees for handling various problems such as nuclear fuel, equipment, safety and defense, manpower training and utilization, introduction of technology, and the dissemination of research results.

Computer capabilities: according to Communist China's 1981-82 annal, Communist China has 3,000 large, medium, and small general digital computers and over 500 computer centers throughout the country. The training of qualified manpower remains an important task in the computer sicence field.

The role of the Academy of Sciences: The Academy of Sciences controls over 131 research institutes and has a staff of over 100,000, including about 7,000 scientists. Also, the Academy of Sciences occasionally takes over research institutes to supervise the scientists' research.

The Guangzhou Project: Negotiations are continuing between Communist China and Hong Kong to build two 900MWe nuclear power plants near Guangzhou. The State Council, composed of 15 vice-premiers, has not yet given authorization for this project. Although Framatome, Westinghouse, Combustion Engineering and Great Britain are negotiating with the Communist Chinese authorities, Quadrex Inc. is Communist China's consultant on this project. Communist China is hoping to complete this project before 1990.

Prospects for hydro-electricity: Communist China relies heavily on water power in its future energy resource planning.

However, the planning is criticized for not being sufficiently aware of the amount of arable land that will be flooded with the completing of dams when it considered potential water power storage capacity. In relation to this, the peasants are an important element in the resolution of this problem. The peasants and the state are saying that they must not lose most of the cropland that would be flooded and unable to produce crops. Thus the water power storage capacity is being re-evaluated and decreased for the most part.

Coal: Communist China has huge coal reserves estimated at 640 billion tons, but its ability to continuously increase coal production has lessened greatly in the past 2 years. Mining cannot keep up with the increasing energy demand.

Communist China's cities are severely polluted with ash and suspended particles from coal. Medical costs for respiratory diseases are high and are reported to be gradually going higher.

Communist China's big problem is a very large population and a relatively limited amount of fertile farmland; also, it is faced with the difficulty of an energy demand that will multiply over the next 20-50 years. As many other countries have already realized, Communist China's policy-makers have also begun to realize that if they are to secure sufficient energy to develop their economy and maintain peace and security they must not rely on coal and water power alone, but must find and develop nuclear power and other energy sources.

Discussions are taking shape for the development of nuclear power generation in Communist China. In December 1981 the People's Congress' Proposal Committee recommended to the State Council that nuclear power generation be developed.

On the surface, the plan to develop a total Sinified nuclear power generation plan calls for 300 MWe and 600 MWe PWR's, but Communist China is said to have plans to purchase 2-6 1,000 MWe class plants in the next 10 years.

The cost needed for each plant is estimated at $250 million. That is, $100 million for NSSS, $100 million for the turbine systems, and $50 million for A/E and other uses. Communist China wants a rapid increase in electric power production, and nuclear power plays an important part in this plan. Communist China appears to believe that it can buy a number of $250 million plants if the plan to introduce nuclear power development receives State Council approval.

7139
CSO: 4008/204

INTERACTION BETWEEN INTENSIVE RELATIVISTIC ELECTRON BEAM, TARGET ANALYZED

Leshan HEJUBIAN YU DENGLIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS] in Chinese No 2, 1981 pp 82-86

[Article by Xu Fuyuan [1776 4395 0337], Institute of Atomic Energy, Chinese Academy of Sciences: "Interaction Between an Intense Relativistic Electron Beam and Target Material"]

[Excerpt] 1. Experimental Conditions and Results

The experiment described by S. Nakai [3] et al. had the following conditions and results.

Accelerator (Reiden III) experimental parameters: $V = 2 \cdot 10^5$ volts; $I = 4 \cdot 10^4$ amperes; $\tau = 8 \cdot 10^{-8}$seconds. Target parameters: deuterated polyethylene (CD_2) target; radius $r = 0.075$ cm; initial density $\rho_0 = 1.06$ g/cm^3.

Experimental results: average plasma temperature $T_p = T_e = T_i \approx 1.5$ keV. For 1 gram-molecule of CD_2, when the temperature reached 1.5 keV, the C and D atoms were entirely ionized, and the following figures were obtained: C ion density $n_i^C = 4 \cdot 10^{22}$ cm^{-3}; D ion density $n_i^D = 8 \cdot 10^{22}$ cm^{-3}; electron density $n_e = 3.2 \cdot 10^{23}$ cm^{-3}; plasma density $n_p = 4.4 \cdot 10^{23}$ cm^{-3}; plasma oscillation frequency $\omega_p \approx \omega_e = \left(\frac{4\pi n_e e^2}{m_e}\right)^{1/2} = 3.18 \cdot 10^{16}$ radians/sec; electron rest energy $\varepsilon_0 = m_e c^2 = 0.511 \cdot 10^6$ eV; relativistic electron kinetic motion $\varepsilon_k = 2 \cdot 10^5$ eV; total energy of relativistic electron $\varepsilon = \varepsilon_0 + \varepsilon_k = 0.711 \cdot 10^6$ eV; relativistic electron velocity parameter $\beta = \sqrt{1-(\varepsilon_0/\varepsilon)^2} = 0.693$; relativistic electron velocity parameter $v_b = \beta c = 2.08 \cdot 10^{10}$ cm/sec; density of relativistic electron beam $n_b = I_b/ev_b\pi r^2 = 6.74 \cdot 10^{14}$ cm^{-3}.

Using an approximative energy balance equation, the experimental data can be used to find the range of the electron beam in the CD_2:

$$\lambda \approx \frac{VI\tau}{n_p k T_p \pi r^2} = 3.44 \times 10^{-4} \text{ cm} \qquad (1)$$

2. The Range as Given by the Classical Theory

Here the electron beam is treated as consisting of point charges which are incident on a plasma with an oscillation frequency ωp, giving an average energy loss [4] of

$$-\overline{\frac{dE}{dx}}=\frac{e^2\omega_p^2}{v_b^2}\ln\left(\frac{v_b k_m}{\omega_p}\right). \tag{2}$$

where k_m is the greatest wave vector of the collective mode of the plasma, defined as follows:

$$k_m = \alpha m_e v_b^2/e^2 \ \text{cm}^{-1}.$$

Here $\alpha = 1.123$ is a constant. From Eq. 2 we can find the range of the electron beam:

$$R=\int_0^{E_0}\frac{dE}{-(\overline{dE}/dx)}=\frac{1}{e^2\omega_p^2}\int_0^{E_0}\frac{v_b^2 dE}{\ln(\alpha v_b^3 m_e/e^2\omega_p)} \tag{3}$$

where $E_0 = 0.2$ GeV is the initial energy of the beam electrons; by numerical integration we find for the range

$$R = 0.034479 \text{ cm}.$$

3. Computation of the Range Using Two-Beam Instability Theory

When an electron beam is incident on a plasma provided that the electromagnetic skin depth (c/ω_p) is much smaller than the beam radius, an electric countercurrent will be produced in the plasma. The interaction between the electrons making up this countercurrent and the electrons or ions in the plasma produces two-beam instability. The electron beam incident on the target is relativistic $(v_b \approx c)$, but the electron beam induced in the countercurrent is in fact nonrelativistic, because $n_b \ll n_e$, and since $I_b = -I_e$, then $|v_e| = |-n_b v_b/n_e| \ll c$, which is to say that the velocity of the electrons in the countercurrent is much slower than the speed of light. Thus it is apparent that, in dealing with the interaction between a strong relativistic electron beam and the target material, we may use the cold plasma approximation by treating the countercurrent electron beam and the newly-ionized target plasma (low-temperature corona plasma) as cold beams. Using the equation of continuity, the momentum equation and the Poisson equation, we can find the electron-electron and electron-ion two-beam instability dispersion relationship and rate of growth (here we use the cold plasma approximation):

equation of continuity
$$\frac{\partial n_j}{\partial t}+\frac{\partial}{\partial x}(n_j v_j)=0, \tag{4}$$

momentum equation
$$m_j\left(\frac{\partial v_j}{\partial t}+v_j\frac{\partial v_j}{\partial x}\right)=-e_j\frac{\partial\phi}{\partial x}, \tag{5}$$

Poisson equation
$$\frac{\partial^2\phi}{\partial x^2}=-4\pi e(n_j-n_j'). \tag{6}$$

We take the perturbation to have the following plane-wave form:

$$q = q_0 \exp\{i(k\cdot r - \omega t)\}. \tag{7}$$

where $\omega = \omega_r + i\gamma$, with γ denoting the growth rate. Substituting Eq. 7 into Eqs. 4-6 we obtain:

for electron-electron two-beam instability,

the dispersion relation $$1-\omega_p^2/\omega^2-\omega_b^2/(\omega-kv_e)^2=0, \tag{8}$$

the maximum linear growth rate $$\gamma_m=\sqrt{3}/2^{4/3}\cdot(n_b/n_e)^{1/3}\omega_p. \tag{9}$$

for electron-ion two-beam instability,

the dispersion relation $$1-\frac{\omega_i^2/Z^*}{(\omega-kv_i)^2}-\frac{\omega_b^2}{(\omega-kv_e)^2}=0, \tag{10}$$

the maximum linear growth rate $$\gamma_m=\frac{\sqrt{3}}{2^{4/3}}(n_b/n_i)^{1/3}\ \frac{\omega_i}{\sqrt{Z^*}}. \tag{11}$$

where Z^* is the effective charge number for the ions. Because $\omega_p >> \omega_i/\sqrt{Z^*}$, we may take into account only electron-electron two-beam instability.

