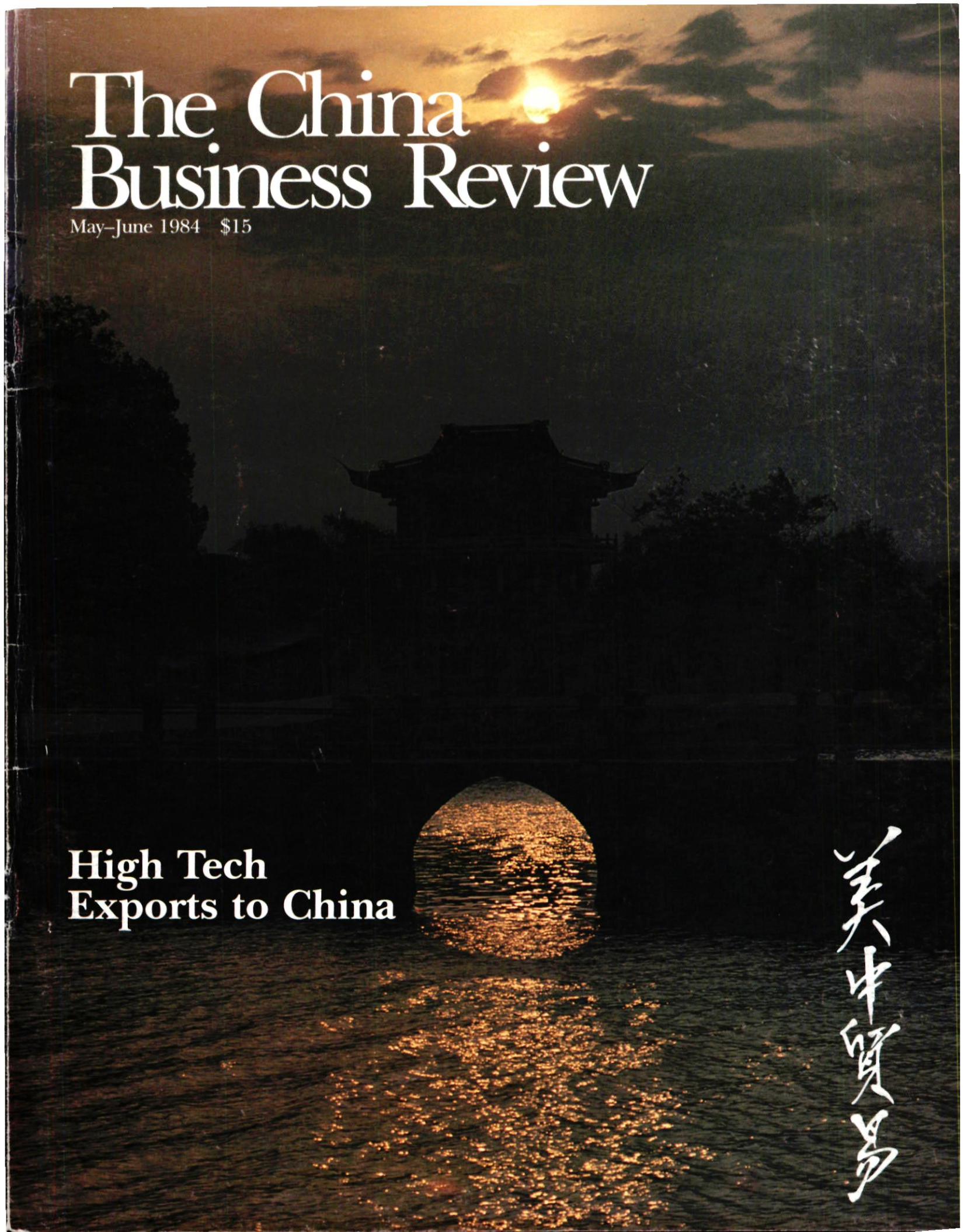
The China Business Review

May–June 1984 $15



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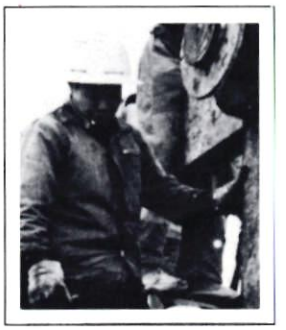
The China Business Review

The magazine of the National Council for US–China Trade

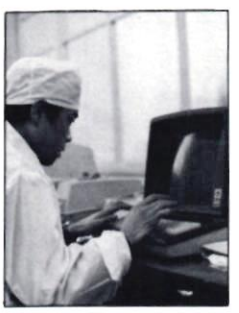
May–June 1984 Volume 11, Number 3

Cover: China is striving to bridge the great technological gap between its high-tech industries and those of the Western world. **Page 26.** *Photograph by Barbara Wolinsky*

Chinese Labor: Negotiating labor contracts in China can be just as difficult as dealing with American unions. **Page 16.**



Export Controls: Two terms describe the state of high-technology sales to China: confusing and promising. **Page 58.**



摘要

14 COASTAL CITIES EXPAND FOREIGN INVESTMENT

Fourteen additional cities have been opened by the Chinese to foreign investors. Dalian, Qinhuangdao, Tianjin, Yantai, Qingdao, Lianyungang, Nantong, Shanghai, Ningbo, Wenzhou, Fuzhou, Guangzhou, Zhanjiang, and Beihai will each be authorized to adopt as yet undetermined flexible policies and incentives to attract foreign investment. This represents a potentially major expansion of Deng Xiaoping's open door policy. The history of this decision is rather interesting.

Since the creation of the first Special Economic Zones in 1979, some elements in the Chinese leadership are known to have been skeptical. This has led to some timidity on the part of officials charged with developing the SEZs. During the last few months, Deng Xiaoping himself intervened to allay the concerns of skeptics and bolster the morale of responsible officials in the zones.

First, he encouraged many top military commanders to visit the zones and assess for themselves their progress and problems. In February 1984 alone, the commanders of eight of China's 11 military regions visited the Shenzhen SEZ near Hong Kong. He also encouraged other high-ranking leaders, including Hu Yaobang's right-hand man in the central secretariat and a son of Chen Yun, to make similar fact-finding trips to enable them to accurately and knowledgeably report to their colleagues and superiors.

Finally, in February Deng himself paid a belated first visit to Shenzhen. The city's mayor reportedly told Deng, "We, the people of Shenzhen, have been longing for your early visit. We could not rest assured until you came." Mayor Liang Xiang, a firm advocate of flexibility and reform, was rumored to have left his Western suit in the closet, concerned that Deng would see him as "spiritually polluted." Deng set everyone's mind at ease by announcing that China should implement its open door policy on a broader scale instead of retreating from it.

Deng made a point of taking with him to Xiamen and Shenzhen politburo members Yang Shangkun and Wang Zhen. Yang, who served as mayor of Guangzhou and vice governor of Guangdong when the SEZs were being established, is now Deng's executive officer in the Central Military Commission and has to face the routine griping and sniping of conservative military leaders. Wang is one of China's most respected retired generals. His success in leading a frontier defense force during the 1940s made him a Maoist model of self-reliance, and led to his command of the conservative state farm system. Both Yang and Wang now have first-hand experience in the successes as well as the difficulties of the SEZs.

Shortly after Deng's return to Beijing, the leadership held a three-week work conference at which the current economic reform program was forcefully reaffirmed and a conservative attack on the leadership and policies of Hu Yaobang and Zhao Ziyang was beaten back. Within days of the closing of the work conference, a 12-day forum was convened to discuss the SEZs and flexible development policies. At this meeting, presided over by Hu and Zhao and attended by Deng and President Li Xiannian, the decision was announced to open 14 new cities to flexible foreign investment policies. —CMC

Office automation Chinese style: A quiet revolution in Chinese word processing has been taking place amidst the microcomputer revolution that is sweeping Western countries. In Beijing, Shanghai, and in such unlikely locations as Virginia Beach and Los Angeles, companies are hard at work perfecting the remarkable software and hardware for electronic Chinese (see pages 30 and 34).

REFORMS CONTINUE AT THE GRASS ROOTS

The latest wave of reform is also sweeping through China's inland counties and cities. One of the most significant is the policy of encouraging cities to take over control of their suburban counties. By the end of 1983, 35 prefectures had been abolished, 22 counties completely absorbed by cities, and 368 counties placed under the administration of nearby municipalities. Of the country's 286 metropolitan centers classified as "cities," 121 now exercise jurisdiction over 541 suburban counties previously under prefectural governments. As a result, 1 in 4 counties in China now come under the jurisdiction of a city.

The intention of these structural reforms is to reduce bottlenecks in the supply of agricultural and light industrial raw materials to cities, and to improve the flow of consumer goods to increasingly well-off suburban peasants. Previously, the lines of control were vertical rather than horizontal, with the result that a city and county normally had to deal with each other through their superior prefecture or province.

Another reform designed to encourage direct contacts between all units has been the greater use of contracts. According to the State Economic Commission, some 8,215 contracts were signed in 1983 between 25 provincial level units, a 230 percent increase over the previous two years. The SEC hopes this sort of cooperation will enable different

parts of the country to make up for each other's deficiencies, pool their resources to expand the energy industry and communications, speed up technical transformation of enterprises, and quicken the distribution of commodities.

Another important part of these reforms has been the effort to make scientific research institutes responsible for their own profits and losses. According to Zhao Dongwan, vice chairman of both the State Science and Technology Commission and the State Planning Commission, some 77 of China's 2,200 research institutes are now independent, and another 44 are about to be weaned off the government budget.

According to Zhao, these research facilities are empowered to use their earnings to update their technology, improve the welfare benefits of their employees, and provide bonuses. In addition, these institutes will enjoy tax exemption on the development and production of new products approved by the State. —CMC

BREADBASKET REFORMS

Ample evidence is accumulating that China's five years of reform have had a decidedly beneficial effect on the Chinese economy. 1983 was another very good year. The value of agricultural output increased by 5 percent, and the value of industrial output climbed by more than 10 percent. Grain output has risen by almost a quarter in five years, while production of cotton has more than doubled.

Have these improvements in the economy been reaching the average Chinese family? It seems so. Peasant per-capita income in 1983 exceeded ¥300, a 12 percent increase over the previous year. Meanwhile, the real income of urban residents increased at an average annual rate of 8 percent between 1979 and 1982. As a result, per capita urban incomes reached more than ¥500 in 1983, a 6 percent increase over 1982. Savings deposits nationwide rose by more than 11 percent in 1983.

Significantly, greater cash incomes appear to have led to higher real living standards for the average Chinese citizen. More than 13 percent of the Chinese population now owns a bicycle, compared with only 7.7 percent in 1978. Sewing machines are owned by 6.6 percent of the people compared with 3.5 percent in 1978, and 18.8 percent of the Chinese now own wristwatches, where as only 8.5 percent did so before the reforms. Televisions are still the dream of most Chinese; only about 3 percent own one, but in 1978 almost no one did.

But the Chinese are being encouraged to aspire to much more. Recently, the government gave great publicity to the first private citizen, a suburban Beijing chicken farmer, to own an automobile (a $4,650 Toyota), and the first peasant to own a small aircraft used for crop-dusting. —CMC

CAAC'S LATEST SHAKE-UP

For years the bane of foreign travelers in China, the Civil Aviation Administration of China, or CAAC, is about to get an overdue housecleaning, the *China Daily* reports. China's only English-language newspaper quoted CAAC Deputy Director Wang Yamin as saying that "cadres at all levels of CAAC will go through a thorough reorganization this year." He emphasized that leaders that cannot improve their units will be demoted and incompetent cadres will be dismissed from office.

This is welcome news to foreigners and Chinese alike who look askance at CAAC's safety record, and have had to cope with the airline's surly and unhelpful service personnel.

The Chinese themselves have begun to publicly chastise CAAC's poor service. The *China Daily* recently ran an article about the cancellation of a Guangzhou–Fuzhou flight. After reboarding the airplane the next day to try again, passengers were again ordered off "due to bad weather" and bussed back to the hotel. The passengers held a sit-down strike, refusing to get off the bus. After the Party secretary of CAAC's regional bureau was contacted, the airline sent a bureau deputy chief to the hotel to smooth ruffled feathers.

No one has yet forgotten China's worst airline accident in recent years, the Guilin crash of April 1982, when 112 people lost their lives reportedly due to the faulty instructions of an air traffic controller.

Among the root causes of these problems are poor airport facilities and obsolete navigational aids, a situation CAAC is now beginning to tackle through a multi-million-dollar program of airport renovations (*see* page 50). —CMC

MAGAZINE STAFF

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managing editor
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associate editors
Priscilla Totten
copyeditor/production coordinator
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评论

COCOM Revisited

The growing controversy between US exporters and the US government over the COCOM review requirements for technology-intensive exports to China is not likely to subside, despite the well-intentioned efforts of a few working-level people in the Commerce, State, and Defense Departments. (*See* "High Technology Sales to China: The COCOM Connection" by Larry Roeder, Jr. of the US State Department in the January–February *CBR*.)

Many responsible government officials, congressional leaders, and industry executives agree with Larry Roeder's assertion that "COCOM is the international export monitoring structure . . . that coordinates the export policies towards communist Asia and Europe . . . of Japan and all NATO countries (minus Spain and Ireland)." But other experienced international business people see COCOM as a US-initiated, informal organization through which the US seeks to persuade some of its military allies not to export technology-intensive products to the Soviet bloc. The Chinese know from their own business relations with other COCOM members that *only* the US has legal and systematic government procedures that require *all* license applications for "A" commodities to the Soviet bloc and China to be automatically sent to COCOM for review (subject to just a few "administrative exceptions"). I hope US manufacturers of technology-intensive products with an interest in selling to China would urge the US government to reconsider the entire COCOM process in light of the following circumstances:

1. The main thrust of US export controls over the past 35 years has been aimed at the Soviet Union, Soviet bloc, and other countries dominated by the Soviet Union. China's inclusion in this category has not been meaningful for some time.

2. There is a precedent for removing countries from the COCOM list. After Yugoslavia under Tito became more independent of the Soviet Union, the US took Yugoslavia off the COCOM list, and has since reviewed exports to Yugoslavia very nearly as it does those to Western Europe and Japan.

3. By the late 1960s and early 1970s, the US had agreed to adopt an exception to the embargo policy at COCOM for certain items, when it could be demonstrated by the applicant or exporter that the commodity would be used for "peaceful" or "civilian" applications by the consignee. With the passage of the 1969 Export Administration Act, there was also a theoretical provision for exceptions when an exporter could prove widespread foreign availability of a commodity.

4. West European countries—including NATO—have a fundamentally different geographic and economic relationship with the Soviet bloc countries than does the United States. Ignoring this fact creates friction in our relations with these countries.

5. Based upon the Defense Department's 1976 export control study (the Bucy Report) and on the 1979 Export Administration Act, greater attention is supposed to be paid to controlling the export of "technology" instead of products. The overall COCOM process, therefore, is supposed to be one of developing improved multilateral controls and enforcement of "technology transfer." With this new emphasis and US efforts (led by the Defense Department) to tighten COCOM controls over technology to the Soviet bloc, it is impossible to simultaneously facilitate sales to China.

6. Now that the US has published initial definitions of the seven major commodity classifications included in a "green zone" classification for export to China (to be reviewed by Commerce only), should the US exporter and the Chinese customer assume that such a license application can still be rejected on the basis of objections by even a single other COCOM member? How can US national security be improved by subjecting US approval of low-level technology commercial transactions to review by foreign governments with competing economic interests?

7. The recent decision by President Reagan to recognize the increasing independence of Chinese policies from those of the Soviet Union by placing China in the free world V Country classification will have little political or economic impact on US–China relations if China is still considered part of the Soviet bloc in the informal COCOM process. To those in government who defend continuing COCOM review for China on the grounds of protecting the overall COCOM process, I would point out that all other COCOM countries long ago determined that China was not part of the Soviet bloc, and have in fact been treating it more liberally. To simply remove China cases from the routine COCOM review should have nothing to do with the willingness of other COCOM members to separately consider US recommendations for improving the process of restricting technology to the Soviet bloc.

—Dana I. Robinson
China Consultant
Photronic Labs
Brookfield, Connecticut

Readers are encouraged to send their commentaries, not exceeding 800 words, to: The CBR *editor, The National Council for US-China Trade, Suite 350, 1050 17th Street, NW, Washington, DC 20036. Deadlines are one month prior to the issue date that appears on the cover. Opinions do not reflect Council policy, unless indicated.*

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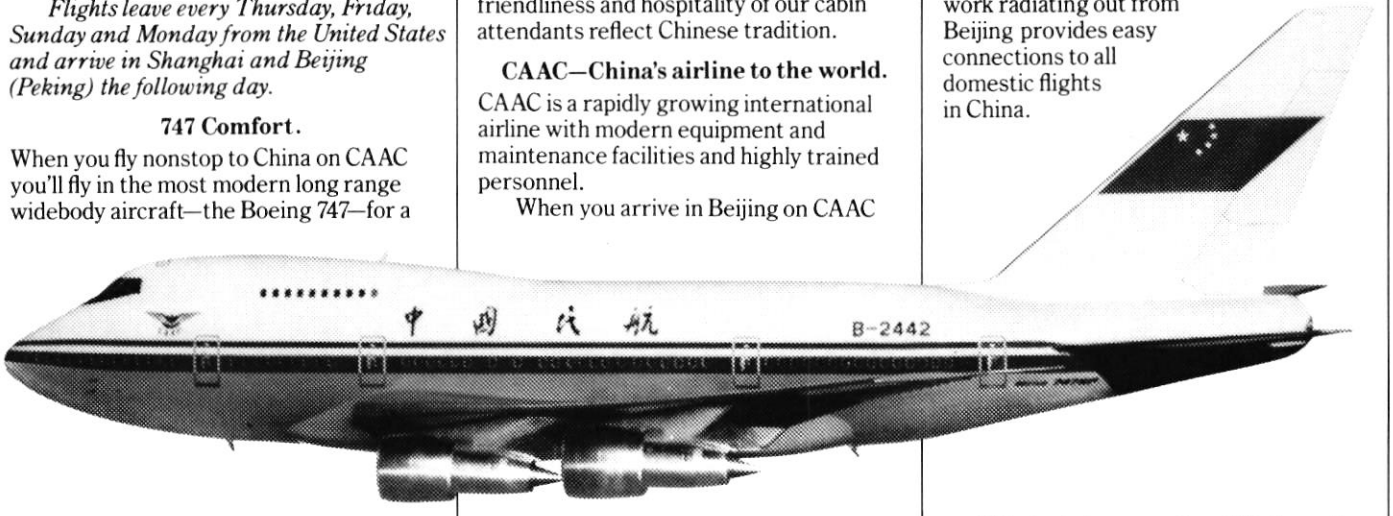

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SUMMER SCHEDULE
Starting April 1, 1984

CA982 Departs New York every Thursday 10:00 am	
Arrives San Francisco	1:05 pm
Departs San Francisco	2:35 pm
Arrives Shanghai	6:20 pm
Departs Shanghai	7:15 pm
Arrives Beijing	9:05 pm

CA981 Departs Beijing every Wednesday 10:25 am	
Arrives Shanghai	12:20 pm
Departs Shanghai	1:35 pm
Arrives San Francisco	9:20 am
Departs San Francisco	11:20 am
Arrives New York	8:10 pm

CA982 Departs New York every Sunday 10:00 am	
Arrives San Francisco	1:05 pm
Departs San Francisco	2:35 pm
Arrives Shanghai	6:20 pm
Departs Shanghai	7:15 pm
Arrives Beijing	9:05 pm

CA981 Departs Beijing every Saturday 10:25 am	
Arrives Shanghai	12:20 pm
Departs Shanghai	1:35 pm
Arrives San Francisco	9:20 am
Departs San Francisco	11:20 am
Arrives New York	8:10 pm

CA984 Departs Los Angeles every Friday 11:50 am	
Arrives San Francisco	1:25 pm
Departs San Francisco	2:55 pm
Arrives Shanghai	6:40 pm
Departs Shanghai	7:20 pm
Arrives Beijing	9:10 pm

CA983 Departs Beijing every Friday 8:55 am	
Arrives Shanghai	10:50 am
Departs Shanghai	11:50 am
Arrives San Francisco	7:35 am
Departs San Francisco	9:15 am
Arrives Los Angeles	10:50 am

CA986 Departs San Francisco every Monday 2:15 pm (starting May 1)	
Arrives Shanghai	6:00 pm
Departs Shanghai	6:55 pm
Arrives Beijing	8:45 pm

CA985 Departs Beijing every Monday 1:55 pm (starting May 1)	
Arrives Shanghai	3:50 pm
Departs Shanghai	5:00 pm
Arrives San Francisco	12:45 pm

CAAC
The National Airline of the People's Republic of China

Sister Relations

Twenty-three states and cities hope to translate their friendship agreements into business contacts

Carol S. Goldsmith

Ms. Xie Heng has become something of a matchmaker at the PRC embassy in Washington. For nearly a year she has researched, recommended, and charted relationships between US and Chinese "sisters"—pairs of provinces and states, or cities, that share trade or cultural interests. It has been anything but a dull assignment. "My phone is ringing off the hook," she says, with calls from politicians, business people, and academics wanting to know how their state or city can find a Chinese sister, and who else already has one. To date, 12 US states, 10 cities, and 1 port have signed formal friendship agreements with China. More are on the way.

Not since the heady trading days of 1979–80 has there been such interest in these government-to-government agreements (*see* the July–August 1980, *CBR*, page 44). Ohio and Hubei Province started the trend by exchanging delegations in July 1979 and concluding, inside of three years, an estimated $300 million worth of business, even though readjustment was in full swing. States and cities at once looked to this agreement for its magical wording. What they found, and have followed since, was a pledge to cooperate in matters of trade, education, culture, and science, according to the principles of "equality and mutual benefit." The popular term "sister" was studiously avoided in the text, since to China it implies that one partner is younger and less experienced. Also, it sidestepped mention of specific areas or levels of trade, lest the agreement collapse over the partners' failure to conclude certain types of business.

From that list of generalities, you might well ask, how has anyone developed any business? Was Ohio an exception, or have other states and cities turned what is essentially a cultural alliance into a successful business partnership?

To explore this, *The CBR* interviewed officials and business people involved in all 23 sister relationships, including one authority in the field. Dr. Winston Yang, chairman of the New Jersey–Zhejiang Sister State–Province Committee, has studied each of the agreements since he helped negotiate his state's protocol in 1981. "Trade is one of the centerpieces of all the agreements," he says, though it often is hard to tell how much business has been a direct result. Ohio officials knew the precise value of trade with Hubei only between the years 1979 and 82, and only because of their close cooperation with Ohio businesses during that time. The state led six business delegations to China, sponsored a catalogue show in Hubei, helped the province stage trade exhibits at the Ohio State Fair, and made contacts and appointments for most of the large and small companies interested in China. Now that so many firms have a foot in the door, says Ohio Trade Group Manager Nora Ching, the state acts more as an information source, often learning of business deals only when a company calls up with the information.

New Jersey, too, has enjoyed a good deal of success with China: $100 million worth of business in 1983 alone, according to Dr. Yang, including $5–10 million with Zhejiang. Yang doesn't know how much of that business can be attributed directly to the relationship, but feels that many firms would not have known where to start without assistance from the state and the committee. "They don't know how to get samples, obtain catalogues, or get in touch with the Chinese," he remarks.

Indeed, the single biggest benefit of a sister agreement for private firms is access to information and officials. Usually when an agreement is being discussed, the top brass from the provincial or city governments sit down with the American delegation to discuss culture, the partners' trade structures, principal industries, export specialties, and import needs. "Right away we get to know the officials in charge of trade," says John Schissel, Iowa's manager of international trade, "so from that point we can contact them directly." Companies that might otherwise have spent months telexing the Chinese may be introduced on their first trip to the appropriate bureaus or factories. There is even some chance they will learn of Chinese industrial projects before their competitors in other states. Illinois, for instance, negotiated a clause with its sister province stating that each would give the other early notification of projects with export potential. Liaoning responded by announcing 200 projects during an April delegation to Illinois. State officials now hope that Illinois companies will respond positively, since the government itself cannot offer the province any business.

Not every relationship is particularly well suited to trade, of course. Chinese and American officials occasionally choose sisters because of cultural or familial ties. Kansas–Henan and Iowa–Hebei came together because of similarities in their agricultural bases, but those very similarities have produced more technical exchanges than business deals. Maryland companies want to sell agricultural and poultry-breeding technology to Anhui, which also has a similar economic basis. The biggest trade obstacle for the state has been

finding countertrade materials that it doesn't already produce. Remarks one Maryland official, "We don't need more coal and limestone."

Sister agreements have been dismissed by some as convenient excuses for government junkets. But on the whole, officials and business people believe they help improve the overall climate for business. "When our delegation went to Tianjin the first time, everyone there knew all about Philadelphia," says Susan Brinn, formerly with the Philadelphia National Bank. In her view the agreement between these old industrial cities helped pave the way for business in banking, shipping, and textiles. Massachusetts and Guangdong became sisters in part to commemorate 200 years of China trade (Capt. Samuel Shaw sailed from Boston to Guangzhou in 1784); now they are actively pursuing business in high-tech, bio-tech, and manufacturing.

Whether a sister agreement will actually lead to business depends on a number of factors: the aggressiveness of local businesses, cooperation between the governments, the Chinese's purchasing power, and—at times—the dexterity of the state or city government in handling Taiwan relations. The following capsule report looks at how seven very different relationships are taking shape:

WASHINGTON–SICHUAN. After Ohio–Hubei, probably the best-known and most admired of the state-to-province pairings is the one between Washington and Sichuan. Governor Dixie Lee Ray visited the province back in 1979, when Sichuan was in the vanguard of Deng's modernization plans. A year later the privately run Washington State China Relations Council (WSCRC) was formed to oversee the relationship. Then in 1982, when the agreement was finally signed, the governor named the state Commerce and Economic Development Department as the official partner, and hired a Chinese-American to work with the private sector. Officials from other states have called the structure a "marvelous model," and several have made it their own.

This comes as something of a surprise to WSCRC Executive Director Robert Kapp. For despite Washington's strong commitment to Sichuan and the publicity it has received, "there is virtually no money in anyone's budget for this relationship," he says. "This year I budgeted $4,500 for one trip to China and administrative expenses." The state government, which just made its first official trip to Sichuan since 1982, has a budget—in Kapp's words—of "zilch."

Still, Washington has spent considerable time and effort trying to facilitate relations with Sichuan. Both the state and the council help Washington businesses make contacts in China, and arrange meetings and reduced-rate accommodations for Chinese delegations coming here. State

Whether a sister agreement will actually lead to business depends on a number of factors: the aggressiveness of local businesses, cooperation between the governments, the Chinese's purchasing power, and—at times—the dexterity of the state or city government in handling Taiwan relations.

International Trade Specialist Mitzi Hu is helping Sichuan bring its first handicraft imports show to Seattle this July, and is working with Washington farmers and researchers on an agricultural training program for six Sichuan specialists.

The state and province have developed "minutes of discussion" to cover the agreement's near-term implementation. According to Kapp, it outlines product areas that interest both sides (Sichuan is looking at food processing technology, hydropower equipment, electronics, and aircraft, while Washington is purchasing food products and considering machine tools). It also pledges Sichuan to give Washington early notification of its purchasing plans, and to consider using Oregon's port facilities. Both parties have also promised to lend assistance at the national level on certain trade issues, such as China's failure to purchase agreed-upon levels of US grain.

Beyond that, Washington's efforts fall mainly in the cultural realm. Northwest Orient Airlines has given the council a travel voucher worth $20,000 to support educational and cultural exchanges, says Kapp; four art and photo exhibits are being established in Washington and Sichuan to promote friendship and understanding. "These obviously aren't business exchanges per se," he says. "But the provincial foreign affairs people we're working with are heavily committed to these exchanges, and they're our liaisons to anyone we want to talk to on trade."

MICHIGAN–SICHUAN. Michigan may have the same sister province as Washington, but relations are taking a much different turn. Sichuan made the initial contact last July by visiting Michigan's manufacturing facilities. Shortly thereafter, officials invited representatives from the state senate and International Tourism Office to attend Sichuan's Southwest China Tourism Conference and to sign a friendship agreement. The reasoning quickly became clear. Hardly had the ink dried before Sichuan asked State Senator John Kelly if he could mobilize Michigan funds for a new hotel in Chengdu. "I explained that the state government doesn't do that," he says, "but I promised to check with the private companies that do."

In surprisingly short order, Kelly came up with a 25-page proposal for a technical assistance and educational exchange program on Sichuan's tourism industry. The bill, now going through the state legislature, would provide $250,000 in state funds for a massive feasibility study of Sichuan's tourism infrastructure—hotels, attractions, transportation, communications, support services, etc. Private funds would be solicited on a three-to-one match. According to the plan, Michigan's Department of Commerce would hire a private consulting firm to do a detailed evaluation of Sichuan's tourism infrastructure, and recommend to the Sichuanese "the most cost-effective and rapid means of channeling their limited resources in order to create a large-scale tourism market." The study would also suggest "profitable and beneficial avenues of entry" for foreign investors—preferably Michigan firms.

If all went well and Sichuan followed at least some of the recommen-

dations, Kelly thinks the province would generate more tourism dollars and be in a better position to buy products from its good friends in Michigan. The plan, admittedly, is idealistic. But then, Michigan is approaching this relationship with high ideals. Says Kelly, "Companies are solidly behind this proposal. They realize that solving the countertrade and foreign exchange problem is key to doing business with China." Kelly and the state governor also hope that Sichuan, as part of the exchange, will agree to open a Bank of China office in Michigan.

COLORADO–HUNAN. The ties that bind these unlikely sisters date back to the late 1940s, when a Colorado native living in the Hunan village of Shaoyang set up small-scale industrial projects under a United Nations program. When the Communists came through, two Americans hid the project funds in the town's water tower. Later, these gold bars and silver coins were retrieved and used as seed money to launch a number of heavy industrial enterprises.

Years later, when Colorado business executives began looking for their own sister province, they discovered some highly placed friends in Hunan: The mayor of Shaoyang had since become governor, and one of the engineers associated with the UN projects had become chief engineer of the provincial machine-building bureau.

To date, Colorado business executives have orchestrated an active Hunan trade program despite some strong pro-Taiwan sentiments in the state government. In the fall of 1981 a group of business people and academics from Colorado and other Western states went to Changsha to plan a follow-up regional conference in Denver. Fifteen preliminary agreements were signed as a result of that conference, according to local businessman Henry Strauss, and deals are now being discussed on everything from oil gear equipment to satellite receivers to pig skins and fishing equipment.