From Eq. 9 we obtain

$$\gamma_m = 2.81 \cdot 10^{13}\ \text{sec}^{-1}, \tag{12}$$

from which we obtain the maximum range of the electron beam in the target material:

$$R = v_b/\gamma_m = 7.4 \cdot 10^{-4}\ \text{cm}. \tag{13}$$

The theoretical value obtained above and the experimental values are presented in Table 1.

Table 1. Theoretical and Experimental Values for Range

	Experimental value	Classical plasma theory	Two-beam instability theory
Range, cm	$3.44 \cdot 10^{-4}$	$3.4479 \cdot 10^{-2}$	$7.4 \cdot 10^{-4}$

Table 1a. Values of I and X

I, amperes	$5 \cdot 10^4$	$1 \cdot 10^5$	$1.5 \cdot 10^5$	$2.5 \cdot 10^5$	$6 \cdot 10^5$
X	1	2.15	3.26	5.0	12.6

It is apparent from Table 1 that the range obtained by the classical theory is two orders of magnitude larger than the experimental figure, while the two-beam instability theory gives a value about twice as large as the experimental figure; if we take account of the magnetic enhancement effect, the theoretical range can be decreased still further.

4. The Magnetic Enhancement Effect

When the electron beam current is sufficiently great (greater than about $5 \cdot 10^4$ A), the effect of the strong magnetic field produced by the beam on the beam itself causes the beam electrons to enter the target plasma on a spiral path. This is equivalent to an increase in the electron density, and it increases the interaction between the electron beam and the target plasma.

The magnetic enhancement effect was discovered by Yonas et al. [5] in 1974. Clauser et al. [6] showed experimentally in 1977 that the magnetic enhancement was 5 times greater in a thin target than in a thick target. Yonas gave the magnetic enhancement effect as a function of beam current intensity [7]; the experimental curve yields the data given in Fig. 1a. Here χ is the magnetic enhancement factor for the deposition power, $\chi = P_{enh}/P_{non}$, where P_{enh} and P_{non} are the deposition powers with and without magnetic enhancement.

The magnetic field created by the electron beam is perpendicular to the direction of the beam, and according to theoretical analysis the magnetic enhancement effect should be proportional to the rotational frequency of the beam as it enters the target plasma,

$$\chi = k\omega_{ce}. \tag{14}$$

where k is a proportionality factor. The frequency of rotation of an electron in a magnetic field B (in gauss) is

$$\omega_{ce} = eB/m_e c = 1.76 \cdot 10^7 \quad B \text{ radians/sec.} \tag{15}$$

If the electron beam is considered to be a straight-line current and the beam radius is 1 mm, the magnetic field produced by the beam has the strength

$$B = \frac{\mu_0}{2\pi}\frac{I}{r} = 2I \text{ gauss} \tag{16}$$

The values of B, ω_{ce} and k found from Eqs. 14 through 16 are presented in Table 2.

Table 2. Values of B, ω_{ce} and k

Beam current I, amperes	$5 \cdot 10^4$	$1 \cdot 10^5$	$1.5 \cdot 10^5$	$2.5 \cdot 10^5$	$6 \cdot 10^5$
B, gauss	$1 \cdot 10^5$	$2 \cdot 10^5$	$3 \cdot 10^5$	$5 \cdot 10^5$	$1.2 \cdot 10^6$
ω_{ce}, radians/sec	$1.76 \cdot 10^{12}$	$3.52 \cdot 10^{12}$	$5.28 \cdot 10^{12}$	$8.8 \cdot 10^{12}$	$2.11 \cdot 10^{13}$
$k \equiv \chi_{exp}/\omega_{ce}$	$0.568 \cdot 10^{-12}$	$0.61 \cdot 10^{-12}$	$0.617 \cdot 10^{-12}$	$0.568 \cdot 10^{-12}$	$0.597 \cdot 10^{-12}$

It is evident from Table 2 that k is almost independent of the current and is approximately constant, and accordingly we use the average value of $0.592 \cdot 10^{12}$. Thus we can determine χ_{theor} and P^{enh}_{theor} from the following equations:

$$\chi_{theor} = \bar{k}\omega_{ce}, \tag{17}$$

$$P^{enh}_{theor} = \chi_{theor} P^{non}_{exp} \tag{18}$$

The values of χ_{theor} P_{theor} obtained from Eqs. 17 and 18 and the corresponding experimental values are presented in Table 3.

Table 3. χ_{theor}, P_{theor} and Corresponding Experimental Values

Beam current I, amperes	$5 \cdot 10^4$	$1 \cdot 10^5$	$1.5 \cdot 10^5$	$2.5 \cdot 10^5$	$6 \cdot 10^5$
χ_{exp}	1	2.15	3.26	5.0	12.6
χ_{theor}	1.04	2.08	3.13	5.22	12.5
P^{enh}_{exp}, 10^{-12}W/G	6	27	62	150	900
P^{enh}_{theor}, 10^{12} W/g	6.24	26.9	59.1	156	930

It can be seen from Tables 2 and 3 that there is good agreement between χ_{theor} and χ_{exp} and between P_{theor} and P_{exp}, with an error not exceeding 4 percent.

Fig. 1 presents curves for P_{theor} and P_{exp}.

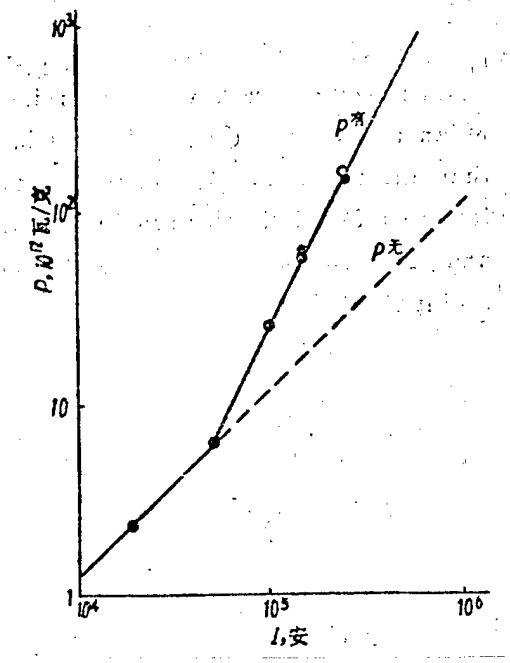

Fig. 2. Deposition Power as a Function of Current

●--experimental values; o--theoretical values; P^{enh}--deposition power with magnetic enhancement; P^{non}--deposition power without magnetic enhancement.

5. Discussion

With regard to the mechanism of interaction between an intense relativistic electron beam and the target material, American investigators believe that the magnetic enhancement effect has the primary role [5-7], while Japanese investigators believe that the primary role is played by the two-beam instability effect [3] in the plasma. On the basis of the theoretical calculations presented here, the present author concludes that taking account of both magnetic enhancement and two-beam instability, which are abnormal absorption effects, gives a very good explanation of the experimental results in the entire beam current region. When the beam current exceeds $5 \cdot 10^4$ A, the magnetic enhancement effect will play the primary role, and when the current is less than $5 \cdot 10^4$ A, two-beam instability plays the primary role. In an intense beam current, the classical absorption mechanism alone cannot explain the experimental results. In addition it should be pointed out that the experiments on the interaction between an intense relativistic electron beam and the target material are still not systematic in character, and more systematic experimental and theoretical investigation should be conducted in order to clarify the question whether or not an intense relativistic electron beam can produce fusion.

During the completion of this article, Professors Wang Ganchang [3769 3227 249] and Yu Min [0060 2404] and Assistant Professor Chen Jia'er [7115 0163 3167] provided assistance; when English beam physics expert Dr J. D. Lawson visited China he discussed the article with the author and made valuable comments. The author takes this occasion to express his thanks.

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CSO: 8011/1561

CONSTRUCTION OF UNDERGROUND SHELTERS DISCUSSED

Changing DAXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 6, 1982 pp 36-39

[Article by Xianyu Fankang, [7639 0600 2455 1660]: "Combine the Construction of Civilian Buildings With that of Underground Air Defense Shelters"]

[Text] Underground air defense shelters are an important component part of civil air defense engineering construction and also a reliable foundation for aboveground buildings. During war time, the combined construction of civilian buildings and underground air defense shelters solves the problems of sheltering people and maintaining positions for city fighting. During peacetime, they can be used for commercial services. This wartime and peacetime combination usage will bring about beneficial investment results. Therefore, during the period of national economic adjustment, various individual views have been put forward on how best to construct underground air defense shelters.

Major Existing Problems

Following the development of urban construction and the requirements of war preparedness, each major city in China has partially constructed underground air defense shelters; great successes have been achieved. However, because of insufficient knowledge and experience, stress on square meters and neglect of engineering quality, there has been a lack of unified planning, design, construction, checking and acceptance. After a construction unit receives its subsidy, frequently it first maintains the ground above and does not concern itself with the underground area. As a result, underground air defense shelters have a lot of dripping water, a great deal of accumulated water and many "halfway" constructions. Some regions are not very strict about design examination and approval procedures, so that the earthen ceiling of the underground air defense shelter is very thin; the layout of the opening's "three defenses" room is not rational; the ventilation and lighting window is open too far, the strength around the window opening is not substantial, and there are no protective measures. The conditions of some underground air defense shelters are very good, but the units in the area do not use, safeguard or manage them. At present, some units are disseminating the falsehood that "the underground air defense shelters were not handled well." Some important cities have not given proper

consideration to the construction of underground air defense shelters in the new construction of many large area high-rise buildings. In several places, when reconstructing buildings and extending roads, the underground air defense shelters have been filled in without authorization and the waste is startling.

Special Features of Underground Air Defense Shelters

Based on domestic and foreign nuclear effects test materials and the verificationof over 10 years' experience, underground air defense shelters have the following special features:

1. The mutual strengthening of above- and below-ground buildings. The simultaneous construction of underground air defense shelters and aboveground buildings is advantageous to strengthening the foundation and the antiseismic capabilities of the aboveground building. After an earthquake, if an underground air defense shelter has been constructed in the middle section of a five-story building, the two ends of this building will have completely collapsed and only the middle section will remain. A building over an underground air defense shelter can lessen the shock wave of a nuclear explosion; compared to dugout, open type defense works, the excessive pressure of the shock wave on the ceiling of the underground air defense shelter can be lessened by 5 percent. A building over an underground air defense shelter is also advantageous for lessening nuclear radiation. Compared to simply constructed defense works, the covering earth of the underground air defense shelter can be one-third to one-sixth thinner. The construction of a sturdy high-rise building over an underground air defense shelter can advance the explosion of a common explosive bomb. This can reduce the bomb's shock and destructive effects on the underground air defense shelter.

2. When the construction of above- and below-ground buildings is combined, the sheltering of people during war time is convenient and during peacetime it is easy to utilize. All underground air defense shelters have entrances and exits. During war time, after an alarm is sounded, people can go underground in only about 6 minutes. In peacetime, entry and departure are also convenient. The commercial network of the combined ground buildings makes it easy to realize underground services for both peacetime and wartime usage. For example, among the underground air defense shelters of a certain city, 37.28 percent of them maintain and use combined above- and below-ground facilities for underground photography, hairdressing, cold and hot drinks, shops, hotels, conference rooms, cultural recreation rooms, daily reparis, etc. There is no noise or waste gas, they provide increased economic income, and they resolve the problem of finding employment for school graduates. Therefore, these networks are warmly welcomed by the masses.

3. The construction of underground air defense shelters not only uses city land for building, but under the premise of guaranteeing quality they can save materials and lower building costs. For example, a certain building's underground air defense shelter in Wuhan has a total area of 1,977 square meters. During wartime, it can shelter people and during peacetime it is a

laboratory with a total building cost of 722,400 yuan. This lowered the foundation cost of the aboveground building by 222,400 yuan, and the building of the laboratory underground used 1,831 square meters less ground at a savings os 293,000 yuan. In this way, the civil air defense only required an investment of 207,000 yuan, and the unit cost was actually 105 yuan per square meter. We can see from this that the combined construction of civilian buildings and underground air defense shelters is very economical for both peacetime and wartime utilization. A steel reinforced concrete prefabricated cast-in-place layered slab is used for the ceiling of the underground air defense shelter. For example, a 10,000 square meter underground air defense shelter can save over 150 cubic meters of wood.

4. It is easy to guarantee quality when building underground air defense shelters. A blueprint of an underground air defense shelter is made by a design institute according to a "standard" uniform design. After the blueprint is standarized, examined and approved by both the consturction committee and civil defense, construction begins. A team of specialists and builders is in charge. Based on the design blueprints and technical operations rules, when construction is completed nothing is left behind. After completion, it is jointly checked and accepted, the quality level is appraised and the accounts are settled for the building file. When done in this way, it is possible to build a shelter to completion.

5. According to foreign materials, Switzerland, celebrated for its "permanent neutrality," has a 47-year history of building civil defense works, beginning in 1934. All the high-rise buildings constructed in that country must have one- to three-story underground air defense shelters, and when private houses are rebuilt, the building of an underground air defense shelter is mandatory. The state subsidizes two-thirds of the cost, while the individual pays one-third. Eighty percent of the present Swiss civil defense works consist of underground air defense shelters for both peacetime and wartime use. In the last 10 years, all newly constructed buildings in Sweden have underground air defense shelters. In Sweden it is a government regulation that when a new building is constructed, 20 percent of the total building cost must go to building an underground air defense shelter.

There are four types of defense works in civil air defense engineering construction. The resistance power of underground air defense shelters is higher than that of simply constructed dugout defense works, and their construction costs are lower than defense works with similar structural forms. When quality is the primary factor, the policy of combining peacetime and wartime usage is easily realized in building underground air defense shelters. Therefore, aside from planning to improve the maintenance of underground air defense shelters year after year for cities, which will be greatly affected by a war situation, it is also necessary to concentrate financial and material resources in low-lying regions with dense populations and little open space. When it is necessary to make a deep foundation or newly construct a high-rise building, it should be arranged beforehand that underground air defense shelters with peacetime and wartime uses are constructed with them. As far as possible, the digging of tunnels under already constructed high-rise buildings when war appears imminent should be avoided, as this is not economical or safe.

Technical Problems in Constructing Underground Air Defense Shelters

1. The thickness of the covering soil should satisfy the requirements to guard against early nuclear radiation. If the reinforced concrete ceiling of the underground air defense shelter is 25 centimeters, the theoretical calculations are that when the conversion calls for soil of 35 centimeters the covering soil on the defense work only requires a thickness of 30 centimeters. Yet, during war, a surprise attack of enemy bombs or nuclear weapons will necessarily cause large fires in a city. This will create a long-lasting high-temperature layer on top of the underground air defense shelter, and as a result it is necessary to have a covering layer of a certain thickness over the underground air defense shelter for heat insulation. Thus, it is necessary that the thickness of the covering soil be no less than 50 centimeters.

2. The structure of the layered slab. The steel reinforced prefabricated cast-in-place layered slab has relatively good ability to prevent moving loads. The prefabricated part of the layered slab should be solid, as an empty slab is useless. The extending slab end of the main reinforcement in the slab should not be smaller than 60 millimeters. To guarantee the integration of the prefabrication and casting-in-place, notches should be made on the upper surface one-third of the way from the end of each prefabricated slab (see Figure 1). Prior to beginning construction, the slab should be washed clean, one layer brushed with similar grade cement, then it should be poured and pounded solid.

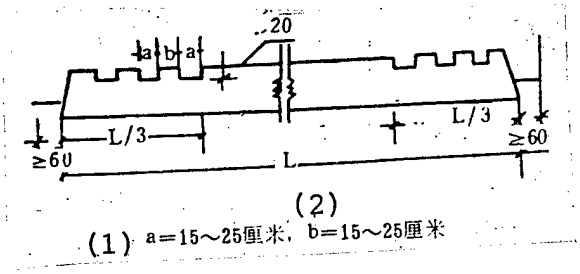

Figure 1.

Key: 1. a=15-25 centimeters
2. b=15-25 centimeters

3. Open ventilation lighting window. To resolve the problem of natural ventilation and lighting, based on requirements, an underground air defense shelter can have the ventilation lighting window on the outer wall open. However, the width of the window opening should be no greater than one-third the open space measurement of the underground air defense shelter; it should not be larger than 1.2 meters. The periphery of the window opening is strengthened with steel reinforced concrete according to "standard" requirements. The window opening's safe guarding door (shield plate) or steel-reinforced concrete prefabricated beam is closed or fitted during wartime, and then the covering soil is sealed. At the same time, consideration should be given to preventing surface water from pouring in and rain water from seeping into the defense work (see Figure2).

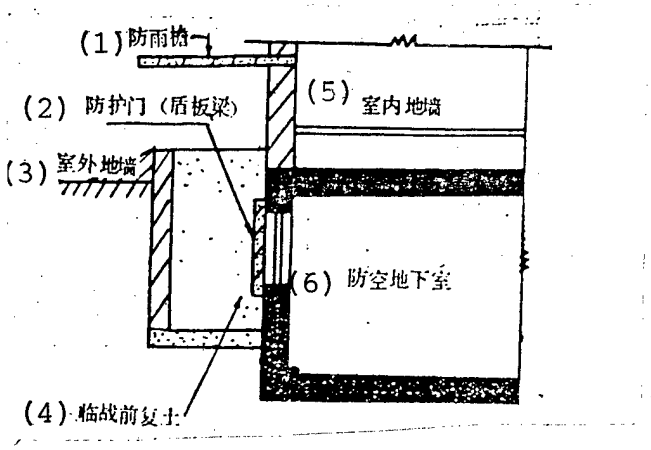

Figure 2

Key:
1. Rain guard eave
2. Protective door (shield plate beam)
3. Earthen wall outside the shelter
4. Covering soil put in place just before war
5. Earthen wall inside the shelter
6. Underground air defense shelter

4. The layout of the open section's "three preventions" room should be compact and rational. Generally, the washroom and superpressure exhaust equipment should be installed in the main exit-entrance opening (see Figure 3).