In time Governor Dick Lamm and much of the state government decided to support the relationship with an official friendship agreement, signed last November. Now Strauss, a driving force behind the relationship, hopes the state will establish a Colorado–Hunan Friendship Association to promote cultural and business relations. Says he, "This thing could ultimately be worth billions if developed on an ongoing basis. The problem is, it costs money to develop it."

OREGON–FUJIAN. Colorado, of course, isn't the only state that has experienced Taiwan troubles. The PRC embassy's Xie Heng describes Taiwan as a "major obstacle" to the majority of sister relations. "We have discovered that whenever we start discussions," she says, "Taiwan Province intrudes and starts drawing on past business relations to promote the ROC."

Oregon is a case in point. Businessman Bill Mulholland had been lobbying for a sister province for some time when the Chinese suggested Fujian; both are coastal and forest regions with major port facilities, and one Oregon firm—Nike—is already producing shoes there. The state senate thereupon passed a nonbinding resolution naming Fujian the sister province. Six days later the governor issued his own proclamation naming Taiwan.

Fujian thereupon withdrew from the discussions. Matters didn't improve when an overseas Chinese art historian living in Oregon City was robbed of the "priceless art objects" he had brought over to promote cultural understanding. (The objects, incidentally, were insured for $50,000.)

At length, the Taiwan snafu was smoothed over, and a delegation of legislators and business people from the Oregon–Fujian Friendship Association went to China in April for discussions on a friendship agreement. The governor—who now supports the effort—may go to Fujian this summer to sign the final document. No one yet knows precisely what activities will be pursued or how they will be funded. To Mulholland's mind, "the state's commitment will depend on what its delegation comes back with, and how much weight the legislators want to throw behind it." In the meantime, Mulholland plans to take another delegation to Fujian for preliminary business discussions.

Staff members Susan Partyke and Betsy Saik assisted with the research of this article.

SEATTLE–CHONGQING. Of the 12 states and provinces that have been matched, only one shares a set of sister cities: the state capital of Washington and the capital of Sichuan. Most other city governments have decided to expand their contacts by finding a sister in another province or state. There are those in Washington who wish Chongqing and Seattle had followed suit.

Two years ago a group of Seattle citizens contacted the Chinese about finding a sister city. Seattle was thereupon twinned with Chongqing, says Jack Doughty, president of the Seattle–Chongqing Sister City Association, presumably because of their port facilities, similar terrain, and forest industries. Under ordinary circumstances having twin sisters may not have created a problem. But last year Chongqing was granted new autonomy in conducting foreign trade. As a result, some China watchers have sensed a new friction between the provincial and local authorities—a situation they fear will hinder the broader trade relationship. One person involved in the Washington–Sichuan agricultural training program, described earlier, worries that Chongqing specialists will either be excluded or will not wish to join the program. Another business person spoke with a Chongqing official about the handicraft fair Sichuan was staging in Oregon, only to learn that the official knew nothing about it. Some business people who want to deal with both the province and city worry that the rivalry will make it difficult to do business in either place.

A similar situation may be developing with Oakland's sister city, Dalian. The independent-minded port city in Liaoning Province was recently granted the status of a Special Economic Zone. Liaoning itself has been linked to Illinois since 1982 by a general friendship agreement and by cooperative pacts on trade and agriculture. All had been going well with the province, says state commerce official Keith Hanson, until a state trade delegation in Liaoning also tried to visit Dalian. "It bordered on disaster," says Hanson. Appointments were either not arranged by city officials, or were set up with the wrong authorities. Conditions are all the more distressing to Illinois businesses, Hanson adds, since "Dalian was one of our major motivations for

selecting Liaoning."

LOS ANGELES–GUANGZHOU. The city that almost lost its sister by flying the Taiwanese flag on a PRC national holiday has since learned its lesson, and profited handsomely by it. Two and a half years after their sister agreement was signed, relations between these progressive southerly ports has expanded far beyond the shipping business. A number of California firms have either bid on or signed contracts related to offshore oil exploration in the South China Sea, according to an LA official. The two cities have created a joint trading company known as the Los Angeles–China Trade Corporation to act as an agent for US companies (ownership is 60 percent LA/40 percent Guangzhou). The corporation is now setting up a China Trade Center in the heart of the financial district, where officials hope to house representatives from Chinese foreign trade corporations, as well as US attorneys and bankers in the China trade. Business and government have been particularly supportive since both cities are investing in the relationship.

SAN FRANCISCO–SHANGHAI. The perennial question of which came first—the agreement or the business—is easy to answer in this case. Mayor Dianne Feinstein initialed the agreement with Shanghai in January 1980, before CAAC started landing at San Francisco airport, before COSCO vessels began docking at the harbor, and before most California companies got a foot in the door. Today Chinese ships bring an estimated $271 million in trade to the Port of San Francisco. And Shanghai is bringing the city long shopping lists of industrial and investment projects.

Peter Henschel, deputy to the mayor, credits the Shanghai Friendship Committee with laying much of the groundwork for Shanghai–SF business. This voluntary group of business people, academics, and government types has helped Pacific Telephone, Del Monte, Standard Oil, and numerous lesser-known firms get into China, he says. "When an American firm contacts Shanghai for business," adds Henschel, "the Shanghai Foreign Affairs Office automatically contacts this committee for background." ₹

SISTER STATES

Colorado–Hunan Sales to China of oil gear technology, telephone systems, manufacturing equipment, semiconductor chips, laser optics, and broadcasting and satellite equipment. Purchases from China of spark plugs, shoes, and light industrial goods.

Iowa–Hebei Sales to China of agricultural and construction equipment, and agricultural technology. Purchases from China of hand tools, hog bristles, textiles, and raw materials.

Illinois–Liaoning Sales to China of poultry and livestock breeding technology, forestry equipment and technology, steel industry equipment, medical equipment and technology, petrochemicals, and plastics. Purchases from China of pottery, handicrafts, and possibly steel.

Kansas–Henan Sales to China of wheat, hybrid grass seed, agricultural equipment and technology, and swine breeding technology. Purchases from China of shoes and light industrial goods.

Massachusetts–Guangdong Sales to China in high technology, bio- and medical technology, and manufacturing equipment. Purchases from China of industrial chemicals and detergents; production in China of medical chemicals.

Michigan–Sichuan Sales to China of heavy equipment, machinery, and industrial goods.

Maryland–Anhui Sales to China of agricultural technology, poultry breeding technology, and slaughtering equipment and technology.

Minnesota–Shaanxi Sales to China of high technology, agricultural technology, and medical equipment. Possible joint venture with China on swine breeding.

New Jersey–Zhejiang Sales to China of chemicals, manufacturing equipment, and measuring devices. Purchases from China of textiles, silk products, canned goods, and tours.

Washington–Sichuan Sales to China of food-processing technology, electronics, hydropower technology and equipment, tanning equipment and technology, medical equipment, aircraft, and wood products. Purchases from China of spices, teas, down, hand tools, measuring and cutting tools, drill bits, forgings, and castings.

Wisconsin–Heilongjiang Sales to China of heavy machinery, mineral extraction technology, grain, dairy and cash crops, forestry equipment and technology, medical instruments, and medical products.

Ohio–Hubei Heavy machinery, manufacturing equipment, and agricultural equipment and technology. Purchases of textiles and light industrial goods, machine tools, and industrial parts.

Sister Cities

Boston–Hangzhou
Chattanooga–Wuxi
St. Louis–Nanjing
New York–Beijing
Oakland–Dalian
Pittsburgh–Wuhan
San Francisco–Shanghai
Seattle–Chongqing
Los Angeles–Guangzhou
Philadelphia–Tianjin
Port of Baltimore–Port of Huangpu

Under Discussion

New York–Jiangsu
Connecticut–Jiangsu
Oregon–Fujian
Washington, DC–Beijing
Des Moines–Shijiazhuang

SOURCES: US city and staff officials and author's files.

Conference Facilities in China

Six cities are making serious bids for international conventions and conferences

Rudy and Sarah Wright

Encouraged by their joint venture hotel partners and impressed with the steady increase in business travel to China, officials there are now recognizing the potential of the meeting and convention business to their growing tourist trade. New hotels such as the Great Wall in Beijing, Nanjing's revolving-top Jinling, and Guangzhou's recently opened China Hotel feature meeting rooms and modern equipment designed specifically for business conferences. Several facilities have been or will be built solely to attract international conferences. At one of the newest, the Hangzhou Conference Center, $14 million is being spent to bring its hotels, auditorium, and business facilities to state-of-the-art standards.

These and other facilities now underway offer as much as 18,000 square feet of meeting space—roughly comparable to that found in a modern Hyatt Regency Hotel.

Last year the China International Travel Service (CITS) formed an International Conventions Division specifically to develop this sector. In one of his first moves, CITS division director Wang Erkang asked our firm to do a detailed evaluation of the meeting facilities in Chinese cities targeted for conference and convention development, with particular emphasis on hotels. The accompanying chart summarizes our findings in China's six primary conference sites: Beijing, Guangzhou, Nanjing, Hangzhou, Shanghai, and Tianjin.

In three weeks' time we saw a fairly wide range of facilities—from older hotels in need of renovation to brand-new facilities that offer many of the features we take for granted in modern American meeting sites.

In Nanjing, Beijing, and Guangzhou, for instance, we saw fully equipped television studios that provide closed-circuit programming to guest-room receivers. The meeting rooms featured two-way video for playback, projection, recording, and video-conferencing. The White Swan and Jinling even have their own editing and production facilities, which enable delegates to produce their own programs and convert them to any of the three international video formats.

It was not unusual in some of the newest hotels, such as the Great Wall, Jinling, and China, to find audiovisual control rooms and interpreter booths in the larger meeting rooms, along with a dedicated simultaneous translation system. Names like Sony, Philips, Shure, and TASCAM appeared on much of the sound equipment.

One feature we saw emerging that will be of tremendous benefit to business travelers is the international business center (IBC). Staffed by multilingual aides, these centers offer telephone, telex, and cable communications, stenographic services, photocopying facilities, and a reference library that includes business and government directories. Some of the newer hotels with IBCs will also have on the premises representatives of foreign trade corporations, or Chinese consultants who can assist foreigners with business appointments. The Garden Hotel has set aside a wing for consular offices. And by the end of the year, the Great Wall, the China, and the Garden hotels will all have CAAC reservation counters.

Of course most of the hotels we visited fell into a far less progressive, but nonetheless important, category of meeting sites: those with modest conference space and limited business facilities. In these cases China is trying to attract smaller meeting groups by capitalizing on the tourism side of the convention business.

Even Beijing's new Fragrant Hills Hotel is making some progress in handling small meetings, after being roundly criticized by foreign business people and the Chinese press alike for the poor service and unkempt rooms offered during a business conference last summer. During our visit, 60 delegates from the International Standards Organization expressed their satisfaction with the hotel's limited conference services and dining facilities. More important to them than the meeting services were Fragrant Hills' quiet, woodland setting, and its central location between Beijing and two of the area's principal tourist attractions, the Great Wall and the Summer Palace.

Though exhibitions were outside of our survey's scope, we did note a few trends of interest to international meeting planners. Extensive hotel construction is underway near Beijing's Agricultural Center in the northeast Chaoyang District. Six new hotels, including the existing Hua Du and Great Wall, will eventually be concentrated in a one-mile radius. When these are completed, Beijing will be able to lodge more than 3,000

Rudy Wright and Sarah Wright are president and vice-president, respectively, of Convention and Conference Consultants (CCC), an international meeting management firm with offices in San Diego and Chicago. A past president and chairman of Meeting Planners International, Rudy Wright recently became international secretary of the World Congress on Incentive Travel and Meeting Management. CCC's parent company, Rockwood Investment Company, is a Council member.

WHERE TO RESERVE YOUR CONFERENCE CENTER IN CHINA

BEIJING

CITS HEAD OFFICE
International Convention Div.
6 East Changan Avenue
Tel: 75-7181 x363
Telex: 22350 CITSH CN
Contact: Wang Erkang, Director
Contact: Jia Debing, Dep. Dir.

CITS BEIJING BRANCH
2 East Qianmen Street
Tel: 75-5017
Telex: 22489 BTTC CN
Cable: 5861 BEIJING
Contact: Gao Zhendong, Gen. Mgr.

GREAT WALL HOTEL*
North Donghuan Road
Tel: 55-8851
Telex: 20045 GWHBJ CN
Contact: Xia Zaolung, Dep. Dir. Sales

U.S. Contact
1200 Bayhill Dr., #220
San Bruno, CA 94066
(415) 877-0780
Cable: 470703 or 171514
Dick Wang, Dir. Sales & Marketing

FRAGRANT HILLS (Xiangshan)
Xiangshan Park
Tel: 28-5491
Cable: 7391 BEIJING
Contact: Guo Ying, Gen. Mgr.

JIANGUO HOTEL*
Jianguo Men Wai Da Jie
Tel: 59-5261
Telex: 22439 JGHBJ
Cable: 6677 BEIJING
Contact: Jacques Warnez, Dep. Gen. Mgr.

Hong Kong Contact:
Peninsula Group
Rm. 1128, Ocean Center
Kowloon
Tel: 3-682335
Telex: 34064 PENGP HX
Cable: PENGROUP HK

JIAN HUA HOTEL
Jianguomen Wai Blvd.
Tel: 75-7181
Telex: 22489 BTTC CN (temporary)
Cable: 5650
Contact: Guo Manru, Dep. Gen. Mgr.

GUANGZHOU

CITS GUANGZHOU BRANCH
179 Huan Shi Road
Tel: 61369
Cable: 1954 GUANGZHOU
Contact: You Zhiwen, Dep. Mgr.

CHINA HOTEL*
Xicun Gong Road
Tel: 66888 or 61334
Telex: 44888 CHLGZ CN
Cable: 6888
Contact: Joachim Burger, Gen. Mgr. or Frankie Ho Cho Tat, Front Office Mgr.

Hong Kong Contact:
New World Center
22 Salisbury Road
Kowloon, HK
Telex: 51878 NWHIL HX

NANHU HOTEL & RESORT
Nanhu, Guangdong Prov.
Tel: 76367 or 78502
Telex: 44511 NANHU CN
Cable: 0945
Contact: Ai You, Dep. Mgr.

WHITE SWAN HOTEL*
1 S. Street, Shamian Island
Tel: 86968
Telex: 44149 WSH CN

Hong Kong Contact:
Ruan Jianming
501 Pepper St. C

GARDEN HOTEL
Huan Shi Road East

Hong Kong Contact:
Lee Gardens Hotel Mgmt. Co.
Tel: S-767211
Telex: 75601 LEGAR HX
Cable: LEEGARDENS
Contact: Wallax Chiu, Dir. of Sales

HANGZHOU

CITS HANGZHOU BRANCH
Zhejiang Provincial Tourism Corp.
10 Baoshu Road
Tel: 22487 or 26961
Telex: 35031 HZT CN
Cable: 1954 HANGZHOU
Contact: Gao Hai Shan, Dir.

HANGZHOU/XILING HOTELS
Tel: 22921
Cable: 7391
Contact: Chen Sheng, Gen. Mgr.

HANGZHOU CONFERENCE CENTER
Tel: 22921
Telex: 35031 HZT CN
Contact: Wang Xin Hua, Dir.

Table prepared by Rudy and Sarah Wright.

**Direct reservation service available.*

NANJING

CITS NANJING BRANCH
313 North Zhong Shan Road
Tel: 8592
Telex: 34119 ITSNJ CN
Contact: Zhang Zuo-Zhang, Vice Mgr.

NANJING HOTEL
259 North Zhongshan Road
Tel: 34121
Contact: Cui Yan, Gen. Mgr.

JINLING HOTEL*
Xin Jie Kou
Tel: 41121
Telex: 34110 JLHNJ CN
Cable: 6855
Contact: Cheng Mingsheng, Sales Mgr.

SHANGHAI

CITS SHANGHAI BRANCH
59 Xianggang Road
Tel: 217200
Cable: LUXINGSHE SHANGHAI
Contact: Chen Yinxing, Vice Mgr.

JING JIANG HOTEL*
59 Mao Ming Lu South
Tel: 582582
Telex: 33011 BTHJJ CN
Cable: 7777
Contact: Zhang Yu Hua, Gen. Mgr.

SHANGHAI HOTEL*
505 Wulumugi Bei Lu
Tel: 312312
Telex: 33002 BTHSG CN
Contact: Wang Run Shen, Dep. Gen. Mgr.

TIANJIN

CITS TIANJIN BRANCH
Tianjin Travel & Tourism Corp.
55 Chongqing Street
Tel: 34831 or 32619
Telex: 23242 TJMPG CN
Cable: 3266 TJMCO
Contact: Huo Zhaohu, Man. Dir. CITS

TIANJIN GARDEN HOTEL
(State Guest House)
337 Machang Road
Tel: 24010
Contact: CITS Tianjin

TIANJIN GRAND HOTEL
Youyi Road, Hexi District
Tel: 29213 or 39288
Telex: 23276
Cable: 1980
Contact: Mr. Wu, Gen. Mgr.

delegates in the same vicinity as their conference or exhibition.

Shanghai, which has a fairly long history of hosting trade shows, is remodeling or building several exhibition halls with meeting functions in mind. The Shanghai Exhibition Center's newly renovated Assembly Hall now has an 18,000-square-foot auditorium that can accommodate either 2,000 delegates or 112 three-square-meter booths. For conference use, it offers a large stage and equipment for simultaneous translation in six languages. The same complex houses another auditorium with full theatrical stage and lighting, orchestra pit, and fixed seating for 950. The hall's management—the Shanghai Bureau of Administrative Affairs—plans to construct another exhibition center on an adjacent site to include extensive meeting facilities and a 700-room hotel.

In all of the cities we visited, the Chinese were making notable progress in upgrading their meeting and conference facilities, many to international standards. Unfortunately, we came away feeling that the same kind of care and attention is not being paid to the service side of the business. Only at the Hangzhou Hotel did we see any emphasis placed on training the conference service staff: A class was just being developed during our visit on the mechanics of meeting organization, such as how to set up conference space, light the meeting rooms, and use audiovisual and translation equipment.

We also felt that CITS had been slow to respond to the special travel requirements of conference organizers. In the past, the CITS head office charged delegates the same per-day package rates as tour groups, even though their dining and sightseeing activities were different. Only recently have CITS managers assured us that the package prices can be modified and that organizers may work directly with the CITS branch offices on arranging post-conference itineraries.

In the final analysis, the future of China's conference industry will hinge on attitude as much as on facilities and staff. Meeting organizers must be assured that the Chinese want their business, and will make every effort to offer the same standards of service they have come to expect at other meeting destinations. ₹

CHINA'S

Facility (date completed/renovated)	Total rooms	Double room rates (RMB)	Meeting rooms	Capacity (theater style)	Restaurants
BEIJING					
Fragrant Hills (1983)	292	200-250	6	105	3
Great Wall (1983)	1,007	220-320	13	1,300	5
Hua Du (1982)	522	70-90	5	500	2
Jianguo (1982)	455	140-150	5	420	3
Jian Hua (1984)	686	60-70	7	530	3
Hunlun (1985)	1,006	—	—	—	—
Lidu (1984)	2,000	—	—	—	—
Xiyuan (1984)	750	—	—	—	—
Guoji International (1986)	1,098	—	—	—	—
GUANGZHOU					
China (1984)	1,200	80-120	13	1,200	5
Garden (1984)	1,170	—	9	1,400	7
Nanhu Garden Resort (1981)	300+	60-65	8	360	4
White Swan (1982)	1,000	70-80	16	610	6
Friendship Theatre (1980)	*	*	4	1,500	—
NANJING					
Jinling (1982)	760	80-96	14	1,050	6
Nanjing* (1959/79)	230	32-36	14	350	4
Ding Shan (1979)	356	10	20	325	4
Shuangmenlou* (1954/79)	190	36	4	400	2
Eastern Guest House* (1959/83)	50	80-150	8	80	2
HANGZHOU					
Xiling/ Hangzhou hotels	418	70-80	4	400	3
Conference Center	*	*	14	750	—
Opera House (1984)	*	*	1	1,800	—
Zhejiang Exhibition Hall (1977)	*	*	6	1,000	—
SHANGHAI					
Jing Jiang Hotel & Club (1954/73)	720	40-96	15	300	9
Shanghai (1983)	600	60	4	850	4
Exhibition Center (1954)	*	*	27	2,000	—
TIANJIN					
Tianjin Garden Guest House (1960)	53	100-150	4	150	4
Tianjin Grand Hotel (1960)	322	36-70	38	1,050	5
Tianjin Friendship Club (1925)	*	*	8	1,000	2

**** Modern first-class hotel with excellent meeting facilities and conference staff.
*** Upper-medium-priced hotel with good meeting facilities.

MAJOR CONFERENCE CENTERS

Conference features & services/Rating

Public address system; limited audio–visual equipment; health club; spa; pool; air conditioned rooms; direct reservations.★★

Divided conference rooms; public address system; control booth; lights on dimmers; limited audio–visual equipment; closed-circuit video; simultaneous translation equipment; translator booths; conference staff; International Business Center (IBC); direct long-distance dialing; airline desk; health club; spa; tennis; pool; smoke detectors; sprinkler system; air-conditioned rooms; refrigerators in rooms; direct reservations.★★★★

Lights on dimmers; public address system; limited audio–visual equipment; cinema projection; telex; photocopy service; air-conditioned rooms; direct reservations.★★

Divided conference rooms; lights on dimmers; public address system; telex; photocopy service; pool; smoke detectors; sprinkler system; air-conditioned rooms; direct reservations.★★★★

Stage; public address system; limited audio–visual equipment; simultaneous translation equipment; telex; photocopy services; health club; pool; smoke detectors; air-conditioned rooms; direct reservations.★★★

Additional information not yet available. Not rated.

Additional information not yet available. Not rated.

Additional information not yet available. Not rated.

Additional information not yet available. Not rated.

Divided conference rooms; stage; control booth; stage light; lights on dimmers; public address system; full audio–visual equipment; closed-circuit video; cinema projection; simultaneous translation equipment; conference staff; International Business Center; direct long-distance dialing; airline desk; health club; spa; pool; bowling; smoke detectors; sprinkler system; air-conditioned rooms; refrigerators in rooms; limo service; direct reservations.★★★★

Exhibit area; control booth; lights on dimmers; public address system; full audio–visual equipment; closed-circuit video; simultaneous translation equipment; conference staff; International Business Center; direct long-distance dialing; airline desk; health club; spa; tennis; pool; smoke detectors; sprinkler system; air conditioned rooms; refrigerators in rooms; direct reservations. Not rated.

Stage; stage light; lights on dimmers; public address system; full audio–visual equipment; closed-circuit video; telex; pools (2); boating; air-conditioned rooms; refrigerators in rooms.★★★

Divided conference rooms; public address system; control booth; stage light; TV editing and production studio; full audio–visual equipment; closed-circuit video; cinema projection; simultaneous translation equipment; International Business Center; direct long-distance dialing; pool; disco; smoke detectors; air-conditioned rooms; refrigerators in rooms; direct reservations.★★★

Stage; air conditioned. Not rated.

Divided conference rooms; stage; public address system; control booth; stage light; lights on dimmers; TV editing and production studio; full audio–visual equipment; closed-circuit video; cinema projection; simultaneous translation equipment; conference staff; International Business Center; direct long-distance dialing; airline desk; health club; spa; pool; dry cleaning; smoke detectors; sprinkler system; air-conditioned rooms; refrigerators in rooms; direct reservations.★★★★

Stage; public address system; limited audio–visual equipment; cinema projection; telex; air-conditioned rooms.★

Limited audio–visual equipment; conference staff; telex; air-conditioned rooms.★★

Stage; telex; refrigerators in rooms.★

Pool; air-conditioned rooms; refrigerators in rooms.★★

Currently being remodeled. Telex; health club; nightclub; smoke detectors; air-conditioned rooms; refrigerators in rooms; direct reservations.★★★

Divided conference rooms; auditorium; stage; public address system; control booth; stage light; lights on dimmers; full audio–visual equipment; closed-circuit cinema projection; simultaneous translation equipment; conference staff; photocopy service. Hotel facilities provided by Hangzhou Hotel. Not rated.

Stage; air conditioned. Not rated.

Cinema theatre; 111,000 square feet of exhibit space on two levels; air conditioned. Not rated.

Auditorium; stage; public address system; stage light; limited audio–visual equipment; cinema projection; simultaneous translation equipment; International Business Center; direct long-distance dialing; airline desk; health club; pool; bowling; air-conditioned rooms; refrigerators in rooms.★★

Stage; public address system; stage light; lights on dimmers; full audio–visual equipment; closed-circuit video; simultaneous translation equipment; telex; photocopy service; lounge; photo studio; air-conditioned rooms; refrigerators in rooms.★★★

Stage; public address system; control booth; stage light; full audio–visual equipment; closed-circuit video; cinema projection; 200,000 square feet of exhibit space on two levels; simultaneous translation equipment; photocopy service; banquet hall. Not rated.

Stage; public address system; spa; pool; lake; air-conditioned rooms; refrigerators in rooms.★★

Auditorium; stage; stage light; public address system; full audio–visual equipment; simultaneous translation equipment; conference staff.★

Auditorium; stage; stage light; public address system; limited audio–visual equipment; simultaneous translation equipment. Not rated.

★★ Medium-priced hotel with limited meeting facilities.
★ Small hotel or motel with nominal meeting facilities suited to small groups.
* Conference facility only; no guest rooms.

Table prepared by Rudy and Sarah Wright.

Chinese Labor

Foreign firms are learning how hard it is to negotiate realistic labor contracts in China

Jamie P. Horsley

Although China boasts of its low labor costs to attract foreign investment, foreign joint venturers in China are required to pay 120–150 percent of the "real wage" of workers in comparable state-owned enterprises. As a result, foreign joint equity ventures in China often end up paying approximately ¥200–300 per month for each worker they hire, even though it is widely known that an urban Chinese worker takes home an average of ¥60–80 per month. After deducting this "premium" of between 20 and 50 percent, some of which may be passed on to the workers, where does the rest of the wage go? And what is the justification for the Chinese side to demand annual wage increases of some 10–15 percent when the published Chinese inflation rate is a mere 1–2 percent per annum?

Given the lack of concrete information on Chinese labor costs and practices, it is no easy matter to negotiate a labor contract in China. Investors are told that they must abide by Chinese law and practice but are often given little information about what the law is, other than the general guidelines contained in recent legislation particularly directed at foreign investors. In addition, many pertinent Chinese laws have not been translated into English or any other foreign language.

For these reasons it may be useful to take a closer look at how Chinese enterprises are managed, in order to understand the operative rules governing wages, bonuses, labor subsidies, discipline, insurance, welfare, and the expanding role of labor unions. As we shall see, the domestic rules have been adjusted in some cases to accommodate joint ventures and other types of enterprises operating with foreign investment, but a basic understanding of how the system works internally will aid the foreign investor both in negotiating a realistic and acceptable contract, and in implementing its terms to the satisfaction of both sides.

The basic wage: Chinese enterprises

The Chinese worker's wage generally consists of three parts: the basic wage, which constitutes approximately 70 percent of total wages; bonuses, which amount to around 15 percent; and various subsidies, which account for the remaining 15 percent. In addition to these costs, state-owned enterprises also pay for labor insurance and welfare benefits, and the state subsidizes workers' living expenses by charging less than cost for certain food, clothing, housing, and services. Such subsidies were equivalent to roughly 40 percent of total wages paid by state enterprises in 1982.

According to the *1983 Statistical Yearbook of China*, published by the State Statistical Bureau, the average annual wage (apparently including bonuses and subsidies) in state enterprises rose from ¥640 in 1978 to ¥836 in 1982. This represented an increase of 9.5 percent in 1979, 14 percent in 1980, 1.1 percent in 1981, and 2.9 percent in 1982. Other sources report that the average annual urban wage (including workers in government, collectives, and individual enterprises) rose to ¥850 in 1983, representing an increase of 6.5 percent over 1982. While this latter figure does not square with those given in the *Statistical Yearbook*, the general picture is clear: Chinese wage income is increasing.

Actual wages of Chinese workers in state-owned enterprises have been set by the government since 1956 according to an eight-grade system. Each grade takes into account the complexity, strenuousness, and responsibility of a particular job. Although the wage scale varies between sectors and localities, the differences reportedly are not great and, in general, the highest wage grade will be about three times the lowest grade. One published estimate of the average 1982 monthly wage of a first-grade worker puts it at ¥40 (¥480 annually), while that of an eighth-grade worker was ¥110, for a total annual basic wage income of ¥1,320. For many years, very few adjustments were made in the original wage scale, and until recently, wage increases were only received through a rise in grade.

Under the most prevalent system, the basic wage is tied to time worked (hours, days, or months). Piece-rate compensation fell into disuse between 1958 and 1977, but has since become the second most popular system. In the case of handicraft, trade, and heavy industrial workers, the piece-rate system is generally regarded as the best way to achieve distribution according to work. Floating wages were introduced on a trial basis in 1981, in part due to the influence of wage reforms in the Soviet Union and Eastern Europe. Twenty to 100 percent of a worker's wage may "float" and be linked to profit targets, output or quality goals, or to various economic indices. In all cases, the wage is linked to total

Jamie P. Horsley is an attorney with the New York international law firm of Paul, Weiss, Rifkind, Wharton & Garrison. She resided in Beijing on behalf of the firm from October 1981 to March 1984 and continues to specialize in Chinese legal matters.

productivity and profit, as well as to individual effort.

Most enterprises calculate the monthly wage on the basis of 25.5 days, and a work year of 306 days (365 days minus 52 Sundays minus 7 legal holidays). Most staff and workers put in a six-day work week of seven to eight hours per day.

Days of leave taken without pay, for personal matters not subsidized by labor insurance, are deducted from the monthly wage. But employees do receive their regular wages for time off in order to: vote in government elections; attend conferences at the district-level and above; serve as a people's assessor, witness, or litigant in the people's courts; attend meetings for model laborers and advanced workers; and participate in activities required by the enterprise management. In addition, employees are given up to three days' leave with pay for their own weddings, and members of enterprise or "grass-roots" trade unions who are not full-time union workers are supposed to be paid for up to two full working days per month for their participation in union activities.

Overtime equal to 100 percent of their regular hourly wage is paid to those who work on Sundays or other prescribed weekly days of rest, and 200 percent is paid for work on the seven statutory holidays: January 1, three days at the Spring Festival (which falls in January or February of each year), May 1 (International Labor Day), and October 1–2 for National Day. Some workers are entitled to one-half or a full day off on Women's Day (March 8), Youth Day (May 4), Children's Day (June 1), or Army Day (August 1). Overtime at night is paid at time and one-half, and those who work the nightshift after 11:00 PM without overtime pay get special meal allowances. In April 1982 the State Council attempted to curtail excessive overtime payments by requiring that enterprise trade unions approve any overtime and by encouraging the substitution of more time off in place of monetary payments. The government has decided that increased labor efficiency during regular working hours will reduce the need for costly overtime work.