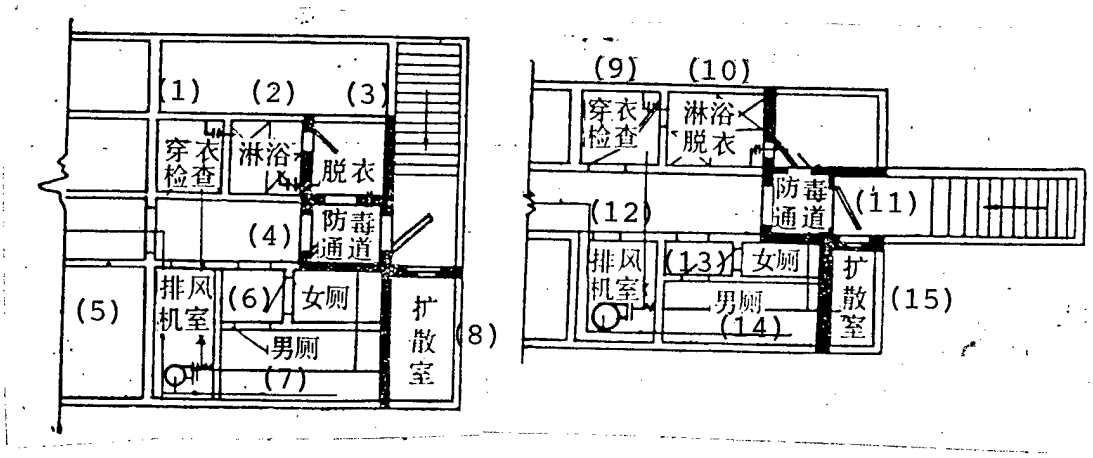

Figure3

Key:
1. Dressing examination
2. Shower
3. Undressing
4. Antitoxic passageway
5. Exhauster room
6. Women's toilet

7. Men's toilet
8. Diffusion room
9. Dressing examination
10. Shower, undressing
11. Gas protection tunnel
12. Exhauster room
13. Women's toilet
14. Men's toilet
15. Diffusion room

Generally, the air inlet should be placed in the secondary exit-entrance, while the diffusion room, toxic chamger, ventilator room and washroom should be set up on one side of the antitoxic passageway (see Figure 4).

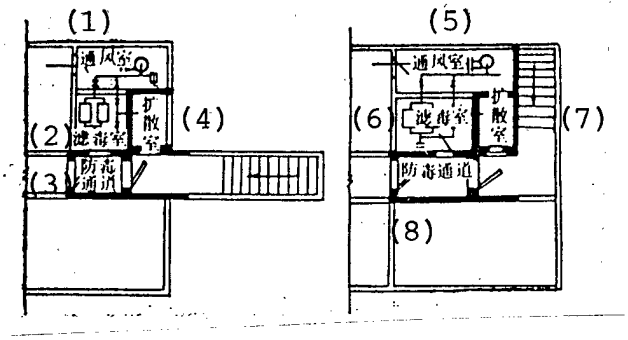

Figure 4

Key:
1. Ventilation room
2. Toxic filter chamber
3. Antitoxic passageway
4. Difussion room
5. Ventilation room
6. Toxic filter chamber
7. Diffusion room
8. Antitoxic passageway

The diffusion room, toxic filter chamber, antitoxic passageway and washroom should have floor drains or sweeping wells so that after the contaminated water is rinsed it can flow into the sewage pool of the opening's first door. Afterward, a water pump is used to eliminate the sewage water from the defense work without it going into the cleaning area.

5. Waterproof measures. In high-water-level areas, every attempt should be made to construct underground air defense shelters which widely use aggregate waterproof concrete with good antiseepage characteristics. The water repellence and density of the concrete itself is relied upon to attain waterproofing. Based on design requirements and operation rules during construction, when casting-in-place is completed, no construction joints are left. When there is a large amount of construction, no vertical construction joints should be left. Protruding or staircase type construction joints should be used (see Figure 5).

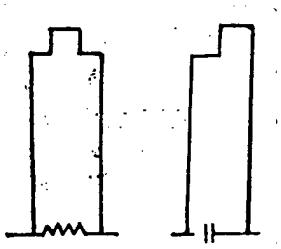

Figure 5

When pouring the upper layer of concrete, it is necessary to chisel off and wash away the pumice and floating paste from the joint. The same grade cement paste should be applied on the first layer and then the second layer of concrete poured, insuring that the new and old concrete combine to form a whole. The exit-entrance outside the shelter and the joining area of the main structure should have a settlement joint. Careful waterproofing should be carried out for each type of orifice.

6. Measures to prevent exit-entrance opening blockage. The exit-entrance opening is the weakest part of an underground air defense shelter. It is very easy to encounter building collapse blockage in densely populated areas and therefore it is necessary to adopt effective measures.

(1) Each independent underground air defense shelter should have at least two exit-entrance openings. They should be in a diagonal line so as to face different directions.

(2) Underground air defense shelters should have at least one exit-entrance opening outside the shelter, and as far as possible place it should be outside the collapsing range of the ground surface buildings (one-third the height of the building). The opening section can have a portable rainproof camouflaged room (see Figure 6) or light fireproof horizontal push and pull cover plate (see Figure 7). The preiphery of the opening should be 20-30 centimeters higher than the nearby ground.

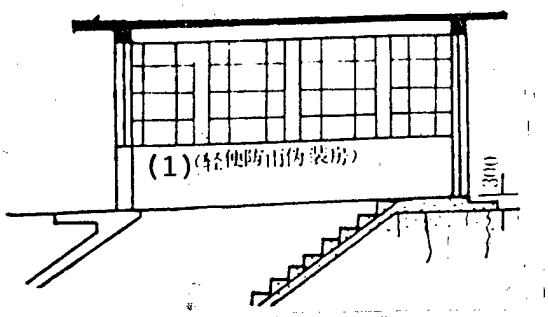

Figure 6 Key: 1. (Portable rainproof camouflaged room)

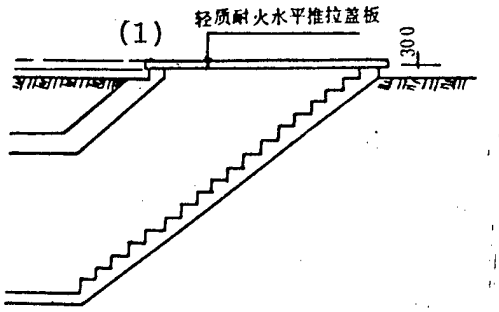

Figure 7 Key: 1. Light fireproof horizontal push and pull cover plate

When limited by conditions wherein the exit-entrance opening outside the shelter is erected within the collapsing range of the aboveground buildings, the opening section should have a sturdy collapse-resistant shed frame (see Figure 8).

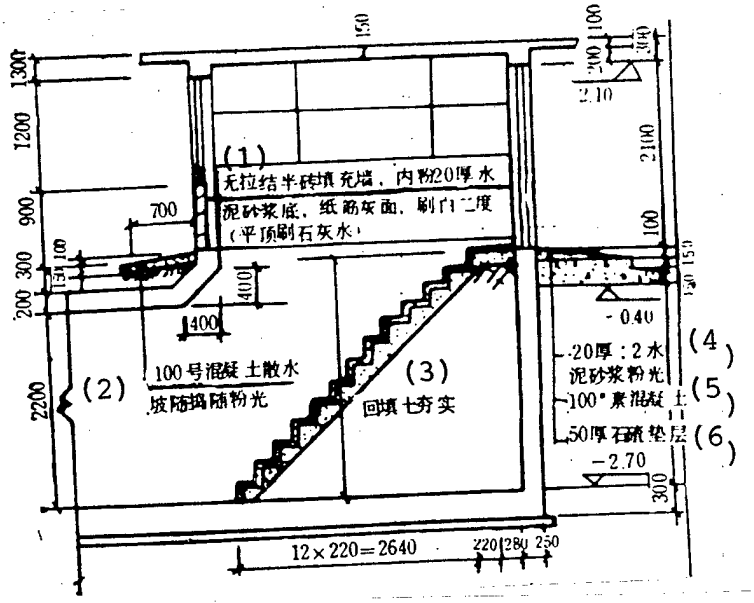

Figure 8 Key: 1. Non-tie half brick filled wall, inner powder 20 thick cement mortar base, paper reinforced mortar surface, white 2 degrees (flat-topped brushed rock mortar)
2. No. 100 concrete apron slope lights up powder as it is pounded
3. Backfill consolidation
4. 20 thick: 2 cement mortar powder light
5. 100 plain concrete
6. 50 thick ballast cushion course
[Dimensions given are presumably centimeters]

The light surrounding wall may be blown away by the shock waves of a nuclear blast, but the stability of the steel reinforced concrete columns and cover of the shed frame is good when enveloped by shock waves so that they are not easily destroyed. They can support the building's collapsing bricks and thus greatly reduce the blockage of the exit-entrance openings.

(3) The exit-entrance opening inside the shelter. Based on needs, a sturdy collapse-resistant shed frame can be set up in the shelter.

(4) Conditions premitting, the underground air defense shelter should, as far as possible, be connected with a civil air defense main passage not lower than the defense level of the main construction as well as with the adjoining civil air defense works.

(5) Each shelter area (section) of an underground air defense shelter should have two or three safety exits. Safety exits are the most effective means for saving people. Full use should be made of open ground for parking areas, factory yards, ball fields, parks, etc. The shallow buried small section horizontal passage should extend beyond the collapsing range, and low silo exits should be set up. The silo opening has a banded shut protective cover plate, and in the joining area of the horizontal passage and main section of the defense work a protective door is fitted which opens to the outside (see Figure 9).

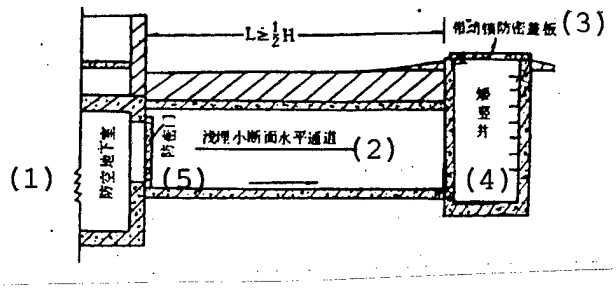

Figure 9 Key:
1. Underground air defense shelter
2. Shallow buried small section horizontal passage
3. Banded shut protective sealed cover plate
4. Low silo
5. Protective door

When conditions are limited and the safety exit can only be set up within the collapsing range, a silo type exit should be constructed. It can sustain shock waves and cause maximum horizontal thrust for the collapse of the building. The height of the silo should be at least one-fourth the height from level ground to the eaves and should exceed the estimated height of the collapsed brick accumulation. A banded shut swinging antiblast valve open to both inside and outside is fitted on the silo. A protective door and sealed door are fitted under the silo, and inside the silo there should be a hand climbing ladder. During wartime, they are safety exits, and in peacetime they are natural ventilation openings (see Figure 10).

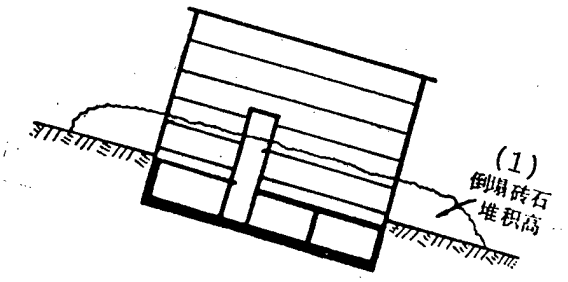

Figure 10 Key: 1. Height of collapsed brick accumulation

(6) Within 2 meters in front of the first protective door or sealed door of the underground air defense shelter and in the antitoxic passageway behind the door, cast-in-place steel reinforced concrete or plain concrete should be used to prevent the collapse of this passageway and the blockage of the door (see Figure 11).

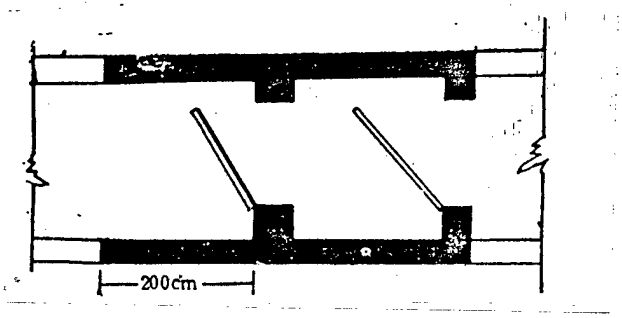

Figure 11

(7) Under certain conditions, a hoisting jack can be installed on the first door, or an opening device in case of accident can be installed on the door-frame (Figure 12) to open the door leaf when the door is blocked or in case of other accidents.

(8) A small room should be constructed next to the last door of the underground air defense shelter's main exit-entrance. During wartime, tools can be left there to clear away blockage from the opening.

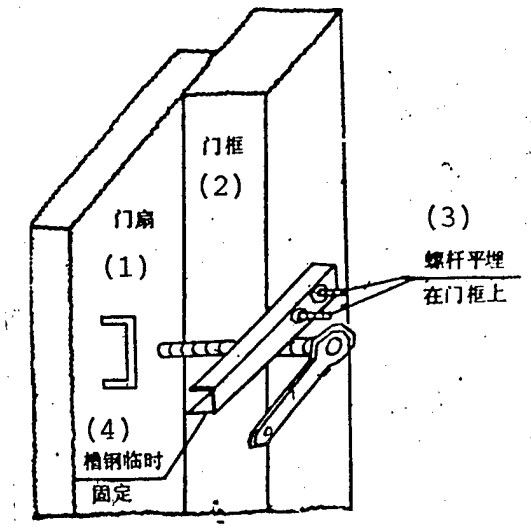

Figure 12 Key: 1. Door leaf
2. Doorframe
3. Bolts buried flat in doorframe
4. Channel iron temporarily fixed

The task of combining the construction of civil buildings with that of underground air defense shelters is very important. It involves a wide range of disciplines and strong technology; research is urgently needed on a great number of technological problems. Because my ideological level and professional abilities are low, there are many mistakes in this article. Thus, the reader is invited to offer criticism and make corrections.

9480
CSO: 4008/214

SINO-JAPANESE SOFTWARE CENTER

Beijing JISUANJI SHIJIE [CHINA COMPUTER WORLD] in Chinese No 5, 5 Mar 82

[Article by Yin Guangji [3009 1684 3444]: "Sino-Japanese Software Center Begins Activities"]

[Text] The Sino-Japanese Software Center was officially established in Beijing on 14 January 14. It was established as a result of the joint advocacy by Minister Qian Min [6929 2404] of the Fourth Ministry of Machine Building and president of Nippon Electric Company, Koboyashi Koji, in 1979 to promote Sino-Japanese cooperation in computer software technology. It is a technical cooperation project established on the basis of friendship and mutual benefits between the China Computer Technology Service Company and Nippon Electric. It has become the first example of cooperation in computer software technology between our nation and a foreign nation. It is being closely watched by concerned people at home and abroad.

A short computer training class for leading cadres was held on the day after the Sino-Japanese Software Center was opened.

The center will hold two managerial personnel training classes each year (the first class will begin on 12 May of this year), and two classes to train programmers and system analysts (this year, they will start classes on 24 February and 25 August, respectively.)

During the beginning period of the Sino-Japanese Software Center, Nippon Electric will send lecturers to China to teach. Later, Chinese technical personnel will gradually perform teaching functions.

The Sino-Japanese Software Center can also provide machine time for computer users and accept computational tasks, train hardware personnel, service ACOS series machines, provide technical support, answer user questions, design software systems, and demonstrate computer products. In addition, it will gradually create conditions for the exchange of high level software technicians of both nations and contract work to process foreign software products.

9296
CSO: 4008/213

MICROCOMPUTER USED IN MACHINERY TESTING DEVICE

Beijing JISUANJI SHIJIE [China Computer World] in Chinese No 5 5 Mar 82 p 8

[Article by Yuan [0337]: "Electrical Machinery Performance Testing Device Using a Microcomputer"]

[Text] A testing device using a DJS-051B microcomputer to process performance parameters of electrical machinery has been test produced jointly by the Shanghai Electrical Machinery Research Institute and the Shanghai Computer Applications Service Department. After several months of actual test use, it recently passed evaluation. The device can directly gather testing parameters of electrical machinery, carry out data processing, and print out the indices of various performances of electrical machinery in time. Previously, manual testing of one piece of electrical machinery required more than two days before results could be obtained. Now, it only requires half an hour, and some tests which cannot be read manually, such as the distribution of the temperature field in electrical machinery. can now be solved by using the device.

The hardware of the device consists mainly of the DJS-051B equipped with an A/D converter, a multiplex sampler, a variable transmitter and printout equipment. Special software was compiled during test manufacturing. At present, it can perform the following three tests: (1) It can perform the whole set of tests (i.e., no-load, loaded, temperature rise and m-s characteristics tests) for all types of asynchronous electrical motors with a capacity below 1KW-100KW and a voltage of less than 440V according to the international GB1032-68 standards. (2) It can measure the distribution of the temperature field of the windings in ventilation and heat dispersion tests of medium and small asynchronous electrical motors. (3) It can separately use the input/output method to measure the actual efficiency of the electrical motor or test the efficiency of the electrical motor according to the loss separation method. It can also be used to study the effect of the temperature of the surroundings on the correction coefficient.

9296
CSO: 4008/213

REAL-TIME DATA ACQUISITION SYSTEM DEVELOPED

Beijing JISUANJI SHIJIE [CHINA COMPUTER WORLD] in Chinese No 4, 20 Feb 82 p 1

[Article: "Wuhan Postal and Telecommunications Sciences Research Academy Successfully Develops Real-time Data Acquisition and Processing System for Testing Spectral Attenuation in Optical Fibers"]

[Text] The Computer Applications Research Laboratory of the Wuhan Postal and Telecommunications Sciences Research Academy recently developed a real-time data acquisition and processing system for testing spectral attenuation in optical fibers. The system is based on the Z-80C level computer synchronized with a monochrometer. One scan during on-line operation can gather 22,500 rounds of samples and store 4,500 units of data. It can simultaneously gather samples, make computations, and produce output. After scanning ends, complete optical fiber attenuation curves can be obtained on the X-Y recorder. At the same time, the internal memory retains all computed results and attenuation curves and data of various types of specifications can be duplicated according to need.