The basic wage: foreign enterprises

The above wage system also applies to all jointly managed Chinese and

Chinese workers earned an average annual take-home pay of $425 in 1983, up from about $380 in 1978. Those working in foreign-Chinese enterprises generally earn much more, although the largest portion of their gross pay goes to the state and not the workers.

foreign enterprises in China. But there are major differences, the most significant being that nearly all Chinese laborers in foreign enterprises in China must be paid at higher rates than workers with comparable jobs in wholly Chinese enterprises. The official justification for this discrimination is that Chinese employees working for foreigners will be expected to have greater skills and be more productive.

The 1979 Joint Venture Law provides that a venture's board of directors is to determine manpower plans, pay scales, and other employment terms to be set forth in labor contracts. The September 20, 1983, implementing regulations (hereafter referred to as the "Joint Venture Regulations") make clear that wage and bonus systems are to be based on the principle of tying compensation to job performance. More to the point, the July 26, 1980, Regulations of the People's Republic of China on Labor Management in Joint Ventures Using Chinese and Foreign Investment (hereafter referred to as the "Joint Venture Labor Regulations") stipulate that the wage levels of staff and workers in joint ventures are to be fixed at 120–150 percent of the "real wages" of staff and workers of state enterprises in the same locality and line of business.

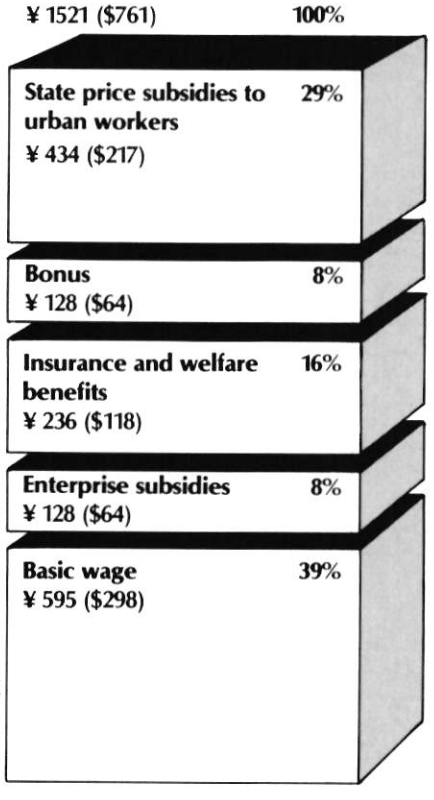
Some ventures have interpreted the "real wage" to mean the basic wage received by Chinese workers in state enterprises. But a December 5, 1983, article in Shanghai's *World Economic Herald* stated that, in principle, the "real wage" should include not just the basic wage, but also labor insurance, medical expenses, housing costs, and other subsidies normally contributed by state enterprises. Current practice as well as the government's draft accounting rules for joint ventures would support this interpretation. On the other hand, the Joint Venture Labor Regulations treat the payment of wages, on the one hand, and labor insurance, medical expenses, and the various subsidies for staff and workers, on the other hand, in separate articles. This would suggest that labor insurance, medical expenses, and other subsidies are not included in the "real wage."

Although there is some uncertainty concerning what the "real wage" does include, it is clear that it does not include bonuses and collective welfare costs. The latter includes costs for such services as nurseries and clinics. These are to be paid separately out of a special bonus and welfare fund that the Joint Venture Law requires all joint ventures to establish out of their after-tax profits. One Chinese analyst estimates that the actual level of wages paid to Chinese staff and workers in joint ventures, when factoring in the joint venture premium, amounts to between three and three and one-half times the average take-home pay of workers in state enterprises.

The term "real wage" does not even appear in the December 24, 1981, Interim Provisions on Labor and Wages in Enterprises in the Special Economic Zones in Guangdong Province (hereafter referred to as the "SEZ Labor Provisions"), which apply to cooperative ventures and wholly foreign-owned enterprises, as well as to joint ventures in the Shenzhen, Shantou, and Zhuhai SEZs. Instead, SEZ enterprises must pay a "labor service charge" for each staff member and worker. Standard charges are to be decided at the time the labor contract is signed, based on the type of enterprise and work involved. Seventy percent of the charge (including basic and floating wage) is to go directly to the employee, 5 percent is to be kept by the enterprise to help subsidize the employee welfare fund, and 25 percent is to be used for labor insurance and as compensation for the various kinds of subsidies that the state normally provides to the staff and workers. This is clearly a

ANNUAL CHINESE LABOR COSTS IN 1983

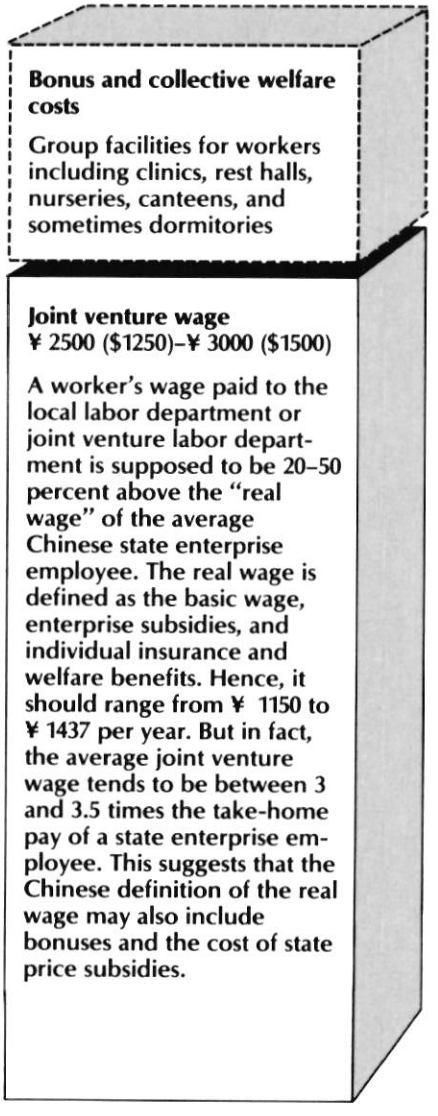
(Costs borne by the Chinese government and a typical state-owned enterprise)



Artwork by John M. Yanson

ANNUAL FOREIGN LABOR COSTS IN 1983

(Costs borne by a typical foreign joint equity venture in China)



very different system than that practiced by joint ventures outside of the SEZs.

Reaching an agreement

What have joint ventures actually agreed to pay? Published reports indicate that joint venture monthly wages range from ¥110 to ¥250, only a portion of which represents take-home pay. In addition, the salaries of joint venture officers and high-level managerial staff are often considerably higher. The Chinese side often presses for salaries for Chinese high-level personnel that are equivalent to those paid to high-level foreign personnel working in the venture, but there is no legal requirement that this must be the case. The Joint Venture Regulations merely provide that the wages and treatment of a joint venture's officers and high-level management personnel shall be determined by its board of directors. Still, the Chinese keep demanding equal salaries or high percentages—of 50 to 70 percent in some cases—of the foreigners' salaries.

If pressed by the foreign investor, the Chinese will break down their estimated "reasonable" wage into its various components. In one early joint venture negotiation, the Chinese side initially asked for an average wage of ¥200 per month. It justified this request by reporting that the basic wage in comparable enterprises was about ¥100 per month, with ¥50 as the basic wage and ¥56 constituting direct subsidies as follows: ¥10 paid to the local authorities for social consumption and medical care, ¥4 for staple foods and by-products, ¥7 for food, ¥2 for transport, ¥1 for heating, ¥2 for personal hygiene (baths and haircuts), ¥1 for vacation or home-leave, and ¥29 for rent. In addition, the Chinese side stated that labor insurance and pensions amounted to nearly ¥90 per month (which seems rather high), so that the ordinary total wage bill would come to some ¥197. By asking the joint venture to pay only ¥200, at least for the first year, the Chinese side was in effect foregoing the joint venture wage premium of 20–50 percent of the real wage. Based on the above figures, the premium in this case would have amounted to some ¥40–100 extra per month.

In another joint venture negotiation, the foreign party was told that the hourly real wage of the rank and file worker in an existing plant was ¥0.6 per hour, or ¥122.4 per month, using the six-hour, 25.5-days per month calculation. Since the average basic wage was said to be some ¥60–80 per month, the amount attributed to bonuses, various allowances, and welfare subsidies amounted to 50–100 percent of the basic wage. Inasmuch as the real wage in other cases may amount to three times or more the basic wage, it would appear that this foreign party was offered a fairly good deal.

In yet another negotiation, the foreign investor was told that the average basic monthly salary for relevant workers in the locale was about ¥100, plus some ¥125 in various subsidies. In this case, as in a few others, the joint venture premium was calculated as a percentage above the basic wage, excluding subsidies and labor insurance.

These few examples demonstrate that actual agreements vary widely among localities, industries, and the Chinese partners. It seems clear, though, that the foreign investor is somewhat at the mercy of the Chinese side, since foreigners do not have direct access to information concerning local wage and subsidy levels. But this should not deter the foreigner from at least asking to see the account books of an enterprise that the investor is taking over or, in the case of newly established ventures, perhaps hiring a Chinese accountant or otherwise prevailing upon the Chinese side to check the books of other enterprises. In addition, an investor would be well advised to do a little prenegotiation homework to get some idea of what a reasonable basic wage for the locality and industry might be, and figure that the subsidy bill will amount to at least 100 percent of that.

Wage inflation

A related issue is the amount the wage should increase each year. The SEZ Labor Provisions require that an SEZ enterprise grant its workers an annual 5–15 percent increase, depending upon the circumstances. The Joint Venture Labor Regulations are silent on this issue. The Chinese parties to joint ventures have sometimes asked for annual increases of up to 15 percent, and wage increases of 10–11 percent are known to have been agreed to by foreign investors.

What would be a fair increase? One test would be to look at domestic wage increases. As mentioned earlier, the Xinhua News Agency reported in January 1984 that the wage of the average urban worker (including collective and individual workers) increased by 6.5 percent in 1983. Perhaps a better index is to compare the increases in the average annual wage for staff and workers in state enterprises over the last few years. According to the *1983 Statistical Yearbook of China*, these wages jumped some 9.4 percent in 1979 and 13.9 percent in 1980, but increased by only 1.1 percent in 1981, and 3 percent in 1982.

Another indicator would be Chinese inflation figures. In November 1983, Beijing announced that the official inflation rate was a mere 1.1 percent, although foreign economists would place the figure closer to 10 percent. Perhaps a more appropriate measure would be the price index for the general living expenses of staff and workers in state enterprises. Probably due to state subsidies, this index increased by only 0.006 percent in 1978, and by as little as 0.18, 0.75, 2.5, and 2 percentage points between 1979 and 1982, according to the *Statistical Yearbook*.

Regardless of the indicator used, it seems clear that wages and living costs have risen only moderately in recent years. Therefore the Chinese should be hard-pressed to justify wage demands that call for annual increases of 10–15 percent. Foreign negotiators might consider linking any wage increases, other than through promotion, to a readily accessible index such as those found in the annual *Statistical Yearbook*.

Bonuses

Bonuses, sometimes referred to as "rewards," can amount to some 15–25 percent of a worker's total wage income. In principle, they are to be linked to performance and effort. However, during the 10 years of the Cultural Revolution, bonuses were abolished and replaced with an "additional wage" distributed equally to everyone. This practice created the still-prevalent expectation that each worker, regardless of performance, ought to receive a bonus as a fixed portion of his or her wage. This view has since come under attack as the "iron ricebowl" mentality, which the

Chinese are now trying to crack through various economic and wage reforms. Unfortunately, the practice still continues. According to the *1983 Statistical Yearbook*, bonus payments have increased from an average of 2.3 percent of the total wages of staff and workers in state enterprises in 1978 to almost 11 percent in 1982.

According to the January 1981 document, "Provisions of the State Council for Properly Implementing the Reward System and Resolutely Checking the Reckless Granting of Rewards," bonuses or rewards are to be used sparingly and for overtime work only, ought to be tied to individual and not to group performance (the iron rice bowl), and should increase more slowly than an enterprise's production and profits. Finally, the Reward Provisions also stipulate that an individual's annual total bonus should not exceed one-to-two months' basic wage, with three months' wage as the cap in exceptional circumstances. This limit does not apply to certain special rewards, such as for inventions, technical improvements, proposals for rationalization of production, and economizing on the use of fuel and materials.

Enterprises that use the piece-rate system generally do not give production-related bonuses, and service and catering enterprises pass on "dividend wages" based on profits in addition to the basic wage.

Subsidies

Enterprise subsidies to Chinese staff and workers amount to up to 15 percent of their total wage. Subsidies, like bonuses, have also increased as a percentage of the total wage bill, from 6.5 percent in 1978 to around 14 percent in 1982.

What are these subsidies? In November 1979, the government authorized a monthly subsidy for workers of ¥5 for "non-staple foods," such as vegetables and certain grains, to cover inflationary price increases. Other subsidies vary according to location. One publication reports that these amount to an average of ¥2 per month for commuting, ¥2 per month for baths and haircuts, and a lump sum of ¥16 for coal to heat in the winter. The total amounts to some ¥124 per year. Other enterprises subsidize housing, and employees working under hazardous circumstances (such as miners) are usually given extra payments.

These enterprise subsidies, it should be remembered, come on top of central government subsidies that are already built into the nation's price structure. The prices of coal, transportation, grain, and housing, to cite just a few examples, are fixed by the state at very low levels that do not reflect true production costs. Hence, the price supports granted by individual enterprises represent subsidies upon subsidies.

In addition, enterprises must make labor insurance and welfare fund payments. These reportedly amounted to 21.7 percent of the total wage bill of state enterprises in 1982 (up from 14.3 percent in 1978). The 1951 Labor Insurance Regulations of the People's Republic of China require enterprises with more than 100 staff and workers to contribute 2 percent of their total monthly wage bill to a labor insurance fund. Of this fund, 30 percent goes to the All-China Federation of Trade Unions for collective labor insurance, and 70 percent goes to the enterprise or local trade union for pensions, certain subsidies, and special relief funds. Besides the labor insurance fund, each enterprise is required to establish a welfare fund for its staff and workers, to pay for recreational and educational facilities, day-care centers, clinics, and the like.

Other subsidies include:

▶ ***Home leave*** Workers living apart from their spouses and single workers living apart from their parents are granted 20–30 days' yearly leave plus travel time with full pay. Their round-trip traveling expenses are also borne by the enterprise. Married workers may go see their parents once every four years for 20 days. Apart from these home leaves, however, workers are not granted annual vacations.

▶ ***Childbirth*** Women workers are normally given 56 days maternity leave at full pay. An extra 14 days is granted in cases of difficult births. Enterprises also cover a child's medical expenses and provide a monthly allowance of ¥5 for childcare (for children up to 14 years of age) to a worker parent who agrees to have only one child.

▶ ***Medical care*** Enterprises must meet all workers' "ordinary" medical expenses, including those for consultation, operation, hospitalization, and medicine, and normally must pay for one-half of the medical expenses of dependent, directly related family members. Workers are also to be paid 60–100 percent of their standard wage, depending on the length of their employment, during sick leaves lasting up to six months. If a leave for illness extends beyond six months, the enterprise pays 40–80 percent of a worker's standard wage.

▶ ***Injury and disability*** The PRC Labor Insurance Regulations provide that workers who suffer on-the-job injuries continue to receive their full wages. They are charged nothing for medical care. Workers who are "disabled," defined as the complete loss of ability to work, will receive up to 75 percent of their basic wage until death or restoration of their ability to work. Such pension or relief subsidies are paid out of an enterprise's labor insurance fund. Some recent sources report that this relief payment must be at least ¥35 per month. Non-worker-related illnesses and disabilities are also covered to a more limited extent.

▶ ***Retirement*** The normal retirement age for Chinese staff and workers in state enterprises is 60 for men and 50 for women. According to China's January 2, 1953, Labor Insurance Regulations and implementing rules promulgated the same year, men who retire at 60 after working for at least 25 years (with at least 10 years' standing in the enterprise) are entitled to 50–70 percent of their wages, depending on the length of time spent working for the enterprise. If a man continues to work after age 60 at the request of the enterprise, he is entitled to an in-service, old-age pension of 10–20 percent of his wage, in addition to the wage itself. These pension payments are to be made out of the labor insurance fund. Women who retire at age 50, who have worked for at least 20 years overall, and have 10 years' standing in the enterprise, are entitled to the same treatment as men.

Recent sources report that retired employees now receive 60–90 percent of their regular pay and continue to enjoy free medical care paid for by the enterprise.

▶ ***Death benefits*** According to the Labor Insurance Regulations, the family of a staff member or worker who dies while on duty is to be given an allowance for funeral expenses equal to three months of the wage

paid to the deceased. A recent report put this figure at ¥240. In addition, the family of the deceased is entitled to a monthly pension of 20–50 percent of the deceased's basic wage, depending on the number of dependents. If the employee dies while off-duty, or after retirement or a disability discharge, the family receives a funeral expense allowance equal to two months' of the deceased's basic wage, and a lump-sum relief payment equal to 6–12 months' basic wage. Enterprise employees are also given up to three days' paid leave to attend the funeral of a direct relation.

The party and trade unions

The board of directors is supposed to be the highest authority in a Chinese–foreign joint venture with the power to determine labor plans and wage scales, according to the Joint Venture Law. Yet joint ventures are required to organize trade unions, which have the power to protest decisions concerning hiring and firing, wage adjustments, allocation of bonuses, and other labor-related issues. Labor union representatives are even given the right to participate in board meetings.

What exactly is the role of the labor union? And what is the role of the Chinese Communist Party, which by law is supposed to "lead" the labor union?

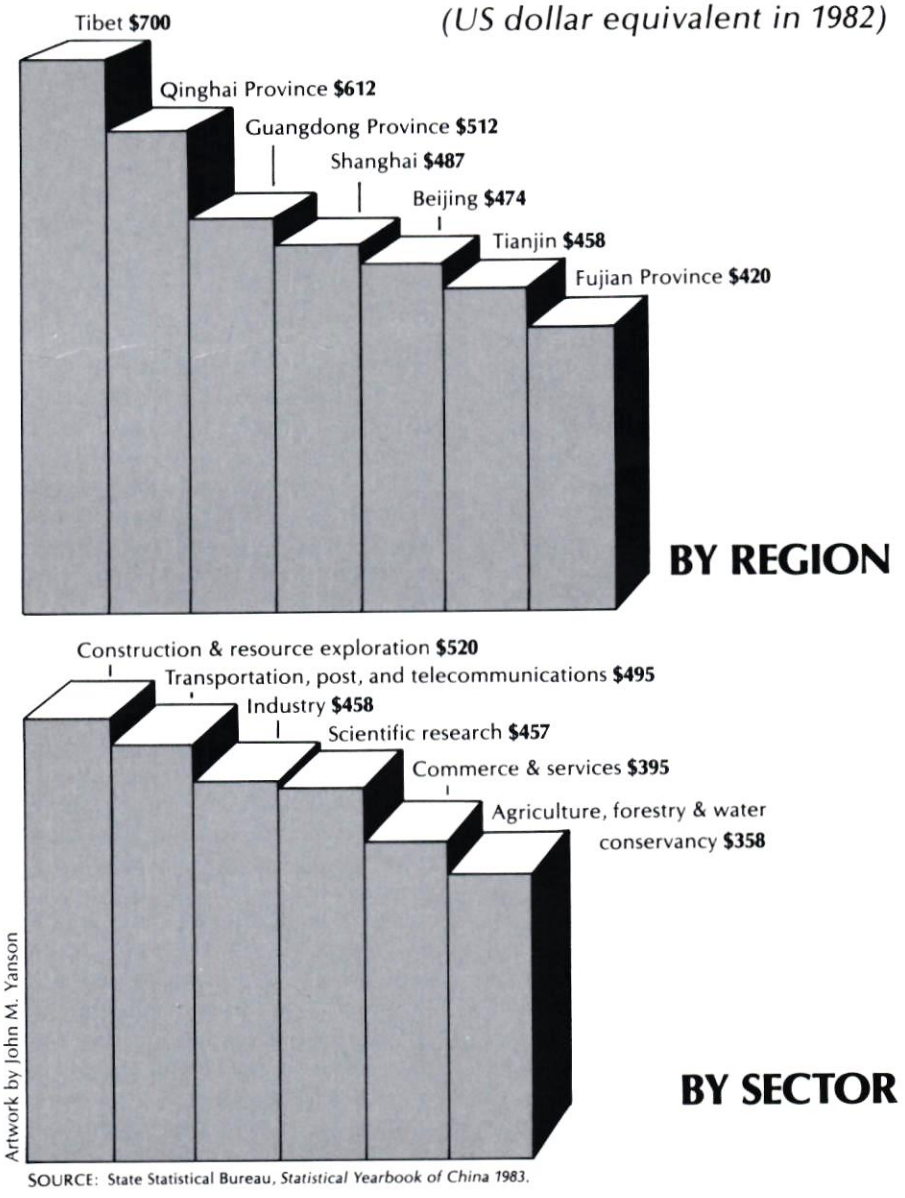
In one recent episode, the board of directors of a joint venture was asked to help establish and support a full-time Communist Party organization within the enterprise, but the Chinese partner withdrew the request when the foreign side objected. This incident supports other indications that the government has adopted a policy not to grant to the Communist Party of China the right to maintain an independent organization or play a full-time role in joint ventures as it does in state enterprises. Instead, the party is expected to make its influence felt through the Chinese-appointed directors, managerial personnel, and other staff and workers who are party members. Such behind-the-scenes party activities as exist are to be confined to ideological supervision and political work, and to ensuring that the venture's workers and managers observe China's laws, regulations, and policies.

But the role accorded trade unions is significant indeed. A trade union is responsible for signing a collective labor contract with the joint venture, covering such matters as wages, recruitment, dismissals, resignations, welfare benefits, insurance, and labor safety. The union is also responsible for supervising the contract's implementation. Article 97 of the Joint Venture Regulations stipulates that other basic tasks of the trade union are to: safeguard the democratic rights and material interests of staff and workers in accordance with the law; assist management in planning the rational utilization of its welfare and benefit funds; organize staff and workers to study political, professional, scientific, and technical subjects; develop cultural and sports activities; and educate the staff and workers to observe labor discipline and work hard to fulfill the venture's economic tasks.

Furthermore, the trade union is given the right under Article 98 to send an unspecified number of representatives to attend board meetings concerning the venture's expansion plans, production and operating activities, and other important matters. In these meetings they may represent employee opinions and "de-

Annual Wages In Chinese State-owned Enterprises

(US dollar equivalent in 1982)



SOURCE: State Statistical Bureau, *Statistical Yearbook of China 1983.*

China's contradictory wage policies: The FESCO Case

An ironic twist in China's labor system is that while the Chinese government is philosophically in favor of paying workers only according to what they produce, it has adopted a diametrically opposed policy toward Chinese who work for foreigners. These workers, Beijing has decided, must be paid as much as 10 times the local wage regardless of their actual job performance.

A case in point is the treatment of translators, secretaries, other office workers, and support staff hired by foreign companies in Beijing. The Foreign Enterprise Service Company (FESCO), for example, charges ¥400–500 per month for a "category 1" worker, such as an office boy or messenger. These are usually young high school graduates with low-level foreign language competency. Category 2 workers, such as office assistants who are generally inexperienced graduates of a foreign language or trade school, are hired out at ¥500–700. Category 3 office staff, consisting of college graduates with some knowledge of a foreign language, earn ¥700–1,000 per month. Category 4 workers, described as professional staff, are paid roughly ¥1,000–2,000. Thus, the lowest-paid FESCO employee nominally "earns" ¥4,800–6,000 per year, as opposed to the 1983 average urban worker's wage of ¥850.

In addition to the basic labor fee, FESCO also requires the foreign employer to pay for overtime, meal allowances for work extending beyond 9:30 or 10:00 PM, legal holidays, 15-day annual home leaves plus round-trip travel time (apparently regardless of whether the worker would be entitled to such a leave under domestic labor regulations), and annual year-end bonuses equal to one month's wage. The foreign employer further must continue to pay the full wage for Chinese staff on sick leave of up to one month in length, standard maternity leave of up to 56 days, and a total of up to 15 days per year for "compassionate leave," presumably for marriages, funerals, and the like. Finally, the foreign employer must cover the cost of medical treatment and food up to the amount of ¥8,000 in cases of employees injured while on duty, plus the regular wage, and a lump-sum pension of up to ¥20,000 for an employee who is disabled or dies as a result of an injury suffered while on the job. The foreign employer can take out insurance with the People's Insurance Company of China to cover this liability.

Finally, the standard FESCO contract requires the foreigner to pay dismissed FESCO employees a month's wage if they have worked for more than six months, or two months' wages if they have worked for more than one and one-half years, and so forth, up to a maximum of six months' wages. If FESCO withdraws the employees on its own initiative, however, no such severance pay is required.

These labor service fees or wages and other payments are paid directly to FESCO, not to the individual employee. FESCO then pays the employee an unknown portion of the fee, presumably covering the basic wage plus applicable subsidies for food, rent and other living expenses, and perhaps a special bonus for working for a foreigner. It seems clear, however, that FESCO must make a significant profit off the foreign companies, since the companies not only pay a highly inflated wage, but also bear some of the normal enterprise subsidies, such as for sick leave, home leave, maternity leave, disability, and death.

When hiring through a local service company other than FESCO, the foreign firm may be able to strike a better deal. In one labor service contract between a Chinese entity and a foreign contractor, the foreigner agreed to pay a relatively high wage (denominated in US dollars) for Chinese technical and other personnel and bonuses in defined circumstances, but was relieved of having to cover various subsidies such as labor insurance or of having to withhold income tax. —JPH

mands," but they do not have the right to vote. The same holds true for board meetings to discuss labor-related issues such as wages, insurance, and welfare benefits. When labor-related topics are on the agenda, however, the board is instructed to "heed the opinions of the trade union and obtain its cooperation." If the trade union does not accept a board decision on a labor matter, it can take the dispute to arbitration before the local labor bureau, and ultimately to the local People's Court if it disagrees with the arbitral award, pursuant to Article 14 of the Joint Venture Labor Regulations.

The SEZ Labor Provisions and the 1980 Regulations on Special Economic Zones in Guangdong Province make no reference to trade union organizations. Instead, labor contracts are to be signed with staff and workers, and in matters of recruitment, employment terms, discipline, and dismissals, are to be approved and supervised by the Guangdong Province Committee for Administering the Special Economic Zones (the GPC) and the local labor departments or labor service companies. The GPC is further entrusted with the task of protecting the legitimate rights and interests of SEZ enterprise employees.

Union activities

Because Chinese trade unions are vehicles for implementing the policies of the state and party, foreign investors should familiarize themselves with the law governing what unions can and cannot do. Moreover, the trade union constitution also makes clear that, in principle, it applies to unions in Chinese–foreign joint ventures and wholly foreign-owned enterprises in China.

The Trade Union Law of the People's Republic of China, promulgated on June 29, 1950, was one of the first laws passed by the newly established PRC government. Trade unions were abolished in 1966 during the Cultural Revolution and began to reemerge in 1973. But they were not formally reactivated until 1978. The related system of workers' congresses, first established in 1957 to implement the system of democratic management in state enterprises, also languished during the Cultural Revolution, but is now enshrined in the 1982 Chinese Constitution. By late 1983, more than

200,000 state enterprises had set up congresses, and workers in more than 15,000 enterprises and mines had actually elected their directors. The congresses are to meet once or twice a year, with the trade unions fulfilling their tasks when they are not in session.

Trade unions at all levels are subject to the overall leadership of the All-China Federation of Trade Unions. Local trade union organizations are to be set up at each level of government. "Grass-roots" or enterprise trade union committees are to be set up in each unit having more than 25 staff and workers. Individual membership is supposed to be voluntary. Smaller units are to elect an "organizer" who works with the local trade unions. According to the Trade Union Law, full-time trade union committee members are to be exempt from ordinary work as follows:

Number of enterprise staff and workers	Number of workers released for full-time union work
200-500	1
501-1,000	2
1,001-1,500	3
1,501-2,500	4
2,501-4,000	5

One full-time union worker is to be released for each additional group of 2,000 employees over 4,000. In units with fewer than 200 employees, one union worker may still be released from work with the approval of the higher-level trade union organization. The wages and subsidies of these full-time union workers are to be borne by the trade union, though their enterprises normally provide their insurance and welfare benefits.

Trade unions enjoy considerable management authority, at least on paper. In state enterprises and collectives they have the right to sign collective contracts with management, request work reports from management, and participate in management committee meetings. They have the right to protest the employment of additional staff and workers, and must be given 10 days' advance notice of any layoffs, which they can protest to the management and the local labor bureau. Their basic tasks, however, are to "protect the interests of the masses," supervise the wage system, ensure factory safety, see that staff and workers are provided with educational and cultural facilities, and help management realize its output quota.

Trade union meetings and activities are generally supposed to take place outside regular working hours. The enterprise is required to provide the grass-roots trade union committee with necessary building space and facilities for its activities. In addition, the enterprise must contribute to the trade union committee 2 percent of the total wage bill, of which 1.5 percent is to be used for cultural and educational activities. Failure to pay or delay in payment can result in a mandatory deduction from the enterprise's bank account, plus a penalty of 0.5 percent per day on the amount in arrears. Trade union members must also pay nominal membership dues. Union expenses are to be met out of union-sponsored cultural and sports events and from subsidies by each level of government.

Pursuant to a new trade union constitution adopted by the 10th Chinese National Trade Union Congress on October 23, 1983, the trade union locals are to operate independently under the general leadership of the local party apparatus and are answerable to union organizations at the next-higher level. This arrangement reflects the government's current policy of removing the party from day-to-day management in favor of a stronger ideological supervisory role. In addition, legal advisory offices may be set up to protect the interests of union organizations.

The 1982 Chinese Constitution and new union constitution do not mention the right to strike, but a spokesman for the All-China Federation of Trade Unions has stated that workers may temporarily evacuate the premises in defiance of orders by enterprise leaders when working conditions endanger their lives. Moreover, they can hold short-term strikes after exhausting all normal means of expressing their reasonable demands. On the other hand, the union must cooperate with the government and the enterprise to resolve the situation without affecting the overall "interests of society." Since domestic enterprises are deemed to be owned by the people, a strike is generally viewed as being injurious to the interests of society.