The system was successfully tested in on-line operation in September of 1981. It has been operating for more than 3 months. It has actually measured more than 100 optical fibers. It not only can replace complex manual computations by workers, improve testing speed, provide complete and reliable scientific data, but also serves an active function to guide improvements of optical fiber manufacturing techniques and to improve the percentage of finished optical fiber products. It is profoundly welcomed by user units.

The system passed evaluation at the academy level smoothly last December 10, and it was praised by optical fiber testing workers and computer colleagues from various localities. They unanimously believed the system is the predecessor of microcomputers for testing spectral attenuation of optical fibers in the nation, and it is a typical and actual example of using the computer to carry out real-time data acquisition and processing.

9296
CSO: 4008/213

'LOOM-COMPUTER MONITORING SYSTEM' EVALUATED

Beijing JISUANJI SHIJIE [CHINA COMPUTER WORLD] in Chinese No 4, 20 Feb 82 p 1

[Article by Shu Hai [2885 3189]: "The 'Loom-Computer Monitoring System' of the Shanghai Cotton Mill No 28 Passes Evaluation"]

[Text] The evaluation meeting for the first phase of construction (controlling 504 looms) of the "loom-computer monitoring system" of the Shanghai Cotton Mill No 28 was held jointly by the National Computer Industry Bureau and the Shanghai City Computer Committee in Shanghai last December. The system was jointly organized and developed by the China Computer Technology Service Company and the Shanghai Textile Bureau. The Shanghai Textile Science Research Academy provided the overall plan. Shaoguan Radio Plant and Changzhou Radio Plant No 2 provided the equipment for the system.

The meeting believed this system is a success in technology and applications. The mainframe DJS112 computer used has a reliable and stable performance. The system has operated continuously without breakdowns for over 3,000 hours. Shangahi Cotton Mill No 28 has been using this system since May of 1981 and has realized visible economic results. Efficiency was improved 1 to 2 percent even when the original efficiency of weaving high density products was relatively high. According to the plant's calculated production value, all investment can be recovered in a year and three months.

The successful development of that system is a welcomed step in the application of the computer in the textile industry. Practice proves that this monitoring system is profoundly welcomed by the factory's managerial personnel and production workers. Their evaluation of the monitoring system is that the data provided by the computer are "accurate, timely, overall, unbiased," therefore "it possesses the greatest authority," the "computer room has naturally become the production dispatching center." Everyone generally understood that to realize modernization of business management, the computer must be used. This is because the monitoring system can truly reflect the current situation in the production process and provide various kinds of useful data so that the leadership and the workers will know what is going on and therefore they can exert their efforts at the right places.

9296
CSO: 4008/213

DESIGN OF DAUPHIN HELICOPTER'S ARRIEL IC ENGINE DETAILED

Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese No 8, Aug 82 p 11

[Article by Yu Wen [0060 2429]: "Dauphin Helicopter's Arriel IC Engine"]

[Text] The French aircraft engine industry employs approximately 22,000 people (the entire aerospace industry employs 100,300). The major engine companies include SNECMA and Turbomeca, whose main products are engines for military and civilian airplanes and helicopters, as well as turbines for ships. "Arriel" is a small turbo engine designed for light-weight single-engine or twin-engine helicopters.

The Arriel engine is a product of the 70's. Its prototype was the 650-hp Arriel IA, which was designed to replace products of the 50's and 60's: the Artouste engine and the Astazou engine. The initial design began in 1971; subsequently, it underwent two modifications: the Arriel IA2 and the Arriel IC, and the engine power was increased to 710 hp. Mass production of the engine began in 1977. Single Arriel engines are used on the "Ecureuil" and "Gazelle" helicopters; twin engines are used on the Dauphin helicopters. Its structure is as shown in Fig. 1. [not reproduced]

The Arriel engine design consists of five separate modules: axial-flow compressor, combustion gas generator, free turbine, accessory drive box, and transmission and speed reduction gear box.

The compressor consists of a single-stage transonic axial-flow compressor and a single-stage supersonic centrifugal compressor. This design is the product of many years of research and development of the Turbomeca Company. For a small turbo engine, a multi-stage compressor is not desirable because the smaller flow rate, narrower passages, and shorter blades tend to increase leaks and boundary layer losses. Also, small blades are more difficult to manufacture. Therefore, a mixed type compressor is more logical both from the design point of view and from the manufacturing point of view.

The rotor of the axial-flow compressor is an integral part made of titanium alloy, and its stator is an integral precision-cast part. The rotor of the centrifugal compressor has an integral flow guide impeller and a centrifugal impeller made of titanium alloy. To achieve the required pressure increase and flow direction, the impeller has both long and short blades.

The diffuser of the centrifugal compressor is also an integral part which consists of a radial diffuser and an axial diffuser. The axial diffuser has 58 blades; the single-stage centrifugal impeller has a pressure ratio of 5.25. Both the impeller and the diffuser are of advanced design, but they are rather difficult to manufacture.

Other components of the compressor are also of simple design. For example, the air intake is along the axial direction, and there are no guide vanes at the inlet. The guide cone in the air intake rotates with the compressor, and the interior of the guide cone is connected to the hot, compressed air so that deicing equipment is not required.

The engine has annular combustion chamber with a short and compact structure. In order to prolong the life of the combusion chamber, its outer and inner walls have several thousand drilled vent holes to provide complete air-film cooling.

The Arriel engine has three turbines, two of which are used to drive the compressor; one is a free turbine. In the prototype engine, all three turbines are of integral design; later the disk and the blades are separated because they are made of different materials, and they are attached to each other using tree shaped tenon gears.

The first-stage guide of the turbine is a welded part; it has hollow blades which are cooled by a branch of the compressed air flowing back to the combustion chamber. The second-stage guide is a precision-cast part; its blades have holes along the leading edge to allow air cooling.

The component structures of the Arriel engine are based on typical designs developed by the Turbomeca Company. The main features are:

(1) The engine is of modular design to facilitate repair and maintenance. It takes 24 minutes to assemble the 5 modules and 17 minutes to disassemble the engine.

(2) By using a high power starter, high energy igniter, and synthetic lubricating oil, good starting performance is achieved.

(3) The oil pump is of the full displacement type. It is equipped with sensors for measuring oil pressure, oil temperature, and vibration; it also has magnetic sensors and fire monitors so that any trouble can be discovered in time to allow appropriate action to be taken.

(4) The fuel regulator is developed by the Turbomeca Company. It uses the fuel itself to provide the control force so as to achieve fast response. When both engines are operating, it can automatically regulate the fuel supply to each engine to achieve balanced power distribution. In an emergency it can be operated manually to provide improved safety.

Compared with similar engines made in England or the U. S., the Arriel engine design has both advantages and disadvantages. It has a simpler structure because integral machined parts and precision-cast parts are used extensively. But the small dimensions, the high degree of precision, and the integral parts require new techniques and new craftsmanship in the manufacturing process.

3012
CSO: 4008/220

NEW TYPE STATIC PLOTTER BEING DEVELOPED

Beijing JISUANJI SHIJIE [CHINA COMPUTER WORLD] in Chinese No 5, 5 Mar 82 p 10

[Article by Liu Zhankai [0491 0594 2818] of the Research Institute of Branch Plant No 1 of the Xian General Petroleum Prospecting Instruments Factory: "A New Type of Static Plotter"]

[Text] The computational speed and the functions of the computer are improving continuously and they are making higher and higher demands on the speed and reliability of output equipment. High speed plotters came about to adapt to this type of need. They can quickly plot various types of graphs and tables, curves and symbols for the user to analyze and study in time, thus greatly improving the efficiency of use of the computer. But the wide line printers and plotters presently in use are mostly mechanical. One shortcoming is that they make a lot of noise when in use. Another shortcoming is that there are technical difficulties in continually increasing the speed. Therefore, developing new types of static plotting devices became an urgent task. Our institute began in 1978 and spent over a year to successfully develop a new type of static plotter. Up to the present, two prototypes have been produced and they have operated for over one year. They have operated normally and their performance has been stable and reliable. They are now being produced in batches.

This new equipment uses advanced static printing techniques. The mechanical structure is new and the paper feeding system is ingenious. It is quiet, stable and reliable and its processing speed is fast. It not only can plot sectional drawings of earthquake times, velocity spectra, frequency spectra, it can also plot various types of graphs and tables, curves and symbols. The equipment can be connected to large, medium and small computers with appropriate interfaces. It is a relatively ideal general purpose peripheral equipment for computers.

The equipment consists of four parts: a writing head, a liquid toner system, a paper feed system and electronic circuits. It possesses two functions of plotting diagrams and characters. The printing speed for characters of 6,943 characters per second, the highest reaching 14,000 characters per second. The plotting of graphs can be done in high speed and low speed. High speed plotting can reach 19,500 lines per minute and

low speed plotting can reach 4,980 lines per minute. In low speed plotting, data requests between lines are locked for a longer time to guarantee a definite time for paper advancement. Both high speed and low speed data requests are realized by one negative pulsed signal with a cycle of 4 to 8 microseconds that requests the mainframe to transmit data.