The workers' congresses, which meet at least every six months, set union policy and theoretically exercise considerable power over enterprises. For example, according to the 1981 Interim Regulations on Staff and Workers' Congresses in State Industrial Enterprises, congresses are empowered to:

- ▶ discuss and make resolutions on the director's report, budget, final accounts, and other major issues;
- ▶ decide how to use the welfare and bonus funds, set reward and punishment procedures, and determine housing allotments;
- ▶ determine overall training, management, and enterprise policies; and
- ▶ supervise leading cadres and staff, and elect leading management personnel from the candidates assigned to the enterprise by the department in charge.

Local governments, like enterprises, are under a legal obligation to assist unions. The labor bureau in each province, municipality, or other local government must approve labor contracts signed between enterprises and trade unions in their respective jurisdictions. Moreover, they must approve all employees hired by local enterprises, though their actual authority over foreign enterprises may depend on the nature and location of the enterprise. In addition, they arbitrate labor disputes.

Local governments are further required to provide trade unions with the necessary facilities for their meetings, welfare, and cultural and sports activities, partly supported through the monthly enterprise subsidy equal to 2 percent of the total wage bill.

Labor discipline

The 1982 Regulations on Rewards and Punishments for Enterprise Staff and Workers, which are administered by local labor departments, admonish all workers to abide by China's policies, laws, and decrees; observe labor discipline; comply with the rules and regulations set forth by their enterprises; care for public property; enhance their cultural, technical, and professional knowledge; unite and cooperate with each other; and fulfill production tasks. State enterprises must formulate their own detailed operating regulations, disciplinary rules, and codes of personal responsibility to guide their employees, pursuant to the Interim Regulations on State Enterprises promulgated by the State Council on April 1, 1983.

The rewards provided by the Regulations on Rewards and Punishments include citations for merit, citations

for great merit, promotions, orders of commendation, and the conferring of honorary titles such as "advanced worker," "model worker," and the like, in addition to monetary rewards in the form of special bonuses. In general, the enterprise trade union must propose that rewards be given, though the ultimate decision is made by the enterprise or the department in charge of the enterprise. Orders of commendation are to be determined by the local people's government or the department in charge of the enterprise, while the conferring of honorable titles is handled at the municipal, provincial, or State Council level.

Rewards are generally conferred once a year to outstanding employees who contribute to the increased productivity, efficiency, modernization, or rationalization of the enterprise. Those who earn honorary titles are to be accorded special benefits and attention, in addition to monetary bonuses. For example, they are given greater labor insurance coverage with respect to medical care and pensions, and enjoy special access to sanitariums, rest homes, and nurseries. In addition, a 1983 regulation issued jointly by the All-China Federation of Trade Unions, the Party Central Committee, the Ministry of Labor and Personnel, and the Ministry of Health requires government agencies and enterprises to pay special attention to the health and welfare of model and advanced workers, who may tend to be overly zealous in their work, take on too many responsibilities, and suffer the attacks and mockery of their resentful peers as a result of remnant "leftist" influences.

The preferred method for handling breaches of discipline is by education through criticism. If this fails, punishments and economic sanctions may be imposed after the trade union is apprised of the facts. Acts requiring discipline include:

- tardiness, absenteeism, and the failure to fulfill assigned tasks;
- disobeying orders and rules, and generally creating trouble;
- causing accidents, or creating waste that results in economic losses; and
- tax evasion, graft, embezzlement, squandering public property, and other crimes.

Possible punishments include warnings, demerits, the recording of serious offenses, demotions of one to two grades, being placed on probation without pay but with living expenses for one to two years and, in serious cases, to being fired. The Regulations on Rewards and Punishments state that an enterprise can fire an employee who stays away from work for 15 consecutive days or for more than 30 days per year without good cause. But such action must be approved by the workers' congress or enterprise trade union, and be reported to the local labor department or the department in charge of the enterprise. In addition, recalcitrant employees may be fined, but not for more than 20 percent of their basic monthly wage. Furthermore, employees must make good any economic losses caused by their behavior. The amount assessed against them is deducted in monthly installments of up to 20 percent of their basic monthly wage.

The decision to fire someone must be carried out within five months of the misdeed, while other misbehavior must be punished within three months. The enterprise is required to notify the employee in writing of the fine or punishment, and enter the fact into his or her personal file. The employee then has 10 days to appeal to "higher leading authorities," although the original punishment is to be carried out pending the review by higher authorities.

These disciplinary measures appear to apply to joint ventures and other types of foreign enterprises in China. Article 5 of the Joint Venture Labor Regulations states that joint ventures may, in accordance with the seriousness of the case, impose sanctions on employees who violate regulations and "thereby cause certain bad consequences." The 1984 Procedures for the Implementation of the Joint Venture Labor Regulations (the "Joint Venture Labor Procedures") mention "education through criticism," fines and economic compensation as possible sanctions, but do not specifically list discharging workers as a punishment. More detail is provided in the 1981 SEZ Labor Provisions, which apply to joint ventures, cooperative ventures, and wholly foreign-owned enterprises in the special economic zones. They prescribe warnings, demerits, wage reductions, and discharging workers as sanctions for violating enterprise regulations.

Under all three sets of labor laws, a decision to discharge an employee must be reported to the department in charge of the joint venture, the local labor management department, or the special economic zone labor department, as the case may be, for approval. They permit foreign enterprises to dismiss employees with compensation if technological and production changes render them superfluous, provided that an effort is made to retrain them or place them elsewhere in the same enterprise. Severance pay or other forms of compensation by joint ventures is to be paid in accordance with the length of employment and the labor contract. In the case of an SEZ enterprise, laid-off workers must receive one month's wage for each full year of employment, and discharged employees are entitled to one month's wage if they have worked less than one year, and to one-half of one month's wage if they are still on probation. The Joint Venture Labor Procedures stipulate that a discharged employee of a joint venture outside of the SEZs is entitled to one month's average wage for each year of employment up through 10 years, and one and one-half month's average wage for each full year thereafter.

The Joint Venture Labor Procedures prohibit a joint venture from dismissing any staff member or worker who is being treated for or recovering from a job-related injury or occupational disease, who is hospitalized for treatment of other illnesses or injuries, or who is six or more months pregnant or on maternity leave.

In actual practice very few firings and lay-offs have been carried out by Chinese–foreign joint ventures or foreign enterprises in China, and when they do occur Chinese and foreign executives are understandably close-mouthed on the subject. It is known, however, that the Xiangzhou Woolen Mill compensation trade deal set up by the Macao Textile Company Ltd. in the Zhuhai SEZ suspended business in November 1979, nearly a year after it went into operation, in order to overhaul management and improve quality. Some 21 workers were fired for incompetence and violating labor discipline. The operation reopened for a time but has now been closed down. Moreover, according to the *China Daily*, the Jianguo Hotel joint venture in

Very few firings have actually been carried out by foreign joint ventures in China, and when they do occur Chinese and foreign executives are understandably close-mouthed on the subject.

Beijing has had to discipline some 12 employees, three of whom were fired, since its opening in the spring of 1982. One hotel driver, for example, was fined ¥35 for failing to properly maintain his car's batteries. In Fujian Province, the Chinese president and director of the Hitachi Television joint venture reports that he once had to lay off 100 workers. One worker, according to the Chinese press, was fined ¥9 for negligence, and a driver who refused to help move a load during the last half-hour of his shift was fined one-half of his year-end "energy conservation reward." The Beijing Air Catering joint venture also has reported that in mid-1981 it fired three workers who had hit others at will, damaged public property, and violated the venture's operating rules.

These are, admittedly, only a few examples. But they do demonstrate that foreign investors *are* insisting on minimal labor discipline. Even in the eyes of the local Chinese press, this is a welcome development that is needed to raise efficiency in all enterprises in China, both Chinese and Western.

Labor protection provisions

Article 13 of the Joint Venture Labor Regulations requires joint ventures to implement the rules and regulations of the Chinese government concerning labor protection, and to ensure overall safety and "civilized production." The Joint Venture Labor Procedures and SEZ Labor Provisions impose a similar requirement, and add that joint ventures and SEZ enterprises must implement the various systems and regulations concerning labor protection, including special health measures for female workers, in accordance with Chinese law.

Since its founding in 1949, the PRC has issued a myriad of regulations promoting safe, sanitary working conditions. The Regulations on Safety and Hygiene in Factories were promulgated in 1956 together with the Regulations on Safety Technology for Construction and Installation Projects, and the Regulations on Reporting of the Injury or Death of Workers and Staff Members. All are apparently still in force. After the chaos of the Cultural Revolution, the Party Central Committee issued a Notice Concerning the Conscientious Implementation of Labor Protection Work in 1978, followed by a series of State Council directives, including the 1982 Regulations on Mine Safety. In 1980 the State Council declared that May of each year was to be "Safety Month." This observance was to be accompanied by safety education campaigns, enterprise inspections, and the filing of reports. The 1982 Chinese Constitution also specifically provides that the state shall strengthen labor protection and improve working conditions.

On the enterprise level, managers are now expected to draw up and implement detailed safety and sanitation plans and regulations in coordination with the enterprise trade union. Pursuant to the 1963 State Council Regulations Concerning the Strengthening of Enterprise Safety in Production, all leading personnel, specialized departments, technical personnel, and production workers are held responsible for developing such plans and regulations. All work-related accidents and deaths must be reported to the management, trade union, department in charge of the enterprise, local labor department, and higher authorities. They must be investigated, and individual or collective responsibility assessed in order to impose the appropriate sanctions. With regard to hygiene or sanitation, special laws prescribe the sanitary conditions governing food-related industries, and specify what constitutes adequate and hygienic toilet, washroom facilities, and eating establishments in Chinese enterprises.

Women and youths receive special protection. Workers must generally be at least 16 years old, a regulation expressly contained in the SEZ Labor Provisions, although younger workers may sometimes be hired as apprentices, subject to shorter working hours and a prohibition against night work.

Women are covered by a variety of laws, including the constitutional prescription that they are to be treated equally with men in terms of employment and compensation. Other laws prohibit their dismissal or reduction in wage for reasons of marriage, pregnancy, childbirth, or nursing a child. Women are prohibited by law from certain kinds of arduous or dangerous work, such as coal mining. Pregnant women, especially after the seventh month, are not to be assigned to night-shift work and are to receive special rest periods and other considerations. Nursing women have at least one-half hour off each day to nurse their infants. If an enterprise has a large number of female workers, it must provide nurseries, special resting rooms for pregnant women, and other special facilities.

Although China's labor regulations may seem unfamiliar or unduly burdensome, nevertheless they do apply across the board to foreign and domestic enterprises alike. The few instances of discrimination that exist favor Chinese–foreign joint ventures and foreign firms to the extent that they enjoy greater autonomy than most Chinese enterprises. But they also pay much higher costs for their labor services.

Labor-related issues are sensitive in all countries, regardless of the nature of the economy. China is no exception. One can only hope that, armed with a clearer appreciation of China's particular system, foreign investors can truly realize the goal of "equality and mutual benefit" in their dealings with China.

Microcomputers in China

Not since the days of mass campaigns and "great leaps" have China's leaders been so concerned with catching up

James B. Stepanek

It has only been nine years since the first commercial microcomputer arrived on the American market. Since then China's own production of microcomputers has grown to nearly 9,000 machines per year (including single board units). Production is projected to reach 30,000 units by the end of 1985.

Imports are rising even faster. Roughly half of all micros in China could be imported models by the end of 1984, with Apple IIs and Cromemco CS-1s and CS-2s accounting for about 55 percent of all imports. As a result, China's inventory of 8-bit and 16-bit computers could reach 57,000 by the end of this year, equivalent to about 2 percent of the total number of installed microcomputers worldwide.

But this success has not been easy Chinese-built micros still tend to be overpriced, poorly constructed, and can be described as "desktops" only in a land of oversize Mandarin furniture. Moreover, foreign vendors report that a significant percentage of their micros are not used properly or are idle, largely due to a severe shortage of software.

According to one West Coast executive, the challenge facing China is this: "Progress has been rapid. That I will say. But this is not a cause for optimism in the context of an industry that is exploding. Each passing year China could find itself further and further behind."

"Time does not wait"

One Chinese leader who feels the sense of urgency is Vice Premier Wan Li, chairman of China's Computer Leading Group. He admonished his colleagues at a recent computer planning conference: "We are at least ten years behind . . . . This business must be managed properly because time does not wait for us!"

Such cries of alarm are beginning to stir the government into action. Last September the triumvirate of China's most powerful planning agencies, the State Planning Commission, State Economic Commission, and State Science and Technology Commission, decided that the country's hardware industry should focus on microcomputers as opposed to minis or larger computers. This February Electronics Minister Jiang Zemin announced that in 1984 and 1985: "We will concentrate our efforts on building a technological basis for the microcomputer industry . . . to develop the production of 8-bit and 16-bit microcomputers."

To make sure the official line was getting through, the *People's Daily* carried this commentary: "The new technology is superior to the old. If you do not want your enterprise to be left behind, please pay attention to computers." Then the State Economic Commission announced that it would launch its nationwide computer courses for factory managers this June. The *Economic Daily* reports that all provincial-level party cadre schools have been told to set up similar courses.

Local leaders are getting the message. Liaoning Province has decided to grant interest-free loans to all factories buying microcomputers. And when Anhui Province set up a microcomputer "leading group," two vice governors had to be appointed co-chairmen, since both refused to be left out.

The key decisionmakers

Today most major cities and provinces in China have a computer leading group, computer industry corporation (usually spun off from the local bureau of electronics industry), software development center, training center, and various user and consultancy groups. In theory, these organizations come under the ultimate policy control of Wan Li's Computer Leading Group and the powerful Ministry of Electronics Industry. The ministry's National Computer Industrial Bureau reportedly controls the bulk of microcomputer imports. Beijing's new computer industry corporation, for example, reportedly supervises 33,000 people at 50 computer facilities around the city. In Hunan, as elsewhere, it is not unusual to find corporations and software centers dedicated solely to microcomputers.

It is largely these entities that set import policy, and it is now fairly clear where their priorities lie. The largest purchases of microcomputers have gone to ▶ educational institutions, both for training and research, ▶ factories and institutes, to raise quality through computer-controlled production processes, and ▶ government agencies, for accounting and statistical analysis.

The Chinese are also interested in computer-aided design and computer-aided manufacturing technology, especially now that very powerful CAD/CAM systems are becoming commercially available for 16-bit micros. But very few sales have survived export controls. (One that did required CDC's French subsidiary to post an expatriate in China to oversee its operation.)

Training future users

Computer Systems and Technology of Farmingdale, Long Island, has sold as many as 700 microcomputers to Chinese educational institutions. "We are a small OEM," explains CS&T President, Dr. Chien F. Chao. "We have sold a limited number of

kits and board-level products, but most of our sales have been complete 8-bit and 16-bit machines bearing the labels of such US companies as Dual, Heath, and Terak. Our largest systems come with one floppy disk drive and 10 megabyte Winchester drive. We have also sold Prism printers made by Integrated Data Systems." OEMs, or original-equipment manufacturers, bring together components from various companies in order to meet a customer's specific price and performance needs. "We have not yet sold systems capable of handling the *Cang Jie* method and other Chinese-language entry systems," Chao notes. "But one of our machines has a partial Chinese word-processing capability."

Dr. Chao has worked with the Hefei Polytechnical University in Anhui Province for many years. There he helped set up a computer training center that became a regular college program in 1980. So successful was it that he resigned his teaching post at the University of the District of Columbia to establish CS&T.

Apple and Kaypro have also focused on colleges and universities. According to one Apple executive, "Our computers in China tend to be used by faculty and research students, that is, at a much higher educational level than here in the US." As many as 8,000 Apples are currently being used by research and educational institutions in the PRC.

Kaypro's donations

Kaypro Corporation of Solana Beach, California, recently donated 10 Kaypros to Tianjin University as part of a program of "selective donations" to Chinese organizations. Six other grant proposals await export licensing. Explains Kaypro media consultant Dan Burnstein: "The Kaypro concept apparently appeals to the Chinese. A Kaypro machine has no proprietary substance. It is a bundled system. The philosophy is to build the most powerful machine for the lowest price." Adds Kaypro's Director of International Marketing, Art Tonnaer: "For the China market we will certainly evaluate the possibility of adapting our computer to Chinese characters as we have for Arabic." The Dorado Company of Seattle, Shanghai, and Beijing is the exclusive distributor of Kaypros in China. Says Dorado President Harry Rutstein: "I'm now looking into the possibility of assembly in China. These systems seem to fit in with China's desire for inexpensive, high-powered micros."

The World Bank's $200 million university development loan gave a boost to the AI Electronics Corporation of Japan, which sold 16-bit micros to 23 universities and research institutes. Each $21,000 system came with the AI M16 8086 multiprocessor, CRT display, printer, X-Y plotter, 8-inch floppy disk drive, and 5 1/4-inch Winchester disk drive. The same loan also helped IMS International sell a number of its 8-bit micros. The door is being opened even wider for computer firms with the World Bank's $75.4 million agricultural education loan and $85 million TV university loan.

Improving factory management

China's immense labor force has made a few computer executives stop and wonder at the wisdom of using expensive computers to "replace" inexpensive labor. After a few on-site visits, though, US visitors seem to believe that micros in China are being used to accomplish tasks that labor cannot perform. For example: automating air and hotel reservations, controlling rail shipments to minimize inventories, and producing precision machinery.

These tasks would be hard to do without computers. This is why Beijing's new Great Wall Hotel installed two 16-bit Data General Eclipse S/140s in 1983 to run their Champs hotel account management software. At about the same time, the Capital Iron and Steel Corporation announced that it regularly uses Intel, Cromemco, and TRS 80 micros. Coincidentally, Wang Labs picked this steel mill for its first networking demonstration in China on March 29, 1984.

In addition, micros are used by fishing companies, department stores, oil drilling engineers, and textile plants. One "micro pioneer," according to the *China Daily*, was Beijing's Qinghe Woolen Factory. In 1979 it bought a microcomputer for accounting. "The next step . . . is to put terminals in the offices of the factory directors," the report said.

A few Cromemcos and Apples were even called into service to help with China's 1982 census. The upcoming 1986 census of China's entire industrial establishment represents a far more significant business opportunity. That year the State Planning Commission, State Economic Commission, Ministry of Finance and State Statistical Bureau will jointly launch the most complete survey of Chinese enterprises in the history of the PRC. A major goal of the two-year survey is to standardize, and eventually computerize, all Chinese enterprise production and financial accounting systems.

One reason China's managers seem to prefer micros is their size. They are small, but so are most databases in China. The generally secretive nature of Chinese society for many years thwarted the pooling of information. The Cultural Revolution alone destroyed databanks in government, industry, and academia. During those chaotic years the gathering of economic statistics nearly stopped altogether. As a result, microcomputers are probably more than adequate for most Chinese enterprises, although large computers are obviously still required for major research projects.

Software problems

Many software vendors are unhappy with their experiences in the China market. Few are selling off-the-shelf business and accounting programs. Says one US computer executive: "We're discouraged. The Chinese usually buy only one or two software packages. It did no good to sell copy-protected software in ROM or hard disk storage." Warns another: "That is one market I would avoid."

"The easy availability of microcomputer software in Hong Kong and throughout Asia is a real disincentive to US firms," a vendor explains. "The Chinese are probably looking at what's going on in Taiwan and Hong Kong, and asking themselves: Why pay high prices for foreign software when it is practically given away? Even rock music stores in parts of Asia sell pirated versions of WordStar and dBASE II at a fraction of their US cost. For the price of a fake Apple II, Hong Kong stores sometimes will throw in anything that runs on CP/M."

Chinese user groups also distribute free software to their members, a practice that is not unknown in the US. The first user group was reportedly organized in Beijing in July 1980

to help users on the 16-bit DJS 100-series computers. Other groups followed, such as the Jiangsu Provincial Microcomputer Applications Association based in Yangzhou, and the Chinese Character Information Processing Technology Users Association in Changsha. The latter group distributes software that runs on Cromemco and Dynabyte micros.

As any international trader knows, however, depressed prices often impede the rate of technology transfer between nations. To many observers it comes as no surprise that Chinese computer-users are desperate for better software, despite the availability of pirated programs. "I would say that only about 60 percent of our micros are being used effectively due to the lack of good software," a Midwestern executive reports.

"They loved it"

Visitors to China are regularly astonished to learn that Chinese computer operators frequently have to write their own software. Claims one: "At the Shanghai Computer Factory I saw customers who had come to the factory to learn how to operate their machines. The whole user-friendly notion is totally absent." Says Rene Moore, president of Calculating Lady, Inc., "Most Chinese users begin from scratch because they have no knowledge of what's out there."

Last fall Moore taught a computer accounting course at Tianjin University. Her only teaching aids were two portable Kaypros. "It became apparent from day one that the students expected me to teach them how to write a bookkeeping program using BASIC or Pascal or something. But I had no intention of reinventing the wheel. They simply were not aware of the enormous number of excellent off-the-shelf products that are now commercially available. I lectured on SuperCalc and Champion. As you might imagine, they absolutely loved it. They said their whole view of micros was totally changed." Her students included prominent officials in the Bank of China, China's national airline, Tianjin University, and a local steel mill.

Sophisticated software

Selling advanced software, however, has been more successful. Foreign firms have signed numerous software contracts for everything from hotel management and statistical analysis to the recent $12 million Mitsui software deal for the Nanjiang General Petrochemical Works. In some cases the Chinese are willing to pay for software improvements as they come on stream. Moreover, the Chinese government treats software as intellectual property, though it is not extended patent protection. This has had the effect of making it easier for Chinese firms to accede to demands that they sign agreements not to copy or transfer imported software to third parties.

A hopeful sign was China's decision in late 1983 to give software development the same attention accorded microcomputers. At the March 25–29, 1984, national software planning conference, Chen Liwei, an Electronics Ministry official, blamed the weakness of China's software industry for throwing the entire computer industry "out of balance." According to the *China Daily*, he also made the admission that the lack of incentives is part of the problem. "With no copyright law to protect software," he said, the work of software specialists "has not been rewarded properly and their initiative is dampened." The conference mapped out a five-year software development program for the nation, and resolved that by 1990 the number of Chinese software specialists would increase tenfold to 100,000.

The revolution in a revolution

The microcomputer revolution in the West has given rise to an equally important revolution in the arcane field of electronic Chinese. Today Chinese ideographs or characters can be entered on a computer keyboard as one would English text, be edited on the screen, and then with the press of a button, be printed, filed, or transmitted by telephone line to another computer or telex terminal. What is remarkable is that these routine functions can be performed in Chinese, the complex tonal language that many predicted would stop office automation cold.

Eastern Computer in the US, Multitech in Taiwan, and Jiaotong University and the Hunan Electronics Institute in the PRC, are among the many organizations developing practical, relatively low-cost Chinese-language systems. The technology broadly falls into two categories: systems that store the Chinese characters on floppy or hard disks (*see* page 34), and those that place the Chinese in the computer's hardware (*see* page 30). The latter type utilizes Chinese character "generators," or microprocessors, that can plug into the back of most existing microcomputers.

How Chinese ideographs are typed into a computer is confusing to many. There are no more than ten common inputting methods commercially available in Taiwan (down from the many dozen originally on the market), while there are several hundred (one government source claims 400) under development in the PRC. A number of equally imaginative methods have been developed in the US, UK, and West Germany. But the shakedown has already begun as IBM, NEC, Fujitsu, and other industry giants begin to make decisions that will establish tomorrow's standards. A few of the better known methods:

▶ ***Cang Jie*** Invented by a Taiwan linguist more than ten years ago, this method is now the most commonly accepted one in Taiwan and Hong Kong, and is gaining acceptance in the PRC. Moreover, it is used by the IBM 5550 recently released on the Taiwan market.

The *Cang Jie* method takes advantage of the standard English keyboard by assigning 24 English letters as its basic building elements. Each Chinese character is entered by pressing from one to five English letters. The method's clear first-place finish at last fall's competition sponsored by Taiwan's official Institute for Information Industry has not been lost on industry observers. Typists using the *Cang Jie* method averaged 57 characters per minute, while equally competent typists using two variants of the three-corner method only scored 35 characters per minute. Most of the other methods were in the 15–30 characters per minute range. A typist using the "combined" method that incorporates elements of *Cang Jie* and Pinyin averaged only 14 characters per minute.

▶ ***Three corner*** Wang Laboratories uses a successful variant of the three corner coding method that reduces all Chinese characters to roughly 100 "radicals," or character components. Characters are entered by typing in the codes for the three radicals appearing at the top left, top right, and bottom right corner of

each character. First on the market in 1976, age has not diminished the Wang method's popularity.

▶ ***Pinyin*** Quite a few Pinyin methods have emerged since 1979, when China officially promulgated the 23-letter romanization system developed in 1958 that produces such words as Xi'an for Sian and Beijing for Peking (and now Xiang Gang for Hong Kong). The problem is that Chinese words cannot be typed into computers according to their sound alone. Many Chinese words (usually composed of two ideographs) are pronounced the same way, and many have both the same sound and tone inflection. As a result, many Pinyin methods require the user to enter additional codes when typing in a word's pronunciation. These codes represent radicals or one of the four tones used in Mandarin Chinese or Putonghua. Never popular to begin with, the various Pinyin systems could die out if left behind by the computer revolution.

Other contenders

These are by no means the only methods in use. There is the Dragon method, similar to *Cang Jie*, and the old telegraphic code method, the earliest form of electronic Chinese. The latter uses four digit numbers to send Chinese characters by telegram. Until quite recently, the system was limited to 4,808 common characters and 10,000 (now 20,000) characters overall. It has been adopted by a number of computer firms, and enjoys the advantage of being the only system based on a pre-existing entry method already known to several thousand telegraph operators, though it is not very convenient for anyone else.

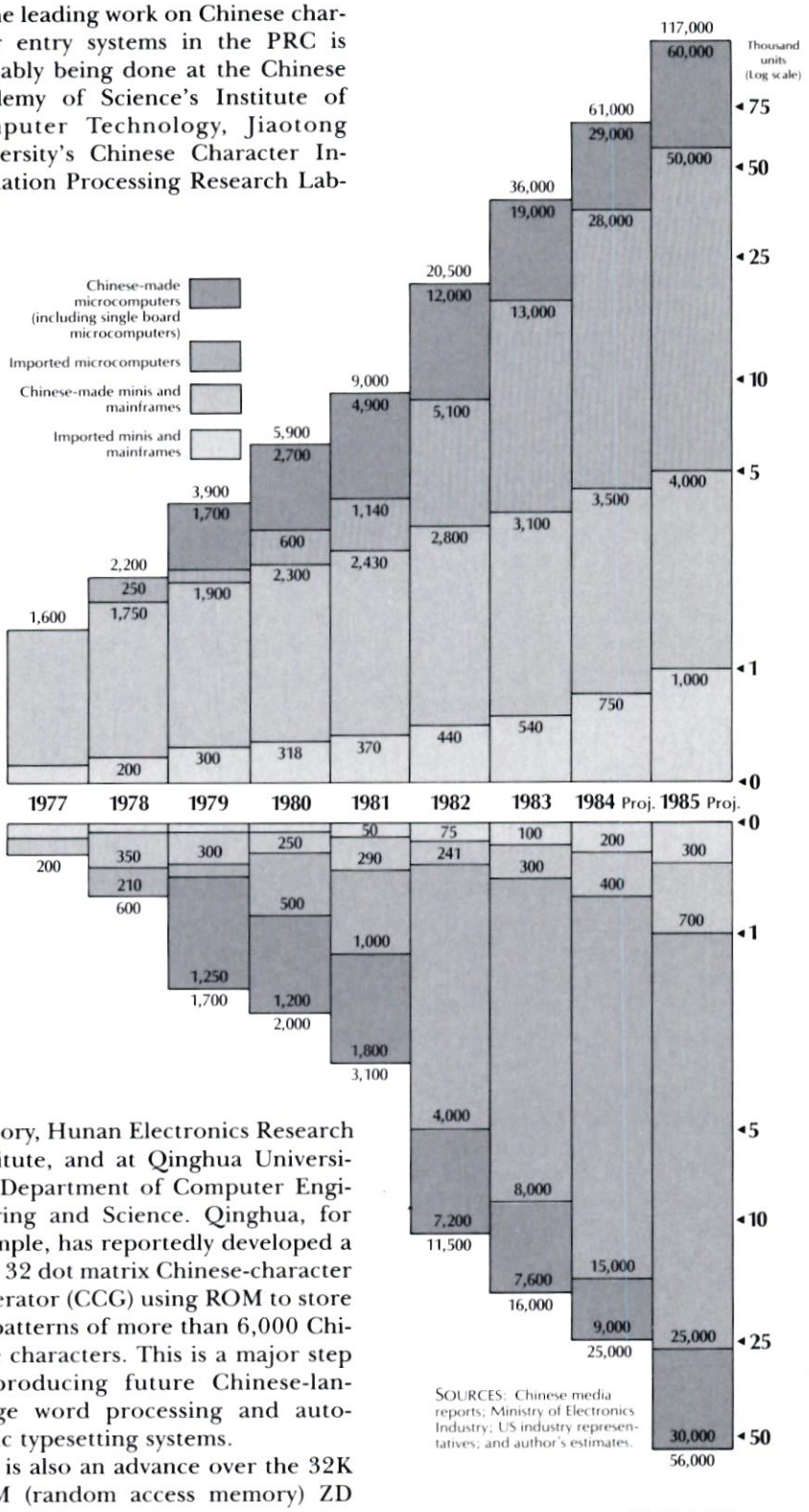
The large keyboard system, an early contender in the market, uses keys for all the radicals needed to compose the several thousand Chinese characters required in business correspondence. The IBM Japan version of this method relies on a 30 by 18 inch keyboard with over 300 keys, and is commonly run on the IBM 4331. Each character requires 256 bits to 576 bits of storage in ROM (read only memory), floppy disk or hard disk, according to one authority. It has a limited vocabulary, and IBM has moved on to more promising technology. Though impractical for effective usage, the large keyboard method is perhaps the easiest for a beginner to master, and several versions are currently marketed in Taiwan.

Qinghua's remarkable CCG

The leading work on Chinese character entry systems in the PRC is probably being done at the Chinese Academy of Science's Institute of Computer Technology, Jiaotong University's Chinese Character Information Processing Research Laboratory, Hunan Electronics Research Institute, and at Qinghua University's Department of Computer Engineering and Science. Qinghua, for example, has reportedly developed a 32 x 32 dot matrix Chinese-character generator (CCG) using ROM to store bit patterns of more than 6,000 Chinese characters. This is a major step in producing future Chinese-language word processing and automatic typesetting systems.

It is also an advance over the 32K RAM (random access memory) ZD 2000 Chinese microcomputer unveiled in September 1981 that reportedly stores 4,096 Chinese characters internally. Developed by the Yanshan Computer Center, the ZD 2000 uses a standard ASCII (Ameri-

CHINA'S COMPUTER INVENTORY
(Year-end estimates)



SOURCES: Chinese media reports; Ministry of Electronics Industry; US industry representatives; and author's estimates.

CHINA'S ESTIMATED COMPUTER PRODUCTION AND IMPORTS

The Magical CCG

How to turn an "English" computer into a Chinese word processor

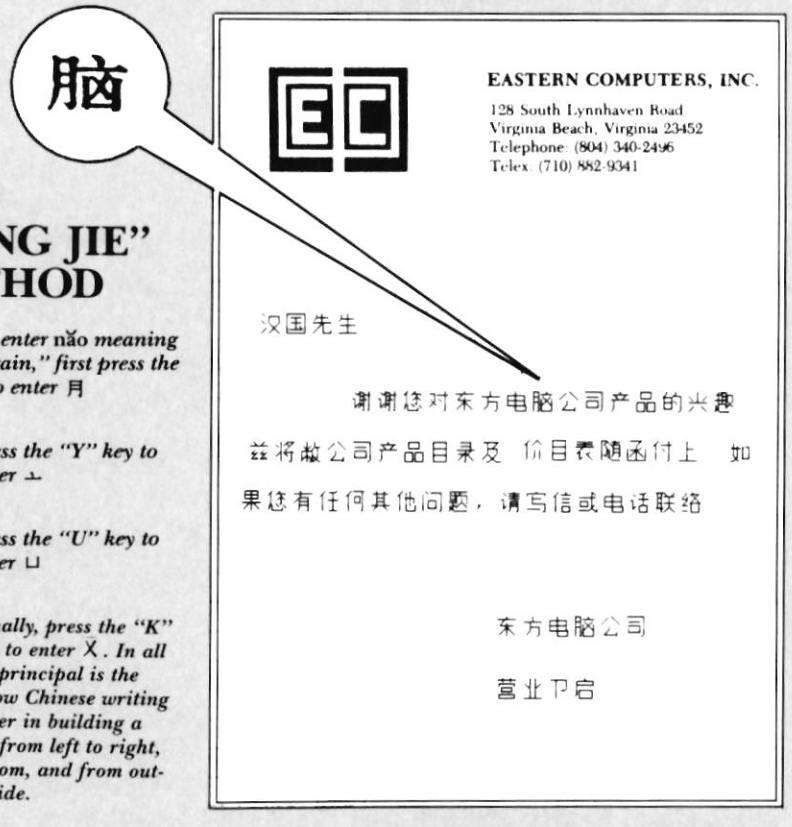
Richard T. Cheng

By simply plugging a board into any expansion slot in the back of an Apple II, IBM PC, or other common microcomputer, it is now possible to type in Chinese ideographs that appear on the CRT as fully-formed 16 x 16 dot matrix Chinese characters. A single keyboard command switches the computer back to an English mode, so that one can easily write a business letter in English and intersperse the correspondence with references to Chinese names, addresses, or technical terms. When the correspondence is edited, another command sends the appropriate graphics code to the printer, or through the modem to a "mailbox" anywhere in the world.

This extraordinary microprocessor board is the Chinese Character Generator, or CCG, that I and my associates Chu Bangfoo and H. L. Shen first began to develop in 1971. Not only can the CCG use an ordinary English computer keyboard to produce more than 30,000 Chinese characters, both simplified and classical, but the available applications software permits sophisticated text editing, financial analysis, database management, and even mailsorts—all in Chinese. The $800 board comes with a brief instruction manual on one floppy disk that runs on CP/M, CP/M 86, MS DOS, or Apple DOS, and accepts most higher programming languages such as BASIC, Pascal, or COBOL.

Unlike many other systems, the CCG has minimal system requirements: a microcomputer with a random access memory (RAM) of only 48 Kbytes and graphics memory of 8 Kbytes. This enormous savings in memory space is achieved by "storing" the Chinese characters in the CCG's micro circuitry, not on hard or floppy disks, which reduces the space available for other purposes, such as storing programs, documents, and addresses. So efficient is the CCG, in fact, that 5 bytes are sufficient to store one Chinese character. This is the same space required for an English word of five letters. A third generator CCG, now in trial production, will be able to store 36,000 Chinese characters in only 2 bytes of space per character. It will produce characters in 24 x 24 matrix form.

Most Chinese-speaking users can learn how to type in Chinese in a week or so using the very popular *Cang Jie* method, named after the legendary inventor of Chinese ideographs. The method was developed by Mr. Chu, who spent 10 years studying the structure of Chinese characters and subsequently developed a Chinese character database. The *Cang Jie* method uses 24 English letters as its basic building blocks; each character usually requires 1 to 5 English letters or strokes on the keyboard. The sequence of letters represents different parts of a Chinese character. For example, the letter "A" correlates with the sun, and "B" with the moon in the character *ming* (明) meaning bright, which is formed by simply typing in "AB". The simplicity of the *Cang Jie* method permits an average trained individual to type 50 to 60 characters per minute. This is really comparable in speed with a somewhat faster English typist, since Chinese characters tend to represent complete components of thought and therefore produce text that is generally shorter and more compact than an equivalent English text.



THE "CANG JIE" METHOD

1. *To enter nǎo meaning "brain," first press the "B" key to enter* 月
2. *Press the "Y" key to enter* 𠂉
3. *Press the "U" key to enter* 凵
4. *Finally, press the "K" key to enter* 大. *In all cases, the principal is the same: follow Chinese writing stroke order in building a character from left to right, top to bottom, and from outside to inside.*

Richard T. Cheng is chairman of the Computer Science Department at Old Dominion University in Norfolk, Virgina. In July 1980 he incorporated Eastern Computers, Inc., which currently designs, assembles, and markets the CCG in addition to a host of related word-processing technology for Chinese, Arabic, Spanish, Korean, and Thai, among several other languages.

can standard code for information interchange) code keyboard and runs a BASIC software system for Chinese-character processing and editing. As with other systems, it also has special output software that drives dot matrix printers and CRTs.

At Jiaotong University, too, the emphasis has been on perfecting a CCG chip to run on its new MIC 48C microcomputer. Its current best microprocessor has 7,168 Chinese characters, and runs on CP/M. Both 16 x 18 and 24 x 24 dot matrix patterns are stored in EPROM (electrically programmable read only memory). Moreover, it reportedly can use either an ASCII keyboard or China's own unique GB 2312-80 exchange code standard. The Hunan institute claims a breakthrough in software-based Chinese word processing using a Cromemco Z-80 C and Apple IIe. Along similar lines, the Jiangsu Computer Technology Institute has modified a Dynabyte A micro to run on a CP/M-compatible EC DOS (English–Chinese universal disk operating system).

The real capability of these systems is hard to determine, however. It is not unusual for the Chinese press to claim that 100 or 120 Chinese characters per minute or more can be entered using a particular system. But according to a foreign software delegation that visited China last year, "none are particularly elegant or efficient."

Chinese-on-a-chip

As one might have expected, small companies were among the first to grasp the importance of marketing micros with Chinese-language capability. Among the first was Progeni, a small New Zealand firm that sold its Poly micros to a primary school run by the Huainan Coal Mining Institute. Its 64K RAM machines offered software, called "courseware," for Chinese, math, physics, accounting, and career guidance.

The founder of Apanda, Inc., became interested in computers and Chinese when a student himself. Today James Bock's Houston firm is taking advantage of the sharp decline in hard-disk prices (from roughly $4,000 two years ago to less than $1,500 today for 10 megabytes) by developing a system to store very high quality Chinese characters in a 10Mbyte Winchester drive. (1 Mbyte is equal to 1,024,000 positions of computer storage.) The product is designed to meet the need for "letter quality" Chinese text.

Eastern Computers, Inc., of Virginia Beach, Virginia, and International Ideographics, Inc., of Anaheim, California, could be the world's two leading designers of Chinese-character generators. Both firms have taken similar paths to their current market preeminence, and hope to start selling expanded third generation CCGs by year's end. These microprocessors will be able to store 36,000 24 x 24 dot matrix Chinese characters in an average space of only three bytes per character, according to John C. Hao, president of International Ideographics. Dr. Richard T. Cheng, founder and chairman of Eastern Computers, expects their latest CCG to be on the market this summer.

Ferranti of Manchester, England, is marketing a two-disk drive Scholar II micro equipped with two Chinese inputting methods and more than 8,000 simplified and classical characters in 24 x 24 dot matrix format. Its debut at last year's military products fair in Shanghai led to follow-up demonstrations this January and March in Beijing.

"The Macintosh lends itself ideally to writing Chinese," remarks Sami Asfour, Apple Computer's manager of Far East marketing. "Writing Chinese with the mouse, for one, will be extremely easy compared to the systems now on the market," Asfour adds. He would not confirm or deny that Apple is presently developing such a system. (Anyone developing a Chinese entry system should avoid infringing on the rights of Chinese patents, advises a United Technologies executive. "The Chinese are currently patenting a number of their systems in Europe, Japan and the US," he points out.)

Seeking a "larger market"

According to Hewlett Packard's director of China operations, Chi-ning Liu, "you will never reach the larger market of commercial enterprises and government offices until micros have some Chinese-character capability." Holding HP back is the lack of standardization. "There are over 200 inputting systems currently in use," he notes. "Therefore we add a Chinese word-processing capability to the systems we sell the Chinese. They get a Chinese-character input/output package, but we leave it to them to develop the necessary applications software."

Taiwan's leadership in Chinese-character systems may explain HP's joint research agreement with Taiwan's prestigious Institute for Information Industry, and its introduction last year of a new Chinese-character computer system for all computers in its HP 1000 and HP 3000 family.

These, together with the HP 9836 and 9826 desktop models, are the mainstay of HP's activities in the PRC, according to Liu. HP opened its service center in Beijing in February 1981, and its representative office on September 1 the same year. The center's staff of 65 Chinese provides demonstrations, training seminars, maintenance, and spare parts. HP pays the center a commission based on sales and the cost of providing warranty services. It maintains only one full-time representative at the wholly Chinese-owned center, HP country sales manager, Colin Chin.

A truly natural language

The marketing strategy of International Cyber Machines Corporation of Princeton Junction, New Jersey, seems to be a mix of common sense and uncommon vision, at least that is the hope of its founder, Dr. Victor C. Yeh. A MIT Doctor of Science and long-time Chinese-language computer systems developer, Dr. Yeh became disenchanted with the work being done in the area of Pinyin entry systems. "Just because the Pinyin approach may be a dead end does not mean a phonetic system cannot work. My biggest problem is convincing people that the age of artificial intelligence is upon us, so it would be a tragedy to abandon this approach."

Dr. Yeh set to work ten years ago on two fronts, first to invent a practical tone-based phonetic Chinese alphabet, and then assign his new phonetic spellings to several thousand common Chinese characters. "The problems were formidable. In contrast to most languages in the world, Chinese is tone-based. This fact has frustrated the development of a phonetic system for the Chinese language in spite of the tremendous efforts made over the past century."

Yeh continues, his enthusiasm rising: "China's current efforts to upgrade the Pinyin system from a mere

sound annotation system to a full-fledged phonetic natural language have not been successful. The difficulty is that any sound-based alphabet must be modified to handle tones. My 85-letter PCA (Phonetic Chinese Alphabet) is the first Chinese alphabet that permits you to 'spell' all Chinese characters without any ambiguity as to which ideograph you mean." He adds: "Because this is the first truly natural language, it is now possible to do alphabetical listings of names, sorting, merging, and searching as easily as one would in English. The path to artificial intelligence is now open."

Wang Labs, Perkin-Elmer, NCR, and Honeywell all offer their customers some form of Chinese-language system, or at least help them install such systems in their products. A Wang executive estimates that half of the more than 160 Wang VS systems sold to the PRC since 1979 incorporate some type of Chinese-language capability. "Each $50,000 to $100,000 system has three to four terminals, one 16-bit CPU, and one or more printers. Just about all are for business, accounting, or economic analysis," he says. Wang recently set up a joint research and service center at the Hubei Radio Factory to develop Chinese-language computers and office automation systems. It also offers "office automation technology ... applied software development and training," Xinhua News Agency announced on March 5. Wang's VS line also got another push with the January 6 opening in Beijing of its new service center run by the China National Instruments Import–Export Corporation.

PE and Honeywell

Perkin-Elmer maintains two INSTRIMPEX-run service centers in Beijing and Shanghai for its line of PE 3200-series superminis. According to Michael A. Caiafa, PE's manager of marketing communications in Norwalk, Connecticut, the company plans to open its own service center in Beijing this fall to service its new micro 7500 Professional Computer. "We will offer a Chinese-language package including Chinese software, VDUs, and printer. The end users generally prefer to add on their own inputting methods," Caiafa says. "Our customers use our machines for anything from drug research and well logging analysis, to scheduling mine production and estimating ore reserves."

Honeywell offers its customers a similar option. "A Chinese-language capability is available, but it is not part of the standard package," says Howard H. Lee, Honeywell Information System's director for business services in Asia. "Many of our clients are scientists who feel comfortable in English," he explains. Honeywell's MS DOS-based microSystem 6/10 can work alone or with a Honeywell or IBM mainframe. On April 4 Honeywell announced that it had signed a distributor contract with the Great Wall Industry Company, the Space Ministry's trading arm. The three-year nonexclusive agreement will market Honeywell minis and micros through Great Wall's Data Equipment Institute. "Micro sales still lag behind sales of our more powerful DPS-6 and DPS-8 minis," Lee notes.

NCR Corporation, however, has been marketing its 9020 and 8200-series through Hong Kong for some time. Designed for hotels and restaurants, these micros store up to 8,800 Chinese characters (3,500 in ROM) and come with a Chinese entry system reportedly capable of

CHINA'S 8-bit and 16-bit COMPUTERS

Roughly 20,000 micros have been produced in the PRC since prototype production of the first DJS micro series began in April 1977

Micro-system	Word length (bits)	Type micro-processor	Random access memory (bytes)	Manufacturer
BCM 2[1]	8	Z-80	64K	Beijing Computer Technology Research Institute and Beijing No. 2 Computer Factory
BCM 3[1]	16	-	64K	Beijing Computer Technology Research Institute
CS 2115C	8	-	-	Beijing No. 5 Computer Factory
DJS 035[2]	8	AIM-65	-	No. 734 Factory
DJS 045[2 3]	8	Z-80	-	No. 735 Factory
DJS 050[2]	8	8080	-	Qinghua University Electronics Engineering Dept., Anhui Radio Factory, Electronics Ministry No. 6 Institute, and Shenzhen Electronics Assembly Plant
DJS 051[4]	8	8080	4-6K	Shanghai Changjiang Computer Factory
DJS 052	8	8080	8-48K	Anhui Radio Factory
DJS 054	8	8080	8-64K	Yantai No. 6 Institute, Yantai No. 2 Radio Factory, and Shanghai Computer Factory
DJS 060[2 5]	8	6800	-	No. 6 Institute and No. 4500 Factory
DJS 061	8	6800	2-8K	No. 1447 Institute
DJS 062	8	6800	8-64K	Liaoning Jinzhou Computer Factory, No. 1447, Institute and Hunan Radio Factory
DJS 063	8	6800	16-48K	Shaanxi Electronics Institute
DJS 064	8	6800	11-64K	Ministry of Electronics No. 6 Institute and No. 4500 Factory
DJS 101[6]	16	-	8-32K	East China Teacher's University and Scientific Instruments Factory
DJS 110	16	-	4-12K	No. 2 Changzhou Radio Factory
DJS 112	16	-	4-32K	No. 2 Changzhou Radio Factory and Shaoguan Radio Factory
DJS 130	16	-	32K	Suzhou Computer Factory, Beijing No. 3 Computer Factory, and Weifang Computer Factory
DJS 131	16	-	32K	Shanghai Computer Factory
DJS 132[7]	-	-	-	Tianjin Radio Technology Institute
DJS 135[8]	-	-	-	Yunnan Electric Equipment Factory
DJS 140	16	-	64-128K	Qinghua University, Beijing No. 3

30 characters per minute.

IBM's high profile

The company everyone is watching, of course, is IBM, or rather, IBM Japan, Ltd., the firm's Tokyo subsidiary that has the main responsibility for marketing IBM products in China. A relative late-comer to China, IBM Japan did not clinch its first sale until 1979 before opening its office in 1980. Today the firm maintains a full-time marketing staff of 21 in Tokyo and another 7 in Beijing, headed by China branch manager Thomas Odom. New offices in Shanghai and Guangzhou will open shortly. "So far orders and installations exceed 50 intermediate and large systems," says Andrew Russell, program administrator at IBM Americas/Far East Corporation in North Tarrytown, New York.

IBM Japan's 5550 microcomputer has not yet been released in China. According to Russell, "The 5550 is a three-in-one terminal offering personal computing, the ability to function as a mainframe terminal, and Japanese and Chinese word processing. It is a 16-bit 8086-based machine," he explains. "When we do introduce the 5550 in China it will have a 'Hanzi' (Chinese character) capability. But I can't say when that will be. Nor can I speculate on what entry method or methods will be used."

Too impatient to wait, the Henan International Economic Technical Cooperation Corporation announced in March that it had written its own Chinese entry software system for the 5550. It did not disclose where it obtained the 5550 machine, which is manufactured by Matsushita for IBM Japan. A 5550 prototype with new simplified Chinese-character vocabulary (and Dragon entry system) reportedly was included in IBM's recent Beijing seminar for 42 top government leaders. Besides the 5550, the February 22–24 event demonstrated the economic benefits of the IBM PC, 4341, 3250, and 3279 color terminal.

Meanwhile, MicroPro International Corporation of San Rafael, California, signed a contract with IBM Japan to adapt three of its most popular programs to the 5550 for the Japan and China markets; WordStar, MailMerge, and SpellStar. Significantly, MicroPro is a pioneer in "icon-oriented" software like that used on the Macintosh, which relies on pictures as prompts. Some experts feel this is the direction Chinese-language systems will eventually go. An interesting demonstration of how much importance IBM attaches to Chinese word processing is the fact that three out of 11 editorial board members of *Computer Processing of Chinese and Oriental Languages* are IBM executives.

Another key agreement between IBM Japan, its parent in Armonk, New York, and Kanematsu-Gosho was announced in January 1984. Its purpose is to sell the full range of IBM microcomputers in China—particularly the 5550. Next in line, export controls permitting, could be the even more powerful 3270 PC and 370 XT desktop. The latter's 68000 microprocessor has the same power as the IBM 370 mainframe, IBM's first sale to the People's Republic five years ago.

Fujitsu and NEC

A number of Japanese firms, led by Fujitsu and Nippon Electric Corporation, Japan's largest computer firm and largest microcomputer manufacturer, respectively, quickly entered the China market in pursuit of their archrival, IBM Japan.

				Computer Factory and Liaoning Jinzhou Computer Factory
DJS 142	16	-	.5M	Liaoning Jinzhou Computer Factory
DJS 153	16	-	32-128K	No. 785 Factory and Tianjin Radio Technology Institute
DJS 154	16	-	32K	No. 738 Factory and Dalian Radio Factory
DJS 183	16	-	28K	No. 830 Factory and Hubei Radio Factory
DJS 184	16	-	32-128K	No. 1915 Institute
DJS 185	16	-	32-128K	Shanghai Computer Factory
DJS 186	16	-	16-128K	No. 1915 Institute
DYL 1300[8]	16	-	-	Chinese Academy of Sciences Semi Conductor Research Institute
Great Wall 100[1 9]	16	8088	64-512K	Beijing Research Institute of Electronics Application, and Beijing Wire Communications Factory
KD 4	-	280A	16K	Science and Technology University
MIC 68K	16	68000	32K	Jiao Tong University Microcomputer Laboratory
MIC 48C[1]	8	Z-80	64K	Jiao Tong University Computer Center
MIC 8K2	16	28002	-	
Model 77II[1]	16	-	-	Beijing Lishan Micro Electronics Corp.
TP 801[2]	-	-	-	Beijing Engineering University and Jingye Co. (Hong Kong)
TQ 15	16	-	32K	Shanghai Radio Factory
TQH 100[10]	8	Z-80	32K	Shanghai Computer Factory
WSJ 2	8	-	64K	
X 1200	8	-	-	Tianjin Electronic Computer Factory
Z SS	8	Z-80	1-2K	Shanghai Computer Factory
ZD 065	16	-	-	Zhongshan University Physics Dept. and Guangdong Nanhai Radio Factory
ZD 2000	8	-	16-32K	Yanshan Computer Center
- [1 11]	16	-	-	Guangdong Computer Factory

[1]Equipped with Chinese character processing capability. [2]Single board microcomputer. [3]The DJS 040 series reportedly accounted for 73 percent of China's microcomputer production in 1982, but has falled substantially since then. [4]China's first microcomputer, an early version of the DJS 051, came with a maximum memory of 2 Kbytes RAM. [5]The DJS 060 series reportedly accounted for 8 percent of China's total microcomputer production in 1982, and a larger share in 1983. [6]DJS 100 series computers are originally conceived as software compatible 16-bit magnetic core machines based on Nova 1200 architecture licensed to China by the Nippon Computer Company, while the DJS 200 series machines closely replicated the IBM 370 and CDC 6600 designs. [7]Upgraded DJS 131. [8]Based on DJS 130. [9]The Great Wall 100 is reportedly "IBM compatible" and comes with 64K RAM, 40K ROM, two 5 ¼-inch floppy disk drives, and runs on MS DOS, CP/M 86, and UCSD p-System operating system, in addition to Chinese character DOS (CCDOS). Its Chinese word processing software contains 7,000 characters. As of January 1984, only 1,000 units had been produced, and sold for ¥30,000 ($15,000) each. [10]Chinese character intelligent terminal. [11]UNIX-based Chinese and Japanese word processor. SOURCES: *China Computer World; China Daily; Computer World; Electrical Market; Asian Computer Monthly; China Business Review; Info World; Nanfang Ribao;* US industry representatives; and National Council computer files.

Apanda's Unique Software

Chinese word processing can be simple and elegant

James E. Bock

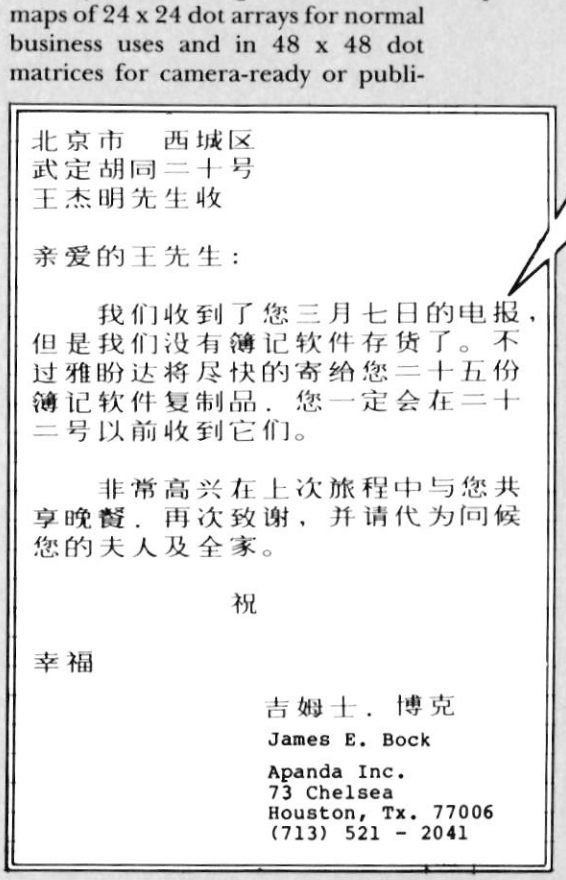
Apanda Incorporated of Houston, Texas, is a new company producing a commercial state-of-the-art Chinese word-processing system that combines the convenience of one-stroke entry for the most frequently used characters with a simplified dictionary-based coding scheme. The system runs on the Apple IIe, IBM PC/XT, Compaq Plus, and other IBM PC compatibles with the requisite memory storage size. It uses an off-the-shelf Epson/IBM dot matrix printer, though the latest laser or ink jet printers will print even smaller size characters faster and more quietly.

Apanda's system was built to meet the needs of a modern China trade firm requiring easy-to-edit high-resolution copy for business correspondence. Characters are therefore individually stored as high-resolution bit maps of 24 x 24 dot arrays for normal business uses and in 48 x 48 dot matrices for camera-ready or publication grade Chinese characters.

A character inventory of more than 7,000 simplified characters is stored in the microcomputer's 10 megabyte memory together with more than 7,700 elegant Ming-style classical characters (Mathews' Dictionary), copyrighted by Apanda as "Electronic Calligraphy." Characters are entered by using Apanda's proprietary Radical/Stroke/Character keyboard inputting system (*see* below). The R/S/C code represents a unique number for each character. The Apanda keyboard also uses replacement key caps that display the most commonly used radicals. These can be entered with a single stroke. For less common characters, the user enters the three-digit radical number from the dictionary. The user then types in the number of strokes in addition to the radical. Push the space bar and the screen immediately displays the characters with that radical and number of strokes to permit the user to choose the correct character in the likely event that there is more than one ideograph with that combination. When the correct character is selected (according to the key appearing next to it on the screen) it drops into the letter or document being typed. One hundred of the most commonly used characters are available directly from the keyboard as "instant characters." While these are less than 2 percent of the universe of 7,000, they will be used 20 to 30 percent of the time in normal business correspondence. Only three or four key strokes are needed to enter the average character.

Significantly, space is reserved in each character file for future additions, such as alternate coding methods like pinyin, three corner, or *Cang Jie* (*see* page 30); STC codes for a telex interface; and space for a translator's dictionary definition. The system also has the capacity to be expanded to accommodate additional languages. A little training and hands-on experience turns this powerful software tool into a surprisingly easy to use Chinese word processor.

Included in the software package is an Editor with a full set of word-processing features (insert, delete, cut and paste, find, replace, copy into text from a file, among others) an electronic File for document storage on both hard and floppy disks, and a Printer to control the dot matrix or other type of printer. The full system, excluding hardware, costs $10,000. This covers all software plus training and on-site installation. Apanda supplies a *User's Tutorial and Manual*, supports the software by telephone, and will offer enhancements and upgrades as they become available.



北京市　西城区
武定胡同二十号
王杰明先生收

亲爱的王先生：

我们收到了您三月七日的电报，但是我们没有簿记软件存货了。不过雅盼达将尽快的寄给您二十五份簿记软件复制品．您一定会在二十二号以前收到它们。

非常高兴在上次旅程中与您共享晚餐．再次致谢，并请代为问候您的夫人及全家。

祝

幸福

吉姆士．博克
James E. Bock

Apanda Inc.
73 Chelsea
Houston, Tx. 77006
(713) 521 - 2041

报

HOW IT WORKS

1. *To type in* bào, *meaning "report," enter the number 55 for the character's radical (报) from the Pinyin* Chinese-English Dictionary *published by the Beijing Foreign Languages Institute.*

2. *Enter the number 4 to indicate that there are four remaining strokes in the character; touch the space bar to fill the zero.*

3. *Type in the number of the character's position in the dictionary's radical and stroke list, or if you do not have a dictionary handy, press the space bar only once. All characters with this radical and stroke combination will then appear in 48 × 48 pixel size. Enter the key for the correct character to drop it into the edit screen.*

James E. Bock is president of Apanda, Inc., which was incorporated in 1983 after several years of development work. Bock holds both an MBA and Masters of City Planning from Harvard.

Fujitsu's micro division has concentrated on research and educational institutions. Likewise, NEC's biggest micro sale of 305 PC 8000s and PC 8800s was to 26 universities and 13 agricultural organizations under the $200 million World Bank loan.

But these 8-bit NEC machines can only display 3,000 Chinese characters, which demonstrates an important point. The Japanese and Chinese languages are totally unrelated. The superficial resemblance between Chinese and Japanese results from Japan's practice in the third and fourth centuries AD of adopting Chinese ideographs. "Because Japanese writing is phonetic rather than ideographic like Chinese, Japanese words are typed into a computer according to their sound," a Tandy representative explains. "Therefore the word-processing technology developed in Japan is not easily transferable to China."

Japan's printer technology is right for the China market, however. Japanese, like Chinese, must be rendered clearly to be legible. As a result, most Japanese dot matrix printers produce a 21 × 27 or 24 × 24 matrix or even larger pattern, while 5 × 7 or 7 × 9 dot matrix printers are more common in the US. Not surprisingly, visitors see few US printers in China, but many Toshiba P1350s and other Japanese models.

"Caught off balance" by export controls

"Because China was given V group status last November, people think microcomputer exports to China are treated like exports to NATO and allied countries such as Japan," remarks Anthony Koo, a microcomputer export licensing officer at the US Department of Commerce. "So companies get caught off balance when we explain all the forms they must submit."

The most important is form 6031P. This large document requires the exporter to explain how the end user will configure the system. Claims a private consultant: "There is no problem for stand-alone units. But 6031P does present a serious problem if you want to export a low-level dumb terminal. You have to get the Chinese to explain how they plan to hook it up, which is really their business. We can't expect them to give us such information when we are so concerned about proprietary information ourselves." Finally, form 6031P must be accompanied by a block diagram, showing all connections and peripherals. If any information is lacking, Commerce will send back form 651, the famous RWA. The "return without action" form means exactly that, and the process must start all over again.

According to Cesare F. Rosati, chief of the Commerce Department's microcomputer and telecommunications branch, "there are three levels of review. The lowest is performed here in our branch. Next is interagency review, coordinated by Commerce. The highest is COCOM.

"Because we are so short of staff, it might take a month before we can assign someone to an application. When we do, a decision is usually made within 30 days. Count on another 60–90 days or more for interagency review, if it's required. If the technology goes to COCOM, then add 30–60 more days," Rosati notes. "Basically we are talking about a review process of at least two months, and at most six or seven. But remember, most export licenses for 8-bit and 16-bit machines are approved right here—since most fall into the green zone and are handled quickly."

Avoid advanced graphics

The "green zone" includes computer systems with processing data rates of 155 or less, far above the pdrs that were sent to lengthy interagency review prior to November 23, 1983. Commerce works on a case-by-case basis, and prefers not to explain its criteria. But companies have gained enough experience to guess what they are. For example, micros with Motorola MC 68000 chips are generally thought to be "above the green line," and go to interagency review, while 8/16-bit micros with 8088 chips are routinely approved. Apart from word length, the critical factor in calculating pdr, Commerce looks most closely at disk-drive speed, memory, and graphics. Gould's new raster display monitor (with four times the clarity of existing state-of-the-art screens) is probably too advanced to win an export license at the present time, industry sources believe. Gould plans to open an office in China this summer to promote the products of all 21 Gould divisions, including its Computer Systems Division's CONCEPT line and the full range of its new UNIX-based micro-to-supermini PS family.