The imaging principle of the plotter is as follows. A specially treated static recording paper passes under the writing head with a row of 2,112 pins. When writing is required, a certain group of charged pins produces a latent image at the corresponding positions on the static paper. The ordinary electrical resistance of the dielectric coating on the surface of this type of static paper is 10^{12} to $10^{16}\ \Omega$. Under the effect of a strong electric field over 550 volts, the resistance of the high resistance layer drops from $10^{16}\ \Omega$ to $10^{9}\Omega$. In this way, the information is stored and kept in the conducting layer. At this time, the paper has a strong adsorption of positive carbon particles. Even when the external electric field is removed, the stored information still remains on the paper. When the paper passes through the toner and is toned at three levels, a clear image is formed. A vacuum blade is attached at the end of the toner. On the one hand, it scrapes away excess fluids on the paper back into the ink bottle. On the other hand, it guarantees that the image on the surface of the paper comes out dry. This type of image can be stored for a long time without changing quality. When an image is drawn on transparent static paper, it can be copied.

9296
CSO: 4008/213

APPLIED SCIENCES

DOMESTIC COMPUTER FITTED WITH IMPORTED MAGNETIC DISK SYSTEM

Beijing JISUANJI SHIJIE [CHINA COMPUTER WORLD] in Chinese No 5, 5 Mar 82 p 10

[Article by Baochang [1032 2490] and Jie Bei [4105 0271]: "Domestic Computer Is Fitted With Imported EC-5561 Magnetic Disk System"]

[Text] The High Energy Physics Institute of the Chinese Academy of Sciences and the Shanghai Shipbuilding Technology Research Institute have successfully installed the Bulgarian EC-5561 (equivalent to the IBM-2314) magnetic disk subsystem on their domestically manufactured DJS-8 computers. They have begun operation.

The whole connecting plan of the High Energy Physics Institute was to regard the magnetic disk equipment as a subsystem to process system-to-system connections between itself and the mainframe system as the starting point. In interfacing techniques, the concept of the adaptor was used, therefore, an interface was provided between two types of different systems. It enables the two systems with different standards to satisfy the protocol of the interface. Both regard the connected object as possessing functional capabilities, thus, both sides of the interface regard the other as transparent. In this way, the magnetic disk interface adaptor has made it relatively easy to solve some relatively complex and difficult problems.

The whole assembly is stored in a small standard DJS-8 computer case. A total of 76 insert cards are used. Of them, 14 are medium scale integrated circuits or thick film integrated circuits, the rest is standard DJS-8 cards. Execution of operating commands and chain operations of commands to control the magnetic disk subsystem, to search, to write (format writing or non-format writing) and to activate readout can be realized via the interface adaptor of the magnetic disk. It can provide a total on-line capacity of 2x29MB for the mainframe.

The Shanghai Shipbuilding Technology Research Institute used a plan to "improve and expand the related logic functions of the mainframe and to add a special channel for use by the magnetic disk independently," and it successfully realized the connection. It also developed magnetic disk management software that is basically compatible with the resources of the original system within a short period. It transplanted the special data bank that was based on the magnetic disk memory and oriented towards scientific computation.

9296
CSO: 4008/213

BRIEFS

COMPUTER TO GROUP FREIGHT CARS--The ST-01A computer produced by the Shanghai Telecommunications Equipment and Materials Plant is being used to group railway freight cars. The operation is simple. It can correctly and quickly provide data needed in grouping freight cars. It has been welcomed by railway workers. The computer not only has the ordinary functions of a desk-top computer, but has added some memory and logic circuits. Pressing one key will complete successive additions and successive subtractions of three pieces of data simultaneously. If used in chemical engineering, metallurgy, commerce, transportation and warehousing and such other professions, the computer can complete other automatic computations and program controls with only a slight modification of program procedures. [Text] [Beijing JISUANJI SHIJIE [CHINA COMPUTER WORLD] in Chinese No 4, 20 Feb 82, p 1] 9296

CSO: 4008/213

MORE MEDICAL FACILITIES BUILT IN BEIJING

OW120158 Beijing XINHUA in English 0101 GMT 12 Sep 82

[Text] Beijing, September 12 (XINHUA)--In the past three years this city has witnessed the biggest increase in medical housing since the founding of new China in 1949, according to a recent report published in BEIJING DAILY.

During this period, the newspaper says, 16 hospitals and 6 medical institutes have been built or expanded, adding a total floor space of 400,000 square meters. Investment in the projects amounted to 230 million yuan, much higher than the cumulative total during ten years of the "Cultural Revolution."

New in-patient and out-patient buildings, operating theaters and laboratories have been added to 17 of the 29 hospitals affiliated to the Academy of Traditional Chinese Medicine, Beijing Municipal Health Bureau, Beijing Medical College and Beijing No. 2 Medical College. A total of 137,000 square meters of housing has been added to 6 hospitals and institutes affiliated with the Chinese Academy of Medical Sciences. The expanded dental hospital now has a floor space over twice that before expansion, enabling it to receive over 2,000 patients each day--50 percent more than before.

Among the new establishments is a Cancer Research Institute and Hospital, the largest in the country, which will soon function as a medical, scientific and teaching center specializing in cancer in China, BEIJING DAILY reported.

Statistics from the Beijing Health Bureau by the end of 1981 showed that there were a total of 123 hospitals at county level and above in Beijing, and 264 commune hospitals in rural areas, with a total of 33,000 beds.

Clinics in all work units are responsible for the prevention and treatment of diseases of lesser severity and first-aid stations in urban areas and near suburbs of the city make emergency help more readily available for city dwellers.

In addition, tens of thousands of doctors and other health workers in health centers, which are distributed in neighborhoods and rural production brigades, deliver medical care right to local patients homes.

CSO: 4010/15

BRIEFS

PARIS NUCLEAR MEDICINE MEETING--The Third World nuclear medical science and biology meeting opened in Paris on 29 August. Some 3,000 representatives, including three Chinese researchers, were present. They are presenting many academic theses and introducing the latest achievements in the field. Nuclear medicine refers to medical treatment by the use of radioactive materials for diagnostic and therapeutical purposes. From the 1940's to the 1960's, it was necessary to use radioactive iodine to examine and treat thyroid gland diseases. In the 1960's, thanks to the availability of gamma ray photography and the latest radioactive medicines, nuclear medicine made remarkable progress. Currently encouraging results are being achieved, particularly in the examination of the functions of the thyroid gland, heart and lungs. In addition, nuclear medicine is also helpful in discovering certain cancers and the metastasis of a carcinoma at an early date. It is also used for therapeutical purposes. [Text] [OW020514 Beijing Domestic Service in Mandarin 1500 GMT 30 Aug 82]

BEIJING INSTITUTE PRODUCES ALPHA INTERFERON--Beijing, 7 Sep (XINHUA)--Scientists at Beijing's Institute of Virology for the first time have produced human alpha interferon, an antiviral and possibly anticancer substance, through the intermediary of E. coli, an intestinal bacteria, the Chinese Academy of Medical Sciences said today. Work on interferon production through genetic engineering began 4 years ago, and in 1981 institute scientists manufactured the first clinical-grade human alpha interferon, Professor Hou Yunde, head of the research group, said. The same year the group established an interferon messenger RNA translation system. This enabled them to set up a series of techniques to artificially induce, isolate, measure and purify the substance. Earlier this year, the professor said, they succeeded in isolating interferon messenger RNA, then were able to synthesize complimentary DNA, and after transformation, put it into E. coli for cultivation. Examination has shown the human alpha interferon produced in E. coli to be the same as the naturally produced substance. [Text] [OW071751 Beijing XINHUA in English 1247 GMT 7 Sep 82]

CSO: 4008/224

AUTHOR: None

ORG: Beijing Type No 3142 Internal Combustion Locomotive Test Group

TITLE: "Brief Report of Beijing Type Internal Combustion Locomotive Traction Hot Work Test"

SOURCE: Dalian NEIRAN JICHE [DIESEL LOCOMOTIVE] in Chinese No 7, 15 Jul 82 pp 53-56

ABSTRACT: The No 3142 internal combustion locomotive is the new product of the Beijing 27 Locomotive Plant. In keeping with the regulation of the Ministry of Railway, the locomotive was operated for 13,542 km on an actual railway line before the special diesel output Cardan shaft was installed for the test. The locomotive entered the test station on 25 Sep 81 to begin the traction capability test and all test items were completed on 9 Mar 82. During the second stage, under the simulated temperature conditions of 15, 27, 33, 40°C, the cooling property, the heat balance, the idle oil consumption of the cold and hot states of the diesel engine, the gear shift property of the transmission box, simulated high altitude work conditions, the mechanical resistance, and the start traction property of the locomotive were tested. The remaining test items followed. During the entire test period, the diesel engine was in operation 223 hours, the equivalent of 3,000 km run of the locomotive. All parts of the locomotive were found to be basically normal. On 22-23 Dec 81, a test report conference was called and the leaders of the ministry, the bureau, the section, and the plant listened to the conditions of the tests. An excerpt of the report is reproduced in the paper. [The dates appear to be in error, but they are the dates given in the paper.]