The Tektronix 4014 high resolution monitor is also "above the line." But it has made it to China anyway. Claims one company chairman, "I see a lot of things in China that shouldn't be there. For example, on my last trip I saw a 4014. It had been sold by a Japanese firm that purchased the model here in the US and resold it in the PRC for 500 percent above the US retail price." David McBride, China project manager for Tektronix, was surprised to hear about the sale. "Normally we don't know if a product is sold to China until we see it there. Then it is too late."

According to Rosati, American companies are required to make sure that their dealers observe US export regulations. They and their dealers must not knowingly re-export unlicensed goods to the PRC. The key word is "knowingly," he emphasizes. "This was spelled out in the January 9, 1984, update to the Export Administration Regulations."

"I insist that all my dealers sign contracts agreeing to comply with our export regulations," points out Apple's Sami Asfour. "But I get the impression some companies don't require this of their dealers. What can you do? What is stopping someone from buying a computer and taking it to China? I've heard there are anywhere from 5,000 to 8,000 Apples in China. But only a portion of these were purchased from us."

The big computer retail chains are still awaiting distribution licenses for China. These would permit multiple sales under one license. ComputerLand chairman and CEO William Millard recently began exploratory talks with the Chinese about opening ComputerLand outlets in the PRC. Helping him is long-time Beijing resident Sid Rittenberg, now special advisor to ComputerLand International. Remarks Commerce Department's Anthony Koo: "Distribution licenses for China are not likely, at least not in the foreseeable future. Everything is still done case by case."

Assembling micros in China

Despite the delays, export controls have not stopped US firms from setting up assembly operations in China. In October 1983 General Robotics

Corporation of Hartford, Wisconsin, won Chinese government approval to implement a SKD (semi-knockdown) agreement with a Tianjin factory to assemble LSI 11/23 micros. These have 256 Kbyte CPUs, four serial I/O ports, two double sides double density 8-inch drives, two 26 Mbyte 5 1/4-inch Winchester drives, and are based on Digital's PDP 11-series architecture.

"We sell only what fits on one chassis, without the CRT, keyboard, or other peripherals. They just plug it together," says General Robotics Executive Vice President Barbara R. Pick. The company has just concluded another agreement to assemble micros in south China.

Some Cromemco CS-series micros have been assembled in China from kits, according to the company's vice president for engineering, Roger Melen. "There are 6,000 Cromemcos in China overall. At least that is the figure they give us. About 70 of these bear the DJS 040 label, but the rest were sold as complete systems."

"Ever since the Chinese asked to visit our Mountain View, California, facilities in 1979 we have been heavily committed to the China market," Melen says. "We have no office or full-time representative as such, but our service center at Qinghua University does respond to sales inquiries."

Sems of France is already assemblying its 16-bit micro at the Guangzhou Computer Factory. Capable of speeds up to 1 MIPS (million instructions per second), the HN-3000 systems are designed for scientific work, data management, and process control. All parts are imported under a CKD (complete knockdown) contract, including the disk drives that are based on old-style flying head disk technology. According to one report, the five-story factory has "the whole works" in terms of modern automated test stations and other assembly equipment. The problem is that the plant's target of 400 units per year might not justify its new investment.

The Shenzhen special economic zone near Hong Kong hopes to eventually produce 100,000 microcomputers per year in its new Shahe electronics district. C. Itoh is rumored to be planning a microcomputer plant there, and hardly a US computer company has not been approached to do the same. Shenzhen is particularly eager to interest Hewlett Packard, which just formed a 50–50 joint venture with the China Electronics Import–Export Corporation. The marketing and manufacturing venture, China Hewlett Packard, Ltd., has been considering a number of plant locations in China.

Altos Computer Systems of San Jose, California, will soon begin to assemble its Altos 586 and 986 microcomputers in China. Shenzhen is the most likely choice, although the company has looked at other sites. Both systems utilize the 8086 microprocessor and are expandable up to 1 megabyte of RAM.

Burroughs Corporation and Everbright, the Chinese-owned trading and investment house in Hong Kong, have also decided to coproduce the Burroughs B25 micro in Hong Kong and the B20 in China. According to a Chinese source, Apple is looking at Fuzhou as a possible site to produce integrated circuits.

"Begin with SKD"

"Running a successful assembly operation in China is not easy," notes Chris Brown of Sun Hung Kai (China) Ltd. "I urge clients to negotiate phased technology transfers. There may be only one contract, but each activity is staggered. The point is to begin by selling a batch of complete systems, say from 10 to 100 units, for evaluation by the Chinese side.

"You get paid up front. This is essential to gauge the seriousness of the venture. The next step is the phased transfer of know-how, documents, and equipment. Assembly should begin with SKD and only move on to CKD as the results merit. In this way, most of the potential snags—payment, training, and export controls—are handled step by step. Both sides can see how things are going before moving on," Brown notes. Sun Hung Kai's clients currently include Industrial Micro Systems, Commodore, Rockwell International, General Robotics, and Data Media, among others.

China's microcomputer plants

Computer manufacturing is surprisingly decentralized in China, at least for micros. According to a 1983 study by the Ministry of Electronics Industry, only 44 percent of the total value of China's computer industry came from ministry-run plants; the remaining 56 percent was produced by factories run mainly by cities and provinces.

In the last year or so the share of local output may have increased as more resources are devoted to producing micros. At the Third National Microcomputer Symposium, it was decided to encourage local initiative by offering the central government's "selective support" to the best locally manufactured microcomputers. Jiangsu Province alone claims to produce 51 different micros, though all could be prototypes. (Only the Great Wall 100 and BCM 3 are produced in quantities of up to 1,000 units per year.)

The lack of standardization is so serious that most Chinese computers, even those turned out in the same series in the same factory, are seldom compatible. According to one US firm, the different models of the 16-bit DJS 030 made by plants in Suzhou and Beijing do not have interchangeable parts, much less software compatibility. Notes a computer expert, "Fabrication at all levels is manual, and hand soldering is used throughout."

"The typical Chinese-made circuit board," observes one expert, "is not nearly as dense as those made in the US. Their integrated circuits generally have two gates per chip, not eight or more as in many US-made products; their memory chips are limited to 4K bits per chip, while we use chips with a minimum of 64K bits and as much as 256K bits per chip. Also, many facilities can't plate through the holes of printed circuit boards, a real detriment to quality. Instead, they put wire through by hand. As a result, Chinese circuit boards tend to be big and unreliable. This means dramatically slower operating times."

Mimicking the Intel microprocessor

"When the Chinese say they are making 8080-type microprocessors," notes another expert, "bear in mind that very often this is a wire board equivalent of the Intel chip. They are mimicking its functions by using cheaper, more readily available basic components. It is like building a Cadillac out of oversize spare parts. You end up with a Cadillac that is 80 feet long, 40 feet wide, and 10 feet high

Needless to say, it can't perform as well."

The need for advanced integrated circuits accounts for the spate of semiconductor contracts signed in recent years. (Transistors and other IC components are made from the metallic crystals called semiconductors.) US know-how has been sold to factories in Wuxi, Beijing, and Shanghai. In an unusual deal, Tianjin municipality reportedly just won US government approval to buy a 45 percent equity share in an IC plant in the US. If all goes according to plan, a similar facility will be constructed in Tianjin.

Seeking the Best

Few, if any, Chinese microcomputers cost less than $8,000, the price of the 8-bit Z SS once made by the Shanghai Computer Factory. Everything else costs more. The 8-bit DJS 062 costs $10,000. When it first appeared the 16-bit DJS 140 cost $75,000, and the newly released 16-bit Great Wall 100 is selling for $15,000 minus add-ons. A recent visitor described the cost of peripherals as "astronomical." Meanwhile, the price of equivalent Western hardware is many times lower and keeps falling.

As a result, the influx of inexpensive microcomputers is causing alarm, as did the importation of color TVs and cassette recorders in the early 1980s. Calls for protectionism could force Beijing to protect infant industries even at the risk of sheltering backward enterprises.

Marketing computers in this environment is not easy. The strategy seems to be to mollify China's fears while fulfilling its aspirations for the best. As a New York executive put it: "The leading lights of China's scientific establishment want the state of the art. And for now there are not too many places you can go." ₹

CHINA'S SOFTWARE INDUSTRY

Zhou Xiling

A clear sign of China's growing commitment to software development was the February 28 agreement between the Beijing branch of the China Computer Technical Service Corporation (CCTSC) and the Tokyo Maruichi Shoji Co. Ltd. Under the agreement, the Chinese corporation will produce software to requirements provided by the Japanese company.

Earlier, the Technical Service Company of Qinghua University in Beijing produced for Fujitsu Ltd. of Japan the FORTUNE software package that is a dynamic analysis system for tuning the user program. It is designed to run on the Fujitsu M 150, and optimizes user programs development in Fortran 77. A contract to develop a second program, the Fortran program analyzer, was recently signed. Programming will be completed in 1984.

Japanese companies are not alone in developing software business relations with Chinese corporations. Sperry has formed the Sperry–CCTSC Computer Technology Center in Beijing.

Early work in the 1960s and 70s in designing operating systems laid the basis for China's current export effort

The software export market is also being explored by the Software Development Group of the Nanyang International Technology Corporation set up by Jiaotong University in Shanghai. Some applications software have been sold abroad by the Applied Software Development Center under the China State Shipbuilding Corporation.

Zhou Xiling is vice-president of the China Software Technology Corporation.

Early developments in system software

Though Chinese software companies are dealing with foreign firms on an increasing scale, China's software industry is still in its infancy. Prior to the mid 1970s, China's software experts spent a great deal of time developing system software, such as compilers and operating systems for Chinese-designed computers. Since then, they have been focusing more on application and support software. With the great upsurge in the nationwide use of computers in recent years, the use of computers has spread from the traditional field of scientific research to the more practical areas of business management. The current focus is to improve the internal management of Chinese ministries, enterprises, and hotels, and implement better data collection and process control systems for the textile, chemical, petroleum, and metallurgical industries. Another area of endeavor is developing expert systems for Chinese traditional medicine and computer-aided designing. Software will not be an appendix of hardware; it is beginning to

become an industry by itself in China.

Universities are heavily involved

It is impossible to give a complete list of all the research institutes, universities, or companies engaged in software development. But the following are some principal organizations that the author is aware of:

▶ Beijing University is currently researching laser photocomposition for Chinese-character texts, image processing, data acquisition, and database management.

▶ Nanjing University is working on programming language design (XCY-2), distributed system software (distributed C language and distributed dBASE II), and Chinese word-processing software.

▶ The People's University of China (in Beijing) is now concentrating on relational DBMS (BTAM, RXDB on the Hewlett Packard 3000), Chinese information processing systems (again using the HP-3000), application systems such as the Query system for national economic and statistical data, and the CRDB database system.

▶ Qinghua University is a leader in developing application software packages for micro and minicomputers and software product testing tools.

▶ Jiaotong University (in Shanghai) is already producing a wide variety of software from financial analysis systems to graphics for micro and minicomputers.

▶ Jilin University is working mainly on expert systems and artificial intelligence.

▶ The North China Institute of Computing Technology has developed system software (OS, compiler, and DBMS, and so forth) for the DJS-8000 and DJS-2000, as well as project software, for example to manage steel plants. The institute is a subsidiary of the Ministry of Electronic Industry's National Computer Industry Bureau (sometimes translated as the Administration of Computer Industry).

▶ The East China Institute of Computing Technology is principally engaged in developing software for the DJS-8000 family. It is also a subsidiary of the National Computer Industry Bureau.

▶ The Institute of Electronic Technique Applications, another NCIB subsidiary, is a leader in economic information management systems, process control and monitoring systems, and engineering project systems for industrial and transportation enterprises.

▶ The Institute of Computing Technology (under the Chinese Academy of Sciences) is concentrating on software theory and the development of specialized languages.

Business opportunities in the field of software are multiplying just as rapidly. In the last two years, many new Chinese software companies have come on the scene. Among these is the China Software Technology Corporation, established in February, dedicated to the development and distribution of software products throughout China. The CSTC is based in Beijing and has already set up subsidiary companies in many provinces and cities.

Both CSTC and its sister company, the China Computer Technical Service Corporation, are under the National Computer Industry Bureau. CSTC is also involved in national planning work associated with the development of new software, and the creation of various standards and disciplines in software engineering.

The growing interest in UNIX

China is now designing and using many types of operating systems. Work began in the 1960s, when China designed and manufactured the DJS-6, DJS-8, and DJS-200 family of computers for domestic use only. These were not compatible with foreign computers, and scientists accordingly had to design special operating systems for them. Since then, China's philosophy has changed. It is now our objective to make China's newer lines of computers compatible with those widely accepted in other countries. China has also imported computers from abroad, with the result that Chinese users and software developers have had to become familiar with NOVA's RDOS operating system, PDP-11's RSX-11M, VAX's VMS, and IBM's MVS or DOS, CP/M, UNIX, and the like. Some of these systems have already been modified or enhanced in order to manipulate Chinese characters.

During the 1960s, ALGOL 60 predominated in the community of Chinese programmers and students, but now Fortran IV and Fortran-77 are the most important higher-level languages used in China. BASIC and COBOL are also widely accepted. Most students learn Fortran, BASIC, Pascal, and COBOL in the universities, though some middle school students are beginning to learn BASIC on microcomputers.

More recently there has been a rising interest in UNIX systems, with the result that C language is also becoming popular with software programmers, especially those concerned with developing system software. LISP is favored by those interested in artificial intelligence. Of course, assembly languages for different machines are still used when necessary.

Chinese word processing

There is no doubt that the inputting, processing, and output of Chinese characters is one of the most important problems that must be solved before computers can get beyond the realm of the specialist and become widely accepted by the public.

More than 40 coding methods to enter Chinese characters have been developed, from the primitive "large keyboard" and phonetic spelling methods, to methods that divide characters into several parts that are then entered separately. Some of them will eventually survive and be used by different people for different purposes. Clerical personnel may choose the fastest method and spend one week to learn the input rules, while the occasional user might prefer an easier but slower method.

There are basically two different ways to internally process Chinese characters. One is to "recreate" the Chinese version of various compilers and operating systems that are capable of accepting keywords, identifiers, and commands in Chinese character form. This can and has been done by some institutes, but it involves a great deal of investment and most users feel this approach offers limited benefits.

The next mainstream approach in China is to treat the Chinese character strings much like ASCII/EBCDIC strings, while making some modifications in the operating system's input–output driver, or equivalently, by designing a special type of terminal in order to distinguish Chinese characters from conventional character strings. The purpose of this approach is to put all the functions in system software for Chinese characters that were originally designed only for English.

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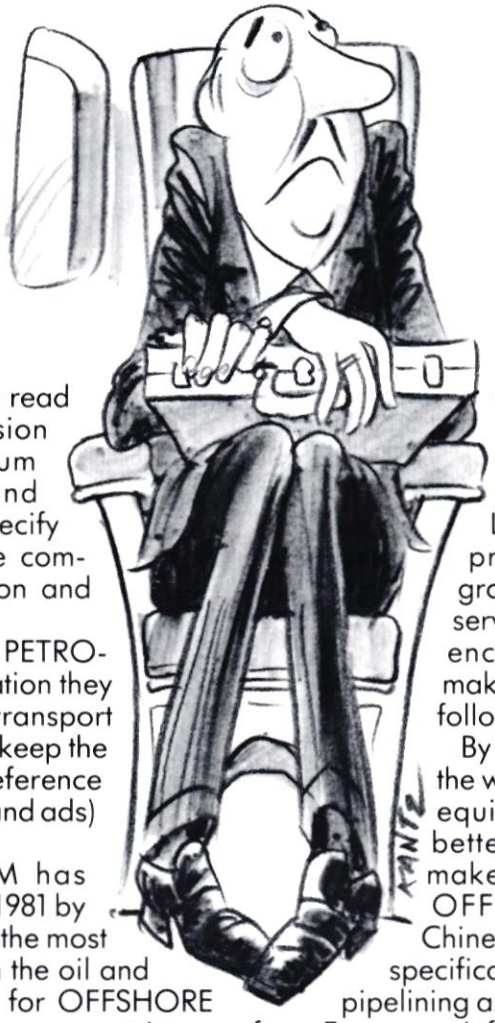

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Instrument Sales

Few marketing opportunities in China are as complex or promising

Erin McGuire Endean

China imported an estimated $515 million worth of precision instruments in 1983, of which US exports amounted to a startling $160 million, more than double the level of 1982. The US share of exports has risen from 25 percent to 31 percent in the last year, although US companies still face strong competition from Japan, Germany, and the UK for all but geophysical instruments.

Precision instruments are a key to development in nearly every branch of industry, and are especially crucial to China's priority energy and electronics sectors. Yet the quantity and quality of instruments available vary widely. Most Chinese designs are 10–20 years out of date, and are produced in limited quantities at an extremely high unit cost. As a representative of the Shanghai Foreign Trade Corporation's Import Department told the US Consul General in Shanghai: "China can make almost any kind of instrument, but not in sufficient quantity or of sufficient quality."

Two conflicting trends complicate China's instrument industry: the move to centrally control and standardize precision measurements on a national scale, and the proliferation of producers and users of all types of instruments throughout the country.

Recognizing the need to improve the precision and availability of instruments, the State Council is promoting the wider application of metrology and standardization in China. In January 1984 it created the National Technical Commission of Comprehensive Standardization of Electrical Engineering and Electronic Structural Equipment. Operating under the State Standardization Bureau, this commission will attempt to standardize widely used structural parts, components, and raw and semifinished materials. The ministries of Machine Building, Electronics, Electric Power, Posts and Telecommunications, Railways, Aviation, Nuclear Energy, and Space will be represented on the commission, as will the China State Shipbuilding Corporation. To support the new commission's efforts, China has established two national research centers for testing weights and measures, and has reportedly codified at least 148 kinds of metrological standards.

In short, the government has completed its agenda for metrological work through 1990. Efforts will focus on replacing old weights and measures at factories and mines in order to improve product quality and reduce the consumption of raw materials. In particular, standards will be set for use in integrated circuit production and in measuring the flow of oil, gas, and water. All units in China will be expected to adopt the international metric system by 1990, according to a March 1984 State Council order.

Proliferating producers

The national effort to standardize measurement is hampered by the staggering number of ministries, corporations, bureaus, and regions responsible for producing precision instruments. In the area of geophysical instrumentation alone, nearly a dozen parties use exploration instruments, and all of these produce instruments, as well. The Ministry of Geology is China's largest mineral exploration group. Responsible principally for metal exploration and regional mapping, the ministry frequently conducts general exploratory surveys that are then turned over to the Ministry of Coal Industry, Ministry of Petroleum Industry (MOPI), or Ministry of Metallurgical Industry (MMI) for detailed evaluation. The State Bureau of Seismology gets involved in iron ore and petroleum exploration in the course of using magnetic and seismic exploration instruments to detect faults. The Ministry of Railroads conducts seismic research in areas prone to earthquakes, and the Ministry of Water Resources and Electric Power explores for groundwater supplies. Individual provinces also conduct mineral exploration through their own exploration bureaus. The Chinese Academy of Sciences coordinates research into new exploration techniques. Needless to say, there is considerable overlap in the use of instruments by all parties.

The number of organizations involved in importing instruments and setting up joint Chinese–foreign production facilities is equally profuse. In addition to the foreign trading corporations operating directly under the Ministry of Foreign Economic Relations and Trade (MOFERT), such as INSTRIMPEX and TECHIMPORT, most instrument-producing ministries and corporations have their own trading arms. Provinces, autonomous regions, and major cities also buy and sell instruments. Shanghai alone has a half-dozen instrument-importing corporations.

The proliferation of purchasers, though often confusing, provides foreign companies with more diverse export opportunities. EG&G Ortec turned such a situation to its benefit. When its major US competitor, Canberra, appeared to have cornered the China market on nuclear instruments through an established trade rela-

While working at the National Council for US–China Trade, Erin McGuire Endean oversaw a grant from the US Trade and Development Program to conduct preliminary feasibility studies of nine projects in China.

tionship with INSTRIMPEX, Ortec was able to market its products to the China Nuclear Energy Industry Corporation instead. As a consequence of such competition, the several Chinese trading corporations pursuing the same technology may make unrealistic promises to the potential foreign investors. Another risk is that Chinese trading corporations tend to cooperate, rather than compete, in the case of straight purchases. "News travels very fast between trading corporations," says an executive at Finnigan-Mat. For this reason, foreign trading firms have found it advisable to set one price for all buyers. "If one trading corporation were to hear that another corporation paid less for a certain instrument than it did, you'd set off a downward spiral in prices that it would be hard to recover from," the executive explains. Establishing a consistent price policy can be achieved unilaterally, by announcing such a policy, or through a formal trade agreement that sets price and volume discount rates. The Solartron Instrumentation Group, headquartered in the UK, regularly signs such annual agreements with INSTRIMPEX, its largest customer. All other Chinese buyers are given the prices fixed in the agreement, to reduce the negotiating time.

World Bank promotes instrument sales

World Bank loans to China have boosted instrument sales to the bank's key projects. Five of the nine loans approved by the bank since 1981 have included sizeable instrument components. Half of the $200 million University Development Program (UDP) loan was spent on equipment for teaching and research labs at 26 universities. Roughly 45 percent of the Agriculture Education and Research loan will be spent on scientific equipment (including computers) to raise the quality of agricultural research at 11 agricultural colleges and 7 research institutes. Loans for the exploration and exploitation of the Daqing and Zhongyuan oil fields include approximately $72 million for well-logging and seismic instruments, flow meters, and laboratory equipment. The Polytechnic/TV University loan will include $10 million for purchases of instruments to be used in polytechnic school laboratories and China's TV University training facilities. More opportunities for sales of geophysical and metering equipment are likely to result from a $120 million loan to the Ministry of Petroleum Industry to develop Xinjiang's Karamay oil field. A detailed list of the equipment to be procured probably will not be available until fall, but substantial purchases of seismic and logging equipment can be expected.

Instrument manufacturers agree that bidding on World Bank projects should be only part of a total sales effort. US companies have made sizeable instrument sales apart from those financed by the World Bank and other multilateral lending programs. In fact, Bill Hargrave, senior marketing specialist at Perkin-Elmer, estimates that only 10–15 percent of his company's China sales in recent years have been funded by World Bank loans. Adi W.Z. Loo, regional manager at Finnigan-Mat, concurs: "World Bank money generally accounts for only about 15 percent of our China sales."

World Bank-financed instrument sales can be a valuable prelude to future sales, and an indication of potential markets. The university development loan, for example, will improve research facilities at only 33 laboratories, although World Bank figures place the total number of key research institutions in China at 1,000. Labs in almost all of these centers are inadequately equipped, and much of the equipment they do have is obsolete.

Moving beyond direct sales

Service may be an important factor in reaching an instrument sales agreement with a Chinese trading corporation. In fact, service is so important to the Chinese that companies bidding to supply lab instruments for the UDP received a 3 percent preference in bidding for agreeing to provide after-sales service in China. In-country service centers enable many companies to provide timely repair services. They also reduce the possibility of damaging an instrument returned to the foreign supplier for repairs. To date, of the 26 service centers maintained in China by US companies, 15 were set up to repair instruments. Another 12 instrument service centers are maintained in China by non-US foreign companies (*See* the September–October 1983 *CBR*). These centers service every type of instrument except those used in geophysical exploration, since those tough field instruments generally do not require frequent servicing.

The push for technology transfer—an issue that will confront all sellers of electronics this decade—is nowhere more evident than in the instruments trade. No fewer than 24 cooperative instrument manufacturing agreements have been signed to date, the majority involving assembly from kits or licenses to produce measuring, testing, or control instruments. At least a dozen more technology transfer agreements are now in the final stage of negotiation.

Because China's needs and buying patterns are so complex, it is best to review each of the four important segments of the market separately.

Geophysical instruments

US exports of well-logging, seismic, airborne sensing instruments, and data processing systems could reach $500 million over the next three years, according to one Department of Commerce estimate. Instruments to collect and record geophysical data are a particularly fast-growing sales area. US exports of geophysical and surveying equipment in 1983 were more than double the level of 1982, and four times the level of 1981.

China's past emphasis on exploitation of known reserves of coal and petroleum to boost short-term production has meant that the rate of energy output cannot help but decline in the near future. A more long-term approach, now being formulated, puts exploration for new reserves ahead of production. This approach means expanding the area in which exploration is conducted to include mountainous and other inaccessible regions, increasing the variety and accuracy of geophysical instruments produced domestically, and improving China's ability to interpret all types of data collected.

In addition to the Ministry of Petroleum, which is conducting extensive seismic exploration of both onshore and offshore areas, several other ministries have announced plans for detailed regional geological surveys. By 1985, the Ministry of Agriculture, Animal Husbandry, and Fisheries expects to complete the nationwide land survey it began in 1978, and to begin new surveys using

higher-resolution equipment on smaller areas to reduce agricultural costs and increase yields. The State Bureau of Oceanography plans to complete a major survey of coastal resources by 1986. Separately, the Ministry of Geology and Minerals has announced its plans to speed up regional mineralogical surveys. According to Geology Minister Sun Daguang, China had completed such surveys on only 1.5 percent of the country's land mass by 1982. Plans call for completion of a 1:50,000 scale survey on 2 million square kilometers, or 20 percent of China's total area by the year 2000. The same ministry plans by 1990 to complete its prospecting for coal in Shandong, Henan, Shanxi, Heilongjiang, Yunnan, Guizhou, and Ningxia provinces—all of which are thought to process substantial deposits.

One of the weakest links in China's resource development strategy is the production of instruments for geological prospecting, recording, and analysis. Chinese exploration technology reportedly lags behind the latest Western methods by 10–12 years. According to the American Society of Exploration Geophysicists, which has established close links with the Chinese Geophysical Society and Chinese Society of Petroleum Geophysicists, "The science of applying geophysical techniques to exploration of ore deposits appears to be largely the same as that applied in the West. However, many of the tools available to apply this science fully are not readily available in China, such as digital recording, adequate computers and computer personnel, and many of the more advanced geophysical instruments."

Although China intends to modernize its geophysical data collection and processing capability, current demand is too urgent for the Chinese to await development of a domestic production base. To boost petroleum exploration in the short term, the Petroleum Ministry has signed service contracts and purchased exploration instruments and data processing systems from foreign companies. The Geology, Coal, and Nuclear ministries have followed suit, not with service contracts so much as with straight equipment imports. Key areas of domestic research and import activity are:

▶ ***Remote sensing*** Since 1979, a considerable amount of technology has been purchased from abroad for use in satellite and airborne sensing and in image processing. But since attention has shifted to the more detailed exploration of specific regions for particular resources, remote-sensing equipment purchases have declined relative to imports of other geophysical instruments. Nevertheless, recent Chinese purchases include magnetometers and gradiometers with applications in oil prospecting, gamma-ray spectrometers, scintillometers for detecting uranium deposits, IR scanning instruments for topographical coverage, and aircraft and computers. EG&G Geometrics has made three $1–2 million sales of radiometric instruments for airborne uranium surveying.

Completion of the first generation of Chinese-made airborne remote sensors and a digital image analysis system for use on satellites is one of

CHINA'S PRINCIPAL INSTRUMENT IMPORTING UNITS

■ **China National Instruments Import and Export Corporation** (INSTRIMPEX)
Sponsor: Ministry of Foreign Economic Relations and Trade
General Manager: Wang Zhongyuan
Manager Department No. 1 (computers and communica tions equipment): Liu Liangcai
Manager Dept. No. 2 (electrical meters): Li Youyun (f)
Manager Dept. No. 3 (optical instruments): Zhang Jing
Manager Dept. No. 4 (physical chemistry lab instruments): Zhang Shukuan
Address: Erligou, Xijiao, Beijing
PO Box 2811
Cable: INSTRIMPEX BEIJING
Telex: 22304 CIIEC CN
Telephone: 890931, x 565, 566, 567
Business: Primarily import of individual instruments as opposed to complex systems.

■ **China National Machinery Import and Export Corporation (MACHIMPEX)**
Sponsor: Ministry of Foreign Economic Relations and Trade
General Manager: Zhou Chuanru
Address: Erligou, Xijiao, Beijing
Cable: MACHIMPEX BEIJING
Telex: 22242 CMIEC CN
Telephone: 890931
Business: Primarily export of electronic components and instruments.

■ **China National Chemicals Import and Export Corporation (SINOCHEM)**
Sponsor: Ministry of Foreign Economic Relations and Trade
General Manager: Sun Suochang
Address: Erligou, Xijiao, Beijing
Cable: SINOCHEM BEIJING
Telex: 22243 CHEMI CN
22556 CHEJM CN
Telephone: 89091
Business: Both import and export of medical instruments and supplies.

■ **China National Electronic Devices Corporation**
Sponsor: Ministry of Electronics Industry (MEI)
Address: 27 Wanshou Road, Beijing
PO Box 160
Cable: 3200 BEIJING
Telephone: 810518, 810350
Business: Import, export, and manufacture of all kinds of electronic devices.

■ **China National Electronics Import and Export Corporation**
Sponsor: Ministry of Electronics Industry (MEI)
President: Huang Zhaoming
Address: 49 Fuxing Lu, Beijing
PO Box 140
Cable: DZJSJCK BEIJING
Telex: 22475 CEIEC CN
Telephone: 810910, 811959
Business: Import and export of wide range of computers and electronic products.

■ **China National Machinery & Equipment Import & Export Corporation (EQUIMPEX)**
Sponsor: Ministry of Machine Building Industry
Address: 12 Fuxingmenwai Dajie, Beijing
Cable: EQUIMPEX, 0656, BEIJING
Telex: 22186 EQUIP CN
Telephone: 368541
Business: Import and export of complete sets of industrial and electrical equipment, including instruments and meters.

■ **China National Medicines and Health Products Import & Export Corporation (MEHECO)**
Sponsor: Ministry of Foreign Economic Relations and Trade
General Manager and President: Yan Rudai
Address: Bldg. 17 Yongandongli, Jianwai, Beijing
Cable: MEHECO BEIJING
Telex: 20046 MEHEC CN
Telephone: 594761
Business: Import medical instruments formerly handled by SINOCHEM.

■ **China National Precision Machinery Import & Export Corporation**
Address: 2 Yuetan Bei Xiaojie
Cable: CPMIEC BEIJING
Telex: 22484 CPMC CN
Telephone: 895012
Business: Import and export precision instruments including instruments and meters for aircraft, ships, and space navigation.

■ **China National Technical Import Corporation (TECHIMPORT)**
Sponsor: Ministry of Foreign Economic Relations and Trade
General Manager: Xu De'en
Address: Erligou, Xijiao, Beijing
Cable: TECHIMPORT BEIJING
Telex: 22244 CNTIC CN
Telephone: 890931 (Import Bldg.)