6248
CSO: 4009/386

AUTHOR: LIU Changnian [0491 7022 1628]

ORG: Beijing Aeronautical Engineering College

TITLE: "Analysis and Design Methods of Inner Force Disturbed Loading System"

SOURCE: Guangzhou JICHUANG YU YEYA [MACHINE TOOL & HYDRAULICS] in Chinese No 4, 1982 pp 1-12

TEXT OF ENGLISH ABSTRACT: Analysis and design methods of inner force disturbed loading system, such as used in material testing machine, vibro-bench, braking system, and fatigue testing machine, are introduced in this paper. Mathematical model of loading system is obtained. Inverse resonance point, available working region and unavailable working region are discussed. A new kind of method of seeking roots of three order characteristic equation and the way of improving rapidity of a system are given. Moreover, the calculating method of maximum travel of hydraulic cylinder and the method of finding the optimum matching parameters, etc. are obtained.

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DONG Muguang [5516 1970 0342]

ORG: LIU of Shaoyang Hydraulic Elements Plant; DONG of Jinan Casting and Forging Machine Research Institute, First Ministry of Machine Building

TITLE: "Axial Piston Pump With Constant Pressure and Variable Displacement 63PCY14-1B"

SOURCE: Guangzhou JICHUANG YU YEYA [MACHINE TOOL & HYDRAULICS] in Chinese No 4, 1982 pp 16-18

TEXT OF ENGLISH ABSTRACT: Constant pressure and variable displacement axial piston pump (model 63PCY14-1B) is developed by Jinan Casting and Forging Machine Research Institute and Shaoyang Hydraulic Elements Plant; its mechanism for varying delivery can automatically change the flow with load, while the pressure remains regulated one. The pump is especially suitable to the systems which are continuously operated at almost zero flow for a long time. Compared to the system with fixed displacement and flooding valve, the system with the new pump can save power by 30 to 85 percent.

10424
CSO: 4009/393

AUTHOR: LYU Lin [0712 2651]
ZHAO Chunjun [6392 4783 0971]

ORG: Both of Qinghua University

TITLE: "Some Applications of Automation Technology to Energy Saving In Industrial Enterprises"

SOURCE: Beijing JIXIE GONGYE ZIDONGHUA [MACHINE-BUILDING INDUSTRY AUTOMATION] in Chinese No 3, 1982 pp 2-10

ABSTRACT: Through a summarization of foreign literatures, mostly of USA origins, this paper introduces the following examples of foreign conditions of applying automation to save energy: (1) A mathmatical model of the motion of an automobile engine and its optimized control; (2) The design of a control system for saving the fuel of an oil-burning boiler; (3) The temperature of an experimental resistance furnace controlled by a microprocessor; (4) System analysis for energy saving in iron and steel industries; (5) Optimal dispatch of an electrical power system; (6) The energy management system of the Westinghouse Company. In view of the party's policy of simultaneously developing energy sources and conserving energy while in the near future putting more emphasis on energy conservation in China, the authors believe some of these techniques introduced in the paper that are well developed [in foreign countries ?] highly efficient, and requiring very little capital investment, should be studied and extended in China.

AUTHOR: CAO Guangchuan [2580 0342 1557]

ORG: Design Academy No 8, Ministry of Machine Industry

TITLE: "Positioning Accuracy Analysis of PR-120 Balancing Arm Type Industrial Robot"

SOURCE: Beijing JIXIE GONGYE ZIDONGHUA [MACHINE-BUILDING INDUSTRY AUTOMATION] in Chinese No 3, 1982 pp 11-20, 33

ABSTRACT: This paper summarizes the characteristics of the general purpose balancing arm of the industrial robot PR-120, without mentioning the designer or the manufacturer of the robot. The positioning accuracy of the arm is analyzed in the following aspects: (1) Effect of the strength of the arm under load; (2) Effect of the weight of the arm itself; (3) Effect of pulse vibration of the arm in the process of positioning; (4) Effect of machining errors with respect to the size of the arm; (5) Effect of gaps of horizontal and vertical guides. The key problems of research on this type of heavy load balancing arm robot are believed to be positioning accuracy and load capacity. Theoretical analysis and experimentation have proved the design of the hollow-box shaped arm structure, made of welded thin steel plate, with a flat and wide rectangular section, to be satisfactory as the balancing arm of the heavy duty industrial robot.

AUTHOR: ZAN Fuxiang [2501 4395 4382]

ORG: General Bureau of Meters, Ministry of Machine Industry

TITLE: "Development of Small Scale Automatic Control Meters and Instruments to Serve the Reconstruction of Existing Industries"

SOURCE: Beijing JIXIE GONGYE ZIDONGHUA [MACHINE-BUILDING INDUSTRY AUTOMATION] in Chinese No 3, 1982 pp 48-50

ABSTRACT: The existing industries of China have technically backward machines. The energy consumption is high, the product quality is poor, the efficiency is low, and the pollution results are very serious. This condition is especially true with the light industry. There are many small and old plants and most of them have very old machines and depend more or less on manual labor. In recent years, the instrument and meter industries have made thousands of items in assembled sets of automatic control meters and instruments. When they are used or installed onto the existing machines, they produce obvious effects of saving energy, improving the quality of products, increasing labor efficiency, reducing labor intensity, and contributing to safety. Their extension will make it possible to reconstruct the existing machines quickly. These automatic control meters and instruments introduced in the paper include simple meters for automatic control and regulation of the water intake system of boilers, the zirconium oxide analyzer, etc. to measure the CO_2 and O_2 contents of the smokestack to proceed with feedback regulation and control, the automatic meter control of the fatty acid synthesis process, simple meters to control the temperature, humidity, etc. Samples of factories using these meters to upgrade their production facilities are given.

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CSO: 4009/389

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TITLE: "Thirty-two Years of Pit Prospecting Engineering in China"

SOURCE: Beijing TANKUANG GONGCHENG [PROSPECT ENGINEERING] in Chinese No 4, 20 Aug 82 pp 5-7

ABSTRACT: The foundation of geological prospecting work in China was very weak before the liberation. There were about 10 old fashioned drill machines to carry out some surface stripping projects and nothing else to speak of. After the liberation, pit prospecting engineering has been gradually adopted as one of the major techniques by departments of geology, metallurgy, coal, machinery, construction materials, chemical engineering, hydroelectric power, railways, and transportation. Pit prospecting techniques allow the geological prospectors to enter the ore body and the country rock to observe and study directly in order to take correct samples according to the changes of the bedded deposit and the gallery used for the prospecting work may also be used for future mining. This method of prospecting is especially effective and indispensable for prospecting scattered, rare, and nonferrous metals. In these 32 years, it has been used to locate more than 50 ores, including coal, iron, chromium, crystals, gold, diamond, mica, lead-zinc, copper, molybdenum, and uranium, and its reliability has been verified. Since 1964, pit prospecting specialty training classes have been established in many geological colleges and schools and the machines and the work processes have been continuously improved as well. The progresses and achievements of these 32 years are briefly reviewed. This paper was originally published in DIZHI LUNPING No 4, 1982.

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TITLE: "Thirty Years of Development in Geological Bore Prospecting Equipment"

SOURCE: Beijing TANKUANG GONGCHENG [PROSPECT ENGINEERING] in Chinese No 4, 20 Aug 82 pp 7-10

ABSTRACT: Although the blast force technique was used in China to bore several hundred feet into salt wells as early as 600 B.C. and as deep as 2,000 feet in 1500 A.D. the bore technique had fallen backward in the past century. The earlist mechanical boring these days is traced to a USA company in its prospecting work for lead-zinc and silver in Yunnan Province in 1900. In 1931-1945, Japanese companies also used some manually operated drills for mineral prospecting in the Northeast and North China during its occupation period. In 1949 to 1981, great progress has been made in terms of designing and manufacturing of drilling equipment and of training of specialized teams. This paper reports the progress in the four stages of 1952-1957, 1958-1967, 1968-1976, and 1977-1982, after giving a description of the condition of pre-liberation days. There are 4 photos depicting the old and the new drilling equipment and a section discussing the directions of future efforts in this field.

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CSO: 4009/392

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TITLE: "System Analysis of Turbine Vacuum and the Optimization of the Circulative Pump Operation"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 82 pp 219-222

TEXT OF ENGLISH ABSTRACT: This paper deals with the application of preview control to cooling systems of power plants. The operation with control can result in a saving of power and an increase net power of power plant. The optimization of turbine vaccum depends, mainly, upon the ambient conditions and the load. A mathmatical model of system analysis and the computer program are presented for determining the optimal preview control policy. The algorithm is applied to all kinds of turbine unit. The preview control is shown to be substantial improvement over the uncontrolled case.

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TITLE: "A Multichannel Automatic Pressure Measuring System With High Accuracy and Low Cost"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 82 pp 315-321

TEXT OF ENGLISH ABSTRACT: Starting from the basic principle of the pressure transducer, a detailed analysis is made in this paper on the various errors likely to occur in the pressure-measuring system. Then, a complete set of methods to eliminate and control those systematic errors is presented. Taking advantage of a computer, a modern data processor, and a valve, named "multichannel panel type valve," created from an original design, the above reasonable idea was implemented. Using this new method, although the total error of ordinary home-made transducers may be as high as a few percentages, most of the transducers attained a full range pressure measuring accuracy better than 0.1 percent. The environment temperature surrounding the transducers is allowed to change slowly. The cheapest DC voltage regulator may be used as the power supply of the transducers.

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CSO: 4009/391

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