China's major scientific research projects for this year and next. China currently manufactures a variety of conventional airborne reconnaissance instruments, including magnetometers, gamma-ray scintillometers, spectrometers, and IR scanners. Airborne electromagnetic techniques have thus far been used with only limited success in China because of navigation and positioning difficulties in areas with rough terrain and dense ground cover. China's purchase of a Landsat ground station in 1983 for the direct processing of data from the US Landsat satellite is likely to lead to an emphasis on the development of image-processing techniques.

▶ ***Seismic exploration*** The Ministry of Petroleum clearly has the upper hand in seismic data collection, and is purchasing tens of millions of dollars worth of digital seismic equipment for use in both offshore and onshore exploration. Fully $14 million of the World Bank loans to the Daqing and Zhongyuan oil fields will go toward purchases of seismic equipment. In July 1983, AMF Geospace made a multimillion dollar sale of such equipment for offshore use to the China National Oil and Gas Exploration and Development Corporation (CNOGEDC). Oriental Scientific Instruments Corporation, the purchasing agent for the Chinese Academy of Sciences, bought six marine seismic systems from Seismic Engineering Company between 1981 and 1983 on behalf of CNOGEDC. The systems, all together worth $3.3 million, use seismic streamers with hydrophones to detect sound waves beneath the ocean floor. Sales of related navigational, meteorological, and depth-sounding instruments also doubled in 1983.

Domestically, Chinese efforts now center on producing numerically controlled and multiplex digital seismographs, as well as assorted navigation and depth-sounding equipment for marine seismic vessels. The Petroleum Ministry is particularly interested in performing more sophisticated three-dimensional seismological tests and in improving the precision and resolution of its data collection instruments. In the field of earthquake seismology, high priorities also include the digitization of seismic data and the collection and interpretation of data to facilitate telemetric data transfer to central seismic data processing facilities. The State Bureau of Seismology is establishing regional telemetric seismological networks in Shanghai, Beijing, Kunming, Chengdu, Lanzhou, and Shenyang, each equipped with systems for quake-monitoring, data telegraphing, data processing, and time regulation. Each quake-monitoring system will be equipped with surface and deep-well seismographs. The Shanghai network has been in operation since 1983. When completed, the entire system will be able to collect and process up to 1,200 signals from 40 field stations at one time.

▶ ***Borehole logging*** This method for determining the structure and composition of the earth's subsurface is getting considerable attention from the ministries of Petroleum, Coal, Geology, and Water Resources. The winner of $40–50 million worth of borehole logging equipment and

Business: Imports advanced foreign equipment including instruments used in manufacturing, in process industries, and in educational research.

■ **China Great Wall Industrial Corporation**
Sponsor: Ministry of Space Industry
Address: 1 Dongdajie, Chongwenmenwai, Beijing
Cable: GWIC BEIJING
Telex: 22337 BEDC CN
Telephone: 893155, 755102
Business: Manufactures and trades various kinds of special machinery, electronic instruments, and computers used in astronomical research.

■ **China Aerotechnology Import and Export Corporation (CATIC)**
Sponsor: Ministry of Aviation
Address: 67 Jiaonan Dajie, Beijing
PO Box 1671
Cable: CAID BEIJING
Telex: 22318 AEROT CN
Telephone: 442444
Business: Import and export of aeroproducts including instrumentation.

■ **China North Industries Corporation (NORINCO)**
Sponsor: Ministry of Ordnance
Address: A7 Yuetan Nanjie, Fuchengmenwai, Beijing
Cable: NORINCO BEIJING
Telex: 22339 CNIC CN
Telephone: 862147, 862254
Business: Manufactures and trades machinery including medical instruments especially for use by military.

■ **China Nuclear Energy Industry Corporation**
Sponsor: Ministry of Nuclear Industry
Address: 21 Nanlishulu, Beijing
PO Box 2139
Cable: CNEIC BEIJING
Telex: 22240 CHEICCN
Telephone: 866930, 867717
Business: Import and export of instruments and equipment for study and use of nuclear energy.

■ **Oriental Scientific Instruments Import & Export Corporation**
Sponsor: Chinese Academy of Sciences
Address: Sanlihe, Beijing
Cable: SINICADEMY, 2233 BEIJING
Telex: 22474 ASCHI CN
Telephone: 868362, x532
Business: Import of technology, equipment, materials, and instruments solely for Chinese Academy of Sciences.

■ **China Scientific Instruments and Materials Corporation**
Sponsor: State Science and Technology Commission
Address: 75 Dengshikou Jie
Cable: CSIMC, 8191 BEIJING
Telephone: 550366
Business: Mainly import of components and spare parts for instruments.

■ **Shanghai Scientific Instruments and Materials Corporation**
Sponsor: China Scientific Instruments and Materials Corporation
Manager: Huang Maifei
Address: 1 Taojiang Street, Shanghai
Telephone: 376011, 374440
Business: Import of instruments, components, and spare parts for research institutes, schools, universities, hospitals, factories under Shanghai municipal authority.

■ **Shanghai Instrumentation and Electronics Import & Export Corporation**
Sponsor: Shanghai Bureau of Instruments and Electronics
Address: 63 Guizhou Road, Shanghai
Cable: SIECO SHANGHAI
Telex: 33261 SIECCN
Telephone: 224677, 226616
Business: Import of technology, equipment, and instruments for Shanghai Municipal Meters Bureau.

■ **Shanghai Foreign Trade Corporation**
Sponsor: Shanghai and MOFERT
Address: 521 Henan Zhong Lu, Shanghai
Cable: SINTRUST SHANGHAI
Telephone: 226650, 221025
Business: Import and export for Shanghai instrumentation sector.

■ **China National General Bureau of Instrumentation Industry**
Sponsor: Ministry of Machine Building Industry
Business: Sets guidelines and policies for technology transfer agreements involving process control instruments.

■ **State Bureau of Seismology**
Sponsor: State Council
Address: Sanlihe Lu, Beijing
Telex: 77777 BEIJING
Business: Import of geophysical instruments and conducts research on seismology and earthquake prediction.

Table prepared by Caroline Gillespie and Erin M. Endean.

services for the Daqing and Zhongyuan oil fields should be announced in May. EG&G Geometrics, a producer of logging equipment used in coal and mineral exploration, sold more than $3 million worth of borehole loggers to China in 1983.

Borehole logging instruments are being produced in China at several factories, but the accuracy of these Chinese-made instruments suffers from the lack of a central calibration facility. Equipment and technology are needed to improve the accuracy of the logging instruments, to increase the number of logs collected by a single instrument, and to improve the ruggedness of both the logging instruments and the trucks on which they are mounted.

Measuring, testing, and controlling instruments

Under the current 1981–85 Five-Year Plan, the State Council has allocated $130 billion for the renovation of existing plants. The drive to reach this colossal goal has created significant opportunities for the sale of metering and controlling equipment, especially for use in the electronics industry. The value of US exports last year totaled $52 million, 150 percent above the 1982 level. The key areas of activity include:

▶ ***Instruments to measure and test electricity*** Over the last three years, US exports of instruments to measure electrical currents and test circuitry have risen from $9 million to more than $26 million, and the trend shows no signs of slowing. Signal recovery instruments, multichannel analyzers, TV test equipment, oscilloscopes, digital voltmeters, frequency counters, and calibration equipment are very much in demand. Exports of nondestructive test instruments also tripled from $2.8 million in 1982 to $9.6 million in 1983. These instruments, which test materials without damaging them, are important to the electronics industry, where they are used to test the thickness or purity of such items as silicon wafers.

Among US firms, Hewlett-Packard, Fluke, Tektronix, and EG&G's Princeton Applied Research Division all have made major sales. Japanese suppliers have taken most of the low end of the market. Their less-expensive voltmeters or multimeters are adequate for TV and radio testing, which require less precision than testing of electronic goods used in industry or for defense.

Fluke and Tektronix maintain service centers in China, as do several firms from the UK, Italy, and Denmark. Fluke has signed an agreement to assemble voltmeters and digital multimeters from kits at the Beijing Radio Research Institute, and may soon conclude a licensing agreement in Sichuan Province. Racal-Dana's UK office initialed a joint venture agreement in September 1983 to produce its 9900-series frequency counters at a Shanghai plant, but preliminary reports indicate that in the first four months of operation, only 15 kits were assembled. Tektronix is currently evaluating opportunities for technical cooperation in the production of oscilloscopes. The Japanese firm Kikusui is reported to have signed a license agreement to produce oscilloscopes at the Honghua Instrument Factory in Xi'an, operated by the Ministry of Electronics. Several other Japanese firms, such as Trio and Leader, are providing kits to assemble oscilloscopes in China.

▶ ***Process control instruments*** These instruments, used to check or control the flow, depth, or pressure of gases, liquids, and bulk materials, command the next most important market share after electronic test equipment. US exports reached $14 million in 1983, up from $4.5 million in 1982. According to a survey conducted by the US Consulate in Shanghai, the city's chemical, metallurgical, and textile sectors all want to purchase foreign process measurement and control instrumentation. The trend is toward purchases of computerized control systems rather than individual instruments.

Nevertheless, electronic receiving instruments, electrical temperature-controlling instruments, and flowmeters or pressure transmitters used to monitor rates of extraction or processing in the petroleum sector all registered strong gains in 1983. Pneumatically operated and mechanical process control instruments are on the way out, as are nonelectrical testing and measuring instruments in general. Instead, more advanced electronic control equipment will be installed in factories undergoing technical transformation.

While purchases to date tend to represent the most sophisticated technology available, Tom Stuhlfire, director of China joint ventures at Foxboro, expects the Chinese to adopt the notion of appropriate technology as it becomes apparent how wasteful it is to let complex instruments sit idle in factories. Electronic controls may be best for a large plant

US EXPORTS OF SCIENTIFIC INSTRUMENTS

The 100 percent growth rates registered in 1983 are expected to continue for 1984 for geophysical and measuring instruments

	1979	1980	1981	1982	1983
Geophysical instruments	21.5	12.8	11.0	20.1	41.9
Measuring, testing and controlling instruments	9.8	16.0	23.1	21.1	51.8
Electricity	(5.7)	(5.8)	(9.5)	(12.9)	(26.2)
Liquids, gases and bulk materials	(1.8)	(3.0)	(4.7)	(4.5)	(13.9)
Nondestructive testing	(1.9)	(6.8)	(8.4)	(2.8)	(9.6)
Other	(.4)	(.4)	(.5)	(.9)	(2.0)
Analytical instruments	11.0	11.3	17.0	21.7	44.2
Chemical	(7.1)	(6.4)	(10.8)	(11.6)	(24.9)
Physical	(3.8)	(4.8)	(6.0)	(6.0)	(14.0)
Other	(.1)	(.2)	(.2)	(4.1)	(5.3)
Medical instruments	4.3	6.5	6.7	11.3	22.2
X-ray and electrical	(4.1)	(6.0)	(5.4)	(10.0)	(19.3)
Surgical and medical devices	(.2)	(.5)	(1.3)	(1.4)	(2.9)
Total	**46.6**	**46.6**	**57.8**	**74.3**	**160.2**

SOURCES: US Commerce Department export statistics, Schedule B; and National Council files. Table prepared by Erin McGuire Endean.

or complex, but pneumatic controls are adequate for small to medium-sized plants. "The difference between pneumatic and electronic controls is like the difference between a gas oven and a microwave oven," says Stuhlfire. "You can cook in both, although one technology may be more versatile and the other more mature, more predictable."

Foxboro signed a joint venture agreement in April 1982 with the Shanghai Instrument Company to produce its electronic process controls. Since opening for business in January 1983, the Shanghai–Foxboro Company Ltd. joint venture has achieved considerable success. The initial technology transfer, including training of Chinese sales and technical personnel and transfer of 25,000 microfilm documents, has been completed. Shipments in the first year of operation were 90 percent of target, and 1984 production is expected to reach two to four times the 1983 level. As a measure of its success, the board of directors of the joint venture recently approved a plan to assemble sophisticated computer-based process-control systems. Parts are scheduled for shipment in 1984 for final assembly in China. The successes of the Foxboro venture have not gone without notice: President Reagan visited the Shanghai–Foxboro Company during his April trip to China.

Although Foxboro is the only company to date to have signed a joint venture to produce control instruments, the Rosemount division of Emerson Electric did license the production of electronic pressure transmitters to the Xi'an Instrument Factory in 1981. In addition, a number of Japanese firms have signed agreements to provide equipment, parts, and training to Chinese factories assembling knock-down kits. The Yamatake-Honeywell Company signed a seven-year contract this February with EQUIMPEX to produce control instruments (used in steel, oil, and chemical factories) at the Guangdong Instrument Factory in Zhao Qing City, Guangdong Province. Yamatake-Honeywell reportedly signed a similar agreement to produce automatic control valves at the Wuzhong Instrument Factory. Yokogawa Hokushin will assemble vortex flow meters at the Shanghai No. 9 Automation Instrumentation Factory, and is reported to have

FOREIGN INSTRUMENT MANUFACTURING AGREEMENTS

Foreign company	Chinese partner	Date of licensing or joint production agreement	Comments
Geophysical instruments			
Mt. Sopris Instruments	Ministry of Coal and Weinan Coal Mine Special Equipment Factory	7/83	License for borehole logging equipment
Texas Instruments	Xi'an General Petroleum Exploration Instruments Factory	9/83	Assembly of seismic data acquisition equipment from kits
Test, measurement, and control instruments			
Fluke International	Ministry of Electronics and Beijing Radio Research Institute	1981	Assembly of digital voltmeter and 4½ digit multimeter kits
Merrick Corp.	MACHIMPEX and Hua Dong Electronic Instruments Works	12/83	Licensing arrangement for electronic conveyer scales
Foxboro Co.	Shanghai Instrumentation Industry Corp.	12/82	Joint venture production of process control instruments
Rosemount Co.	TECHIMPORT and Xi'an Instrument Factory	1979	License for pressure transmitters
Yokogawa Electric Works, Ltd. (Japan)	TECHIMPORT and Sichuan Instrument and Meter General Plant	12/82	Manufacture of self-balancing recording instruments
Kikusui (Japan)	Honghua Instruments Factory	—	License for oscilloscopes
Racal Dana Instruments, Ltd. (UK)	Shanghai Factory NA	2/83	Joint venture production of 9900 frequency counters
Yamato Scale Co., Ltd. (Japan)	Yingkou No. 3 Instruments	—	Rural environmental protection equipment
Fanuc, Ltd. (Japan)	TECHIMPORT	1980–83	4 licensing agreements for electronic control systems
Trio (Japan)	Ministry of Electronics	8/83	Assembly of oscilloscope kits
Leader (Japan)	Ministry of Electronics	—	Assembly of oscilloscope kits
Yamatake-Honeywell (Japan)	EQUIMPEX and Guangdong Instrument Factory, Zhao Qing City	2/84	7-year technology transfer agreement of pneumatic transmitters
Yamatake-Honeywell (Japan)	Wuzhong Instrument Factory, Ningxia	1981	Automatic control instruments
Fuji Electric Co. (Japan)	Wuxi Machine Tool Electrical Equipment Factory	—	Electronic timers
Yokogawa Hokushin (Japan)	Shanghai No. 9 Automation Instrumentation Factory	—	Vortex flow meters
Yokogawa Hokushin (Japan)	Xi'an Instrument Factory	1981	Electronic control systems
Yokogawa Hokushin (Japan)	Beijing Electric Meter Works	—	Electronic control systems
Yokogawa Hokushin (Japan)	Sichuan Instruments Complex	—	Industrial recorders
Analytical and medical instruments			
Varian Associates	TECHIMPORT and Beijing Analytical Instruments Factory	—	License for gas chromatographs
VG Analytical, Ltd. (UK)	Chinese Academy of Sciences	9/83	License for mass spectometers
MEL (UK)	Beijing Medical Equipment Institute and Beijing Economic Development Corp.	—	Assembly of six 20 MeV medical linear accelerators from kits

SOURCES: National Council files, US industry sources, and *Japan Economic Journal*. Table prepared by Erin McGuire Endean.

signed three other transfer deals involving the Xi'an Instrument Factory, the Beijing Electric Meter Works, and the Sichuan Instrument Complex. Finally, the Fuji Electric Company is supplying the Wuxi Machine Tool Electrical Equipment Factory with electronic timer-making know-how.

Analytical instruments

US sales of analytical instruments skyrocketed as a result of purchases under the World Bank's University Development Project and agricultural education loans. US exports of analytical instruments in 1983 reached $44 million, double the 1982 level. Results of the World Bank loans will show up in the 1984 trade statistics as well, since many of the goods have not yet been shipped.

Traditionally considered research tools, many analytical instruments also have applications in industry. Spectrometers and chromatographs, for example, can be used to test chemicals or liquids used in manufacturing, in environmental protection, or in geological exploration. Therefore, sales opportunities go beyond traditional purchasers such as the Ministry of Education and the Chinese Academy of Sciences.

In fact, sales to enterprises may soon surpass those to universities and research institutes. "Sales are going where the money is," notes Adi W.Z. Loo of Finnigan-Mat. That is to say that instruments used in resource exploration, quality control in process industries, and nuclear power generation will be purchased before instruments with applications in agriculture and environmental protection.

As is true of most electronics purchases, some Chinese buyers want the "best," meaning the most advanced, regardless of its cost-effectiveness. Adi Loo explains: "With instruments, after an item has been produced for a few years, we might discover a way to lower the price and still produce an instrument capable of doing all it is supposed to, although performance levels might be a bit lower. The Chinese are not interested in making this sacrifice." Bill Hargrave of Perkin-Elmer agrees: "For now, the top-of-the-line instrument is fine for the few who know how to use it, but it won't help others to understand new principles and applications. You don't get into a racing car before you learn how to drive." His company has successfully marketed more conventional instruments, such as IR and UV spectrometers rather than the FTIR-type used in advanced research.

Technology transfer is just beginning to come into play. Varian recently signed a license to produce gas chromatographs at the Beijing Analytical Instrument Factory. The UK firm VG Analytical Ltd. has agreed to license mass spectrometer technology to a Beijing factory under the Chinese Academy of Sciences. A Finnigan-Mat executive notes that the Chinese are increasingly interested in keeping the foreigners around, and that many of these licensing deals could evolve into joint ventures.

Medical instruments

It comes as no surprise that China's primary areas of medical research—radiotherapy, lasers, and diagnostic imagery—are also the areas that have provided the greatest sales opportunities in recent years. The largest deal of 1983 was the $6 million sale of eight computed axial tomography (CAT) X-ray scanners by General Electric to the China National Chemicals Import–Export Corporation (SINOCHEM). The CAT scanners will be distributed throughout China, including hospitals in Beijing, Guangzhou, Harbin, Shenyang, and Zhengzhou.

Nuclear medical apparatus sales also look promising. Cyclotron made a $1.2 million sale of equipment to produce radioisotopes for radiotherapy diagnosis. The UK firm MEL sold two linear accelerators, one 20 MeV unit, and one 14 MeV unit, for use in cancer therapy. Canberra and EG&G Ortec have sold assorted instruments for gamma-ray detection in nuclear research labs, around nuclear power stations, and for geophysical prospecting.

The GE sale is proof that the Chinese are willing to spend money on sophisticated electromedical apparatus for research and, to a more limited extent, diagnosis and treatment. The sale does not mean that medical equipment sales are rising rapidly, however. According to GE's Eric Wentz, "China is just beginning to allocate money to purchase high-technology medical equipment. Until now, health-care technology has not been a high priority. It doesn't generate resources and doesn't produce goods to sell overseas. You're not likely to see the trend changing very rapidly," he cautions. "Health care as a whole is not likely to replace priorities in energy, transportation, and industry." Wentz believes the increase in last year's sales over 1982 is the result of a single large purchase. "Even infrequent purchases of big-ticket items add up rapidly," he says.

Major imports of medical equipment invariably end up at research institutes or factory-affiliated hospitals that help develop China's domestic production capability. Shanghai's Huashan Hospital, in conjunction with the Shanghai Institute of Medical Instruments and Appliances, produced China's first head CAT scanner in early 1983. But the country simply has not allocated sufficient funds to make radiotherapy and diagnosis a routine part of hospital care. The San Francisco magazine, *Diagnostic Imaging*, reports that China had only four CAT scanners in operation as of November 1983. That statistic is comparable to having only one CAT scanner in all the US. Even the CAT scanners purchased from GE will only marginally improve that ratio.

So far, MEL is the only foreign company to have reached an agreement to assemble medical instruments in China. But its agreement with the Beijing Medical Equipment Institute covers the assembly of only six medical linear accelerators—a fraction of the 200–300 linear accelerators the company estimates are required. China's imports of large pieces of X-ray and electromedical equipment are likely to continue to be for research rather than hospital use. Likewise, manufacturing arrangements will probably be few and far between.

Less expensive and less sophisticated surgical, dental, and medical instruments account for only a fraction of the medical instruments China imports. Even so, that fraction is likely to decline as China attempts to increase its own exports of medical devices. Opportunities for foreign companies are, for the most part, limited to joint ventures or compensation trade agreements involving such items as dental drill bits, syringes, surgical hand instruments, and veterinary instruments.

The Mount Sopris (Licensing) Story

The $2.3 million licensing deal between Mount Sopris Instruments (a division of EG&G) and China's Ministry of Coal Industry is among the first of its kind. Mount Sopris was asked to present a technical seminar on its borehole loggers in the summer of 1982. Within six months the company had signed contracts with the ministries of Coal and Geology worth $3 million. Before another six months passed, Mount Sopris signed a technical transfer agreement with TECHIMPORT, the China National Technical Import–Export Corporation, to manufacture borehole logging systems at the Weinan Coal Mine Special Equipment Factory near Xi'an, operated by the Ministry of Coal.

After an export license is approved, the Chinese will be trained to assemble OEM (original equipment manufacturer) parts supplied by Mount Sopris into borehole logging instruments and trucks, beginning with electronic circuitry and some mechanical parts. The first copy should be ready for testing in mid-to-late 1985.

Payment for the $2.3 million deal will take place in stages. The Ministry of Coal will make its initial payment as soon as an export license is granted. Additional payments are to be made at various points during the period of training. Mount Sopris proposed that the cost of the agreement be tied to the number of products manufactured by means of royalties, but the Chinese preferred a flat fee fixed at the outset. The agreement contains no product buy-back provisions and does not involve compensation trade; the equipment produced under license is for domestic sale only.

Mount Sopris made the decision to move from direct sales to technology transfer for several reasons. It felt that the demand for coal exploration logging trucks during the current five-year plan was several times higher than its current production capacity. Moreover, the firm wanted to establish good working relations with the Ministry of Coal, in order to demonstrate its capabilities in other product areas.

Mount Sopris has avoided one problem that has beset other licensing agreements: product distribution. Both parties want to sell the products in China. Chinese demand for the instruments is so high that earning foreign exchange through product export has not been an issue, as it is in so many licensing agreements. Moreover, Mount Sopris's earnings will not be dependent on Chinese production levels or marketing efforts, since the firm will get up-front payments rather than royalties. Sales of parts would be affected by low production and sales levels, but Mount Sopris has priced the agreement independent of anticipated earnings from sales of parts. —EME

Fluke: Step-by-Step into the China Market

Robert A. Kapp

The state of Washington, long known for its apples, timber, and aircraft, now boasts a vigorous and expanding electronics base. And while forest products represent the lion's share of the state's exports to China, individual high-tech companies in the state, especially in the fields of medical instrumentation and measuring and testing devices, have developed solid markets in the PRC in recent years.

The John Fluke Manufacturing Co., Inc., one of Washington State's best known electronics manufacturers, topped $5 million in sales to China in 1983. Now ranked fourth among the company's foreign customers, after the United Kingdom, Germany, and Canada, China is Fluke's fastest-growing overseas market.

In addition to direct sales, Fluke began a series of assembly contracts at a Beijing factory in 1980, and opened a service center there in 1982. Today Fluke is gearing up for a systematic program of market expansion and service to a varied and growing list of Chinese partners.

The company's gradual entry into the China market has created a good base of contacts and experience to expand upon. Fluke's product line of 40 types of testing and measuring instruments and systems, used on electronic products throughout industry, has broad applications in China's economy. The growth of Fluke's involvement in the PRC illustrates a corporate strategy in transition from ad hoc response to opportunities to a planned, long-term presence in the Chinese electronics sector.

From Sales to Assembly

Fluke's China sales began in 1973 with a $5,000 order for digital multimeters and frequency counters, the result of earlier Chinese contacts with a Canadian company acquired by Fluke. Business continued at modest levels until 1978. That year, the China National Instruments Import and Export Corporation (INSTRIMPEX) invited the company to China for a week-long seminar series on Fluke's circuit board testers, calibrators, and digital volt meters. The seminar gave Fluke a chance to introduce 80 percent of its entire product line. Nearly all the equipment brought to Beijing sold on the spot. The INSTRIMPEX seminar was the real jumping-off point for expanded business with the PRC, and sales of finished products have increased regularly ever since.

By early 1980, a series of introductions led Fluke into a special relationship with the Beijing Radio Research Institute (BRRI). The Institute, a municipal unit originally charged with research on broadcasting and volt meter technologies, has concentrated on research and development of digital multimeters since the late 1970s. Fluke's links with BRRI have endured to this day—until recently, BRRI has been Fluke's only formal partner in business deals above and beyond finished-goods sales.

The first Fluke–BRRI contract, valued at $500,000, called for Chinese assembly of 2,000 semi-knockdown and complete-knockdown (SKD, CKD) kits of the model 8024A hand-held multimeter for testing properties of electric currents. This was followed in 1980 by a $250,000 contract for assembly of 50 Model 8502A bench testing devices. Cooperation with BRRI on product assembly expanded in the fall of 1981, when the two sides agreed on Chinese assembly of Model 8520A bench-type precision digital multimeters. Unlike the earlier multimeter and bench testing device contracts, this assembly deal called for Fluke to provide and install production capability at BRRI, including such key items as flow soldering equipment.

This million-dollar-plus contract broke new ground for US technology transfer to China in the electronic test instrument industry. As a result, US export control review and COCOM deliberations proceeded slowly, and 14 months elapsed before assembly of the device began in Beijing. Assembly has continued beyond the term of the original deal; subsequent contracts extending through 1985 will bring to 700 the number of model 8520A digital multimeters assembled at BRRI.

In the spring of 1982 Fluke and BRRI contracted for Beijing assembly of a large quantity of bench portable four and one-half digit digital multimeters, in a transaction valued at more than $500,000.

Improving Service

With so much assembly work in the pipeline, location of a Fluke service center at BRRI was a logical development. The Fluke service center opened for business in April 1982. Under a two-year agreement, Fluke placed equipment worth about $100,000 at BRRI. Operating expenses of the center were to be covered by a small commission on all Fluke China sales—a very advantageous arrangement for BRRI as it turned out, since sales have exceeded both sides' expectations.

With the creation of the service center at BRRI, Fluke for the first time put a permanent service representative in China. Thus far, the center's workload has been lighter than expected, with 60–80 units a month sent in for service of the several thousand Fluke instruments in use throughout the country. Service problems have been routine, and reveal no distinctively Chinese patterns.

Fluke's service center contract with BRRI expires in April 1984, and the company then plans to transfer its service facility to the auspices of INSTRIMPEX, its original trading partner. The move will definitively separate service functions from the manufacturing operations of the host unit. Fluke thus joins the growing ranks of US, Japanese, and European instrument companies that have es-

Robert A. Kapp is executive director of the Washington State China Relations Council, a private nonprofit organization dedicated to advancing commercial and cultural ties between Washington State and the People's Republic of China. Kapp is the author of a book on Sichuan Province and numerous articles on China, and recently edited Communicating with China *(Intercultural Press, 1983).*

tablished service centers under INSTRIMPEX, including Perkin-Elmer, Varian, Finnigan-Mat, Jarrell-Ash, and Canberra.

Branching Out

As expected, the assembly agreement has greatly enhanced overall business. In 1983, finished-product sales and assembly contracts each accounted for roughly half of total China income. According to China manager Roland Chua, John Fluke Manufacturing Co. expects continued growth of assembly deals, and there are indications that the range of Fluke partners in China will soon widen. Negotiations for assembly of SKD kits for state-of-the-art test equipment at a Ministry of Electronics Industry plant in Sichuan Province have reached an advanced stage, two and one-half years after initial contacts were made.

Meanwhile, changes in Chinese economic organization have brought new business opportunities for Fluke. Formation of the China Electronics Import–Export Corporation in 1980, under the then-Fourth Ministry of Machine Building (now the Ministry of Electronics Industry), further widened the company's contacts. Rather than focus on a single trading partner (INSTRIMPEX), or single assembly partner (BRRI), the company is now involved with many Chinese organizations—including, in Beijing alone, CEIEC, INSTRIMPEX, NORINCO, TECHIMPORT, CATIC, Oriental Scientific Instruments Import–Export Co., China Great Wall Industry Corp., and the Xiaofeng Technology Equipment Company. Through TECHIMPORT, Fluke provided digital volt meters, data loggers, and signal generators to 26 Chinese universities under the University Development Program funded by the World Bank. Furthermore, the company is expanding its direct contacts with Chinese units outside Beijing. It currently deals with several Shanghai organizations as well as counterparts in Guangzhou, Yunnan, and elsewhere.

China's rapid acquisition of Fluke products has concentrated on the upper end of the company's product line. As Director of International Operations Ronald Wambolt points out, Chinese purchasers try to spend their limited foreign exchange on products that are simply not obtainable domestically. While the company has been responsive to opportunities for assembly of kits in the PRC, it has only recently become more receptive to Chinese interest in other forms of trade; China manager Roland Chua indicates that Fluke has begun to explore licensing opportunities in response to greater realism on the Chinese side.

An Eye to the Future

Fluke will remain very responsive to opportunities for assembly of its products, even while it eyes new opportunities in finished-product sales and in licensing. While politely but firmly drawing the line on how much technology it is willing to transfer, Fluke is confident that the rapid pace of change within the industry will minimize the risk of Chinese copycat production and competition. (Several obvious reproductions of Fluke instruments have been superficially similar but have lacked the crucial precision of the Fluke originals.) The company will leave the contract-writing to its international marketing staff, which has handled all contracts with China thus far.

Above all, Fluke's China business must now be brought fully into the company's corporate landscape, says Roland Chua. From modest beginnings in the basement of founder John M. Fluke's Connecticut home in 1948, Fluke's worldwide sales are likely to exceed $200 million in 1984, some 35 percent of which is generated outside the US. China is not only Fluke's fastest-growing overseas customer, it is a major market in its own right, with distinctive commercial, cultural, and social styles. Recognizing this, Fluke has recently made China market planning a separate process, distinct from its Asia-wide planning effort. Two staff specialists have been assigned to handle China full-time since January 1984. Now in the final stages of putting together recommendations on Fluke's long-term approach to China, Chua feels the company must emphasize technical support and training functions. Another task will be to integrate China business further into the work of the entire company, bringing more personnel at Fluke's Everett, Washington, headquarters into direct contact with China. ₹

Civil Aviation's Growing Pains and Opportunities

CAAC's poor safety record highlights its lack of modern navigational aids, airport facilities, and aircraft

Madelyn C. Ross

CAAC, China's Civil Aviation Administration, oversees not just the national airline of the same name, but most aspects of aviation in China. CAAC will attempt to put its multifaceted operations in order this year in the wake of a spate of accidents, hijackings, and press attacks on its service. With the spotlight on the shortcomings of aviation in China, and unremitting pressure to increase passenger and cargo service, US sales could rise substantially.

The immediate opportunities

Aircraft and engine sales, a mainstay of US exports to China since CAAC first bought US aircraft in 1972, have been brisk in the past two years. In 1983 $265 million worth of commercial aircraft, engines, and parts for 14 airliners were delivered—a significant portion of the US $2.2 billion export total.

CAAC should remain an important market for airliners as older planes are phased out and the fleet is expanded to meet transport requirements. The demand for aircraft should be particularly brisk as the priority once attached to rail, water, and highway transport gives way to a growing recognition that China's remote western provinces and large eastern cities desperately need better and faster links. China has announced that it will need some 100 large jetliners and another 100 smaller domestic aircraft for its civilian fleet by 1990. US industry analysts expect these purchases to continue at least until the end of the century.

China's domestic airliner production can meet only a small portion of the demand. Civil aviation has traditionally received a lower priority than military aviation, and China is still unable to commercially produce large passenger jets. Only three prototypes of the 100-plus-seater Yun-10 have been made, mainly for research and development purposes, though at least one may enter regular domestic service this year. Test flown in 1980 and 1983, the fuel inefficiency and outdated design of these 707 look-alikes make commercial production impractical. The next largest civilian plane made in China is the 48-seat turboprop Yun-7, an improved version of the Russian An-24, which in 1982 became China's first civilian liner to be produced in significant numbers. (*See* the November–December 1982 *CBR*, page 40).

More active role for McDonnell Douglas

Patience has paid off for the McDonnell Douglas Corporation, which completed its first major sale to the PRC in December 1983 with delivery of two MD-80s, derivatives of the DC-9, to CAAC's Shanghai Regional Administration. The planes entered service in March between major Chinese cities and Hong Kong and Nagasaki. That sale was followed in January by the signing of a letter of intent between Douglas Aircraft Company, a McDonnell Douglas division in Long Beach, California, and the Shanghai Aircraft Industrial Corporation, for joint production under license of 25 MD-80 jetliners at the Shanghai Aircraft Factory. A final contract could be signed any day, and the first plane should come off the assembly line by late 1986. Assuming all goes according to plan, this will be China's first major coproduction agreement with a US aerospace firm, and the largest coproduction agreement between the US and China to date. It also improves the MD-80's sales prospects worldwide, as it comes just one year after McDonnell Douglas hinted it might close down commercial aircraft production entirely.

The McDonnell Douglas joint production accord has been more than four years in the making. In late 1979 the company was on the verge of a similar agreement with the China Aero-technology Import–Export Corporation (CATIC), when the policy of readjustment intervened. McDonnell Douglas then scaled back its ambitious joint venture plans and concentrated on producing MD-80 landing-gear doors at the Shanghai Aircraft Factory. This interim arrangement was the first aviation subcontracting agreement between the US and China and was more in line with the financial realities of the Chinese side. Moreover, it offered McDonnell Douglas a chance to learn more about the capabilities of its eventual licensee. A second contract was signed in 1982 to manufacture nose landing-gear doors. The Chinese are now supplying more than 80 percent of the doors that McDonnell Douglas puts on the MD-80. "We have never missed a schedule or had a quality problem," claims Jack Utley, director of countertrade and offset programs at McDonnell Douglas.

The company expects to achieve the same success with its aircraft assembly operation, which will be China's biggest technology transfer deal to date, assuming a final contract is signed. For the first two years or so, kits containing about 80 percent of the MD-80 parts will be shipped to Shanghai for assembly. The two types of landing-gear doors already in production there, plus some other parts, will be added at the factory. McDonnell Douglas will provide technical

assistance on tooling, production, and certification, gradually increasing domestic content over a number of years. The major difference between this proposal and the one in 1979 is that this project will be a straight licensing agreement instead of a joint venture.

McDonnell Douglas hopes that increasing familiarity with their planes will lead to more sales. After the first 25 MD-80s are built, CAAC has an option on 15 more. McDonnell Douglas is also actively exploring the possibility of building a new, smaller commercial aircraft at the factory, which would meet China's future needs and might be marketed in other countries as well.

Engines for the twin engine MD-80s will be supplied by Pratt and Whitney, whose share of the contract value will be $150 million plus spares. Pratt and Whitney has provided engines for most of the civilian aircraft sold to China since 1972. Its Canadian division has sold smaller PT6A-10 turboprops used in the Chinese-built Y11T and Y12 planes being marketed overseas.

Past design failures may explain China's decision to buy (rather than coproduce) engines for the MD-80s. In 1975 China signed a $190 million licensing deal with Rolls Royce to assemble 50 Spey military aircraft engine kits at the Xi'an aircraft factory. However, the factory lacked the requisite metal-alloy technology to manufacture a suitable airframe and the arrangement collapsed after only a handful of kits were assembled. Pratt and Whitney has stuck with straight sales to China since its first deal in 1972, and has not seriously discussed building engines there. "China is one of our best cash customers," says John Ryan of Pratt and Whitney. Ryan notes that today CAAC buys spares more conservatively than in 1972, when it bought enough to completely rebuild every 707 engine. Now it is more sure of its commercial relationship with Western suppliers and waits to purchase spares as needed.

Boeing still going strong

The prospect of a McDonnell Douglas coproduction contract does not change Boeing's strategy in the hotly contested China market. As the first US firm to sell commercial aircraft to the PRC, Boeing has sold 25 aircraft to China between 1972 and 1983. The first contract, valued at $125 million for 10 707s, was awarded in 1972. Now international noise regulations have forced CAAC to transfer some of these planes from international to domestic routes. In 1978 CAAC purchased three 747 SPs, and a fourth 747 SP and a 747 Combi were ordered in 1982, as well as 10 737-200s (five for the Guangzhou Regional Administration and options on another five for the Beijing Regional Administration). Only the five destined for Beijing remain to be delivered, though China may order 737-300s instead, and is pressing for assembly in China. Two of the 747s were leverage-leased, and the rest were sold for cash.

The McDonnell Douglas joint production accord has been more than four years in the making, and when signed it will be China's biggest technology transfer deal ever. After the first 25 MD-80s are built, CAAC has an option on 15 more.

China sales have helped Boeing through lean times, accounting for more than 10 percent of the company's worldwide sales in 1982. Even if China goes ahead and produces MD-80s, there will be a need for more planes for long-haul international routes, and Boeing hopes to continue to dominate this market. The company hopes to deliver the five remaining 737s and sell three to five more planes this year. The new 767-200 extended-range is the most likely candidate and would be ideal for the lower traffic Beijing–Europe routes, according to Seddik Belyamani, director of Boeing's Asia-Pacific International Sales Department. But Boeing faces fierce competition from Airbus Industrie, the European consortium that manufactures the A-310. Airbus is reportedly willing to sweeten the deal with promises of technology transfer, and has received the personal backing of President Francois Mitterrand. For more than five years its efforts to woo the Chinese have failed, but recently the A-310 beat out Boeing's 767 in a hard-fought sale to Thai Airways. The decisive factor was Airbus's willingness to offer major discounts. The outcome of the Boeing–Airbus face-off in China could be decided by the second half of the year.

Smaller planes in larger numbers

In addition to operating the national airline, CAAC has responsibility for special aviation services such as agricultural spraying, geological prospecting, forestry, and fire-fighting. Agricultural advances have increased demand for aerial spraying and seeding services, while planes for aerial mapping and mineral exploration are also in high demand. In early 1983 CAAC Director Shen Tu predicted that some 100 planes for industrial and agricultural use would be purchased between 1983 and 1990.

US suppliers have already made some sales of small and medium-sized aircraft. Cessna took the lead in 1981 with the sale of three Citation II business jets worth $6.8 million plus spares. Only one of the planes was outfitted for passenger transport. The second was equipped with special calibration equipment for checking navigation airways, and the third with a special radar nose for mapping and radar testing. Cessna feels the potential is good but not outstanding. "We don't see a boom market for these aircraft in China over the next few years," says one Cessna executive. The key, he feels, is to concentrate on the sale of specially equipped aircraft for specific industrial and agricultural missions.

China's buying pattern to date bears this out. Beech sold three Super King aircraft worth $6–7 million each for aerial surveying, which should be delivered in 1984. Gates Learjet sold a long-range 36A, designed as an 8-passenger executive transport for the US market. The $24 million model delivered to China in May was equipped with a sophisticated radar system for geological surveying.

One US-based small-plane manufacturer, Quickie Aircraft Company of Mojave, California, preceded McDonnell Douglas at the Shanghai Air-

craft Factory where it has made about10 small Q2s under license since 1982. One of the Q2s will be on display at the Fall 1984 Guangzhou Trade Fair, but Quickie President Eugene J. Sheehan is not sure yet what he will do with the rest of them. They might be sold overseas, used in China for aerial patrols or courier service, or marketed in the US if and when they are certified. Sheehan claims his Q2's are $5,000–$10,000 cheaper when produced in China, a substantial amount for a plane costing only about $25,000.

Bureaucratic rivalries and technology transfer

In aviation, as in every industrial area in China, those doing the business are generally companies willing to engage in technology transfer at low cost. This usually means setting up some form of manufacturing facility there, and agreeing to buy back part of the production. Large aircraft sales to CAAC are increasingly accompanied by a 15–30 percent offset obligation on the part of the supplier. The Ministry of Aviation Industry (MOAI) is particularly insistent on this point, since it wants to modernize its factories. MOAI shares responsibility for aviation with CAAC, an administrative bureau directly under the State Council, which makes its aircraft purchases through the China National Machinery Import–Export Corporation, or MACHIMPEX, a trading organization under the Ministry of Foreign Economic Relations and Trade (MOFERT). For smaller purchases, CAAC uses its own procurement agency, the China National Aviation Supply Corporation (CASC). In its turf battles with CASC, MACHIMPEX's hand was strengthened in 1983 and 1984 by the central government's decision to increase the authority of the trading organizations under MOFERT. For the near future, MACHIMPEX and CASC will probably share contract-signing power. The Ministry of Aviation conducts foreign business through its corporation, the China National Aero-Technology Import–Export Corporation (CATIC), which takes primary responsibility for technology transfer and manufacturing aviation components for export. CATIC now has offices in New York, Los Angeles, and Montreal to promote buy-backs and joint production.

McDonnell Douglas has worked very closely with both CAAC and the Ministry of Aviation to keep down the price of its aircraft by facilitating counterpurchase arrangements. To this end, McDonnell Douglas provided space for CATIC's first US office for two years and introduced CATIC to dozens of potential US customers, both for China's aviation components and for nonaviation products.

Cooperation with CATIC contributed to subsequent aircraft sales. For example, when McDonnell Douglas introduces CATIC to a US firm, a price is put on the value of the technology China wants to obtain from the firm or the foreign exchange China stands to earn from the arrangement. If the deal goes through, a paper accounting transaction gives McDonnell Douglas "credit" that offsets the price tag of the planes it sells to China. In this way McDonnell Douglas's buy-back arrangement with CATIC and the Shanghai Air-

CHINA'S INTERNATIONAL AIRPORTS

International airport	Runway Number	Runway Type	Available navigational aids ILS	VOR	NDB/L	Alternate airports
Open to regularly scheduled international flights						
Beijing	18R	PII	X		X	Shanghai,
	36L	NP		XD		Taiyuan, and
	18L	NP				Tianjin
	36R	PII	X		X	
Guangzhou	03	PI	X	XD	X	Hangzhou,
	21	PI	X			Hong Kong, Nanning, and Shanghai
Kunming	03	NP		XD	X	Nanning
	21	NP				
Shanghai	18	PI	X	XD	X	Beijing,
	36	PI	XD			Hangzhou, Hefei, and Hong Kong
Shenyang	06	NP		XD	X	Beijing,
	24	NP				Harbin, and Tianjin
Urumqi	07	NP		X	X	Lanzhou and Hotan
	25	PI	X			
Xiamen	05	PI	X	X	X	Guangzhou,
	23	NP				Hangzhou, and Shanghai
Alternate (emergency) airports						
Hangzhou	07	PI	X		X	Guangzhou,
	25	NP		XD		Shanghai, and Xiamen
Harbin	05	NP		X	X	Shenyang
	23	NP				
Hefei	14	NP			X	Shanghai
	32	PI	X			
Hotan	11	NP		X	X	Urumqi
	29	NP				
Lanzhou	18	NP		X	X	Urumqi
	36	NP				
Nanning	05	NP		XD	X	Guangzhou and Kunming
	23	NP				
Taiyuan	13	NP		X	X	Beijing
	31	PI	X			
Tianjin	16	PI	X		X	Beijing and Shenyang
	34	NP		X		

P Precision approach runway
NP Nonprecision approach runway
I Classified as category I runway by International Civil Aviation Organization allowing planes to land with 200-foot ceiling and ½ mile visibility
II Classified as category II runway by International Civil Aviation Organization allowing planes to land with 100-foot ceiling and ¼ mile visibility
ILS Instrument landing system
VOR Very high frequency omni-directional range
NDB/L Nondirectional beam or locator
D Runway also equipped with associated distance measuring equipment (DME)

SOURCE: International Civil Aviation Organization. Table prepared by Madelyn C. Ross

craft Factory for landing-gear doors helped offset the foreign exchange cost of the two MD-80s bought by CAAC, worth about $25 million each. McDonnell Douglas has been a pioneer in the use of counterpurchase arrangements in countries with tight foreign exchange, and credits its success in China to these creative financing techniques.

European firms have been eager to offer similar coproduction packages. The French firm Aerospatiale has produced the Dauphin helicopter under license in Liaoning Province since 1980. Meanwhile, another European firm, Cie-Italie, has proposed coproduction of the ATR-42 short-haul transport suitable for use on feeder lines. China is also considering Canada's Dash 8 and British Airways's 146 for the same purpose.

While not yet involved in major coproduction in China, Boeing has signed contracts with CATIC for castings and forgings for its 737s and 747s made by the Xi'an Aircraft Factory. Boeing sent a negotiating team to Shanghai in May to explore the possibility of final assembly of 737-300s in China. Boeing's March 1984 announcement of a coproduction agreement in Japan indicates that the company may be more willing to enter into such arrangements given the present heated competition among major aircraft manufacturers.

Revmaster Aviation, which manufactures engines for the Quickie Aircraft Corporation, has been particularly successful sourcing components in China. Introduced to CATIC through McDonnell Douglas's offset program, Revmaster buys crankshafts and other engine parts from the Harbin Engine Factory. Richard Joh, director of Revmaster's special products division, claims they are superior to the equivalent product manufactured in the US. "The crankshaft is one of the most difficult items to get involved in," he notes. But the Harbin product was "a beautiful piece of workmanship." The company is now actively looking for other parts it can buy from China. Quickie Aircraft Corporation is also very pleased with the work done on its Q2s in China, and is considering buying small machine tools, aircraft instruments, and blades from CATIC for use on its planes.

Some companies, of course, prefer to stick with direct sales, and several feel that if the Chinese need the equipment badly enough they will buy it with or without some form of compensation trade. Gates Learjet did not buy back parts in China when it sold the 36A, although it may do so in the future. Cessna has been urged by CATIC to buy airplane parts in China since 1981. Both Gates Learjet and Cessna will explore the idea further in 1984 in the hopes that it will lead to increased sales.

New selling strategies

A change in the ground rules for selling aircraft to China may be in the offing. CAAC is close to a decision to give its regional administrations more buying power for aircraft flown on local routes. These regions are based in Beijing, Shanghai, Guangzhou, Shenyang, Lanzhou, and Chengdu. They currently must receive approval for all major aircraft purchases from CAAC's head office in Beijing. Under the proposed changes, the number of regional offices could be reduced from six to four, with Shenyang and Lanzhou absorbed into the Beijing and Chengdu regions, respectively. These four major regions would participate in the negotiating process with MACHIMPEX and CASC, and all parties would sign contracts.

Major US aircraft companies are already beginning to adjust their marketing strategies accordingly. The trend is likely to become clearer by December, when CAAC sponsors the first major exhibition devoted strictly to aviation. In March 1984, CAAC established its first regional civil aviation enterprise, Xiamen Aviation Ltd, which is authorized to negotiate regional aviation business and set up joint ventures with foreign companies. Talks have already begun with Aloha Air, and Xiamen Aviation Ltd.'s success or failure may shape the future of other regional aviation companies.

Most observers believe that the US–China airworthiness agreement under discussion since 1982 will greatly facilitate aviation deals. The US has such agreements with two dozen countries, including all major aircraft-producing nations except the USSR. By ensuring that aircraft built in China meet globally accepted Federal Aviation Administration standards, such an agreement "minimizes the paperwork involved in certifying imports from China to the US," according to Frank McCabe of the FAA's international division. Thus it would facilitate exports of Chinese-made aircraft to the US, and enable US companies to build aircraft in China for sale in third countries and the US.

The FAA has sent a draft airworthiness agreement to the Ministry of Aviation, but the question of implementation remains to be worked out. The lack of a single aviation regulatory body in China similar to the FAA poses problems. The engineering division of CAAC regulates all CAAC operations such as pilot licensing, aircraft maintenance, and the certification of CAAC planes. However, the Aviation Ministry's China Airworthiness Research Management Organization regulates aircraft production, using standards largely borrowed from the military, and issues "type" certificates for Chinese-built aircraft.

If and when an airworthiness agreement is reached, several US firms see important new opportunities. Quickie Aircraft, for one, looks forward to the time when its Shanghai-made Q2s can be sold in the US. Although McDonnell Douglas's MD-80s are for China's domestic market and do not need FAA certification, the company eventually wants to sell these planes in other markets. At present, US companies sourcing aviation components in the PRC can do so without an airworthiness agreement due to a wrinkle in the regulations that allows companies to guarantee parts made abroad under their own production certificates.

Liberalized export controls could also be around the corner. Aircraft and much of the standard commercial equipment they carry, such as high-frequency radios and altimeters, must be licensed for sale to China. Export of most of these items is controlled by the Department of Commerce, but particularly sophisticated items such as the inertial navigations systems (commonly found on sophisticated commercial transports as well as military aircraft) are regulated by the Office of Munitions Control under the Department of State. Aviation firms have run into numerous unexpected difficulties and delays in getting export licenses, particularly for planes equipped with specialized equipment for geophysical surveys and other industrial uses.

Good news, however, may be on the way. Due to the large increase in

export license applications for aircraft and related equipment to China (which accounted for more than half of the value of export licenses issued to China in the first quarter of 1984), the Commerce Department hopes to establish technology zone guidelines to facilitate sales of nonmilitary aircraft and airborne communications equipment.

Navigational aids needed

CAAC's poor safety record in recent years has "tremendously intensified the pressure" to improve airport facilities and ground-based navigational aids, according to one expert.

Investment in this sector is long overdue. Few navigational aids were purchased in the 1970s, even though China bought 33 Trident jets and 10 Boeing 707s. Nine instrument landing systems were bought from Britain's Plessy Company in 1974 along with a handful of very high frequency omni-range (VOR) stations from France's Thomson CSF. In 1979 a delegation of US companies toured the major air traffic control facilities in Beijing, Shanghai, and Guangzhou and, based on their findings, proposed a comprehensive $200 million integrated improvement program for these three airports. However, the plan was "complete overkill" according to one of the companies involved, going far beyond what China was prepared to do at that time. Very few US sales resulted from the trip.

CAAC seemed to grow complacent about the operation of China's airports and rudimentary navigational system, for which it is responsible. In fact, it announced at an early 1982 working conference that the national airline had earned "great prestige both at home and abroad" for having "one of the best safety records in the world." Within a matter of months CAAC's worst air disaster occurred, killing 112 as a Trident jet crashed near the Guilin airport in April 1982. A Hong Kong report blamed the accident on an air controller's mistake. In December another fatal accident, involving one of CAAC's Ilyushin-18s, killed 23 passengers at Guangzhou. Less than a year later CAAC's third fatal accident occurred as a Trident collided with a military plane on the runway at Guilin. During the same two-year period, two non-CAAC planes were involved in accidents at China's airports: a Japan Airlines flight overshot the Shanghai runway and injured 23 in September 1982, and a small King Air 200 aircraft leased by the French oil company Total Chine crashed and killed eight as it took off from the Guangzhou airport in April 1983.

The cumulative effect of these accidents may have produced some action. Guangzhou now has a brand new $1 million air traffic control system installed by Eaton Corporation's AIL division in 1983. The system has gotten "rave reviews" according to AIL's Anthony Freda Jr., and the Chinese want to install similar secondary radar systems at a number of other airports. AIL is now competing with Thomson CSF and others to supply six more air traffic control centers at Shanghai, Wuhan, Chengdu, Xi'an, Kunming, and Xiamen (Amoy). Smaller systems are under consideration for Guilin and two cities on Hainan Island.

Without accurate air traffic control systems, China has been trying to avoid collisions simply by allowing sufficient time intervals between scheduled flights. The addition of secondary radar at airports, in conjunction with transponder-equipped aircraft, will permit air traffic controllers to locate and identify aircraft within a 200-mile radius of the airport, significantly improving safety and scheduling capacity.

China has also recently purchased equipment that supplements and enhances the basic air traffic control package. Wilcox Electric Corporation, a division of Northrop, has sold China millions of dollars worth of equipment over the last four years, including six instrument landing systems in 1980 for Guangzhou, Chengdu, Xi'an, Guilin, Shenyang, and Xiamen. These systems will complement radar by providing precision approach capability once the plane has reached the airport vicinity. Wilcox has also sold 2 VOR stations for en-route navigation and 16 sets of distance-measuring equipment.

China buys most of its ground-based navigational equipment through CAAC's procurement arm, the China National Aviation Supply Corporation (CASC). Continued sales to CASC are more than likely, according to a group of US avionics specialists who visited China in mid-1983 and concluded that the basic ground system is still rudimentary. It includes only about 70 low-frequency nondirectional beacons, the simplest form of electronic navigation aid, subject to considerable weather interference and now largely phased out in the US. VORs for en-route control and nonprecision landings number only 18 (versus close to 500 in the US), and are mainly stationed along only two routes: the Beijing–Shanghai corridor, and the northern China air route to Moscow and Europe.

CAAC's three-phase plan to improve navigational aids will begin with modernizing air traffic control and instrument landing systems at international airports. There are now seven airports receiving regularly scheduled international flights, and eight alternates for back-up use (*See* page 52). Phase two calls for installing terminal navigational aids at *all* major airports in the country, and phase three of CAAC's long-range plan will focus on upgrading en-route navigational systems. According to industry sources, the best sales opportunities for foreign firms will be concentrated in the first phase. China hopes to manufacture much of the equipment needed for the second and third phases by itself, or perhaps in conjunction with foreign manufacturers willing to aid in technology transfer.

Increasingly sophisticated airborne avionics equipment will be required to interact with the ground-based navigational aids. Rockwell-Collins has been the most active supplier to date in this area, but several other US firms have also made indirect sales to aircraft and helicopter manufacturers selling to China. Retrofitting older aircraft, and selling equipment for new planes being built in China, such as the YIIT, which used Rockwell avionics, provide other opportunities. The market in China for radios, flight control systems, and airborne radar could be as high as $40–100 million over the next decade, depending on the amount of military aircraft equipment sold.

Better airport facilities

In 1983 CAAC launched airport expansion projects at more than nine of China's 115 airports. Next on CAAC's list are Guangzhou's Baiyun Airport and those at Xi'an in Shanxi and Dalian in Liaoning Province. As many as a dozen new airports are planned or under construction. According to David Bowie at the De-

partment of Commerce, CAAC traditionally has not gone outside the country for airport construction, but appears willing to do so now on several projects. A British–French consortia hopes to assist in building an international airport at Shenzhen, which would help reduce the load at Hong Kong's overburdened Kai Tak Airport. A new airport for the region has been under discussion for a decade, with sites in Macao and Hong Kong's Lantau Island already rejected. The biggest obstacle facing the Shenzhen proposal is of course convincing the dozens of international airlines now flying into the British territory of Hong Kong that it would be profitable to negotiate new bilateral agreements with the PRC to land in Shenzhen.

The major expansion of Shanghai's Hongqiao Airport, in need of a complete facelift to keep up with the modernized Beijing International Airport (finished in 1980), will also involve outside help. Obayashi-Gumi Ltd, a Japanese contractor, has already begun to expand the existing terminal from 6,000 to 15,000 square meters. It will be solely for domestic use once a new international terminal and runway are completed with foreign assistance. Meanwhile, a temporary domestic terminal will be built by the Chinese themselves.

Construction of heliports is another area of activity, particularly in southern China. Shenzhen's Nantou heliport was completed in November 1983 and another will be ready soon at Zhuhai. Both will accommodate the influx of helicopters servicing offshore oil operations.

Catching up

Between 1972 and 1982 civilian passengers increased almost tenfold from 460,000 to 4.45 million, while China's air freight increased from 30,000 to over 100,000 metric tons. CAAC now operates 671 domestic and international flights a week during the spring and summer, and 641 in the off season. Eight domestic and seven international routes have been added since 1980, and flights to north and west Africa will soon extend the international network. Some of these routes are primarily for transporting Chinese laborers to overseas projects, now one of the most important sources of revenue on CAAC's international routes.

There has also been room for newcomers, with 15 foreign carriers now flying directly to the PRC. Northwest Orient has just become the second US carrier to fly to China, joining Pan Am, which has served the PRC since 1981. The increase in international carriers serving China also indirectly increases CAAC's domestic business, as CAAC has maintained its monopoly over domestic service.

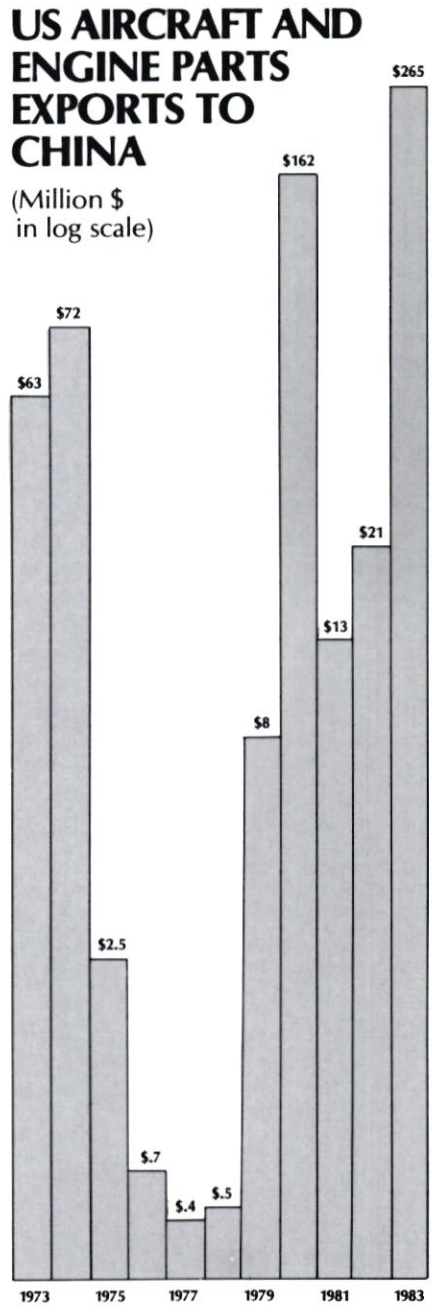
After overcoming a long-term operating loss for the first time in 1980, CAAC's profits rose to close to $100 million in 1982 and 1983. Much of this comes from international services, since domestic travelers are subsidized and generally pay only 40–60 percent of the fares charged foreigners. CAAC's cash flow has also benefited from the government's low aviation fuel prices. But rapid growth has been a mixed blessing, for along with profits has come a reputation for poor safety and scheduling. In 1983 and 1984, criticism of CAAC became so frequent in both the Chinese and foreign press that CAAC responded with an internal directive that all incompetent CAAC cadres, and those unable to improve service in their units, will be removed from their posts during 1984.

In order to improve its poor reputation, CAAC has mounted a concerted public relations effort. Glossy in-flight magazines, full of glowing reports about CAAC, are now found at each passenger's seat, and Western advertising firms have been enlisted to improve CAAC's image abroad.

While the public relations campaign and internal reorganization may have a short-term effect, only time will tell if CAAC can play the key role expected of it in China's push toward modernization. Air transport is scheduled to be an important factor in relieving China's transportation bottleneck—recognized as one of the greatest hindrances to growth of the national economy. Aviation industry representatives in the US estimate that CAAC currently can meet less than 50 percent of China's air transport needs, and is growing more slowly than the national economy it serves. Thus CAAC would have to expand operations eight times in order to meet the economy's transport needs if China's GNP quadruples by the year 2000, as projected.

Even if an eightfold expansion of service were feasible, it would be just a beginning. Aviation expansion will require an equally rapid growth in secondary facilities and services, such as airport access roads, associated rail transportation, and accommodations for many more domestic and foreign passengers. The task of coordination will be a herculean challenge, and not one that CAAC has met with distinction in the past.

CAAC officals have just begun to take a more comprehensive look at the needs of the air transport industry as a whole. One likely result will be the spinoff of some of CAAC's functions to separate corporations. This would permit CAAC to streamline itself and concentrate on fulfilling its own ambitious plans. ₹



SOURCES: US Commerce Department export statistics, Schedule B; and National Council files.

Artwork by John M. Yanson

China's Rising Demand for Helicopters

Madelyn C. Ross

The rapid growth in oil exploration and natural resources development has forced CAAC to begin replacing its aging fleet of Russian MIL-4s and MIL-8s with foreign-designed high-performance helicopters. The most immediate need is to support offshore oil rigs, but China is quickly discovering how useful helicopters can be for geophysical surveys in the interior, stringing power lines across rugged terrain, and on military patrols in western China. According to Lee Linthicum of Bell Helicopters, China is recognizing that it often can be more cost effective to use transport helicopters to fly men and material to remote work sites than to build new roads.

Assembling a fleet

CAAC's first major purchase of US helicopters—eight Bell 212s—came in 1979; the ninth 212 was delivered in early 1982. Two of these helicopters are now used for forestry services and fire prevention in north China, while two perform geophysical surveys. The five remaining Bell 212s are being used for offshore oil support, as are 11 additional US helicopters introduced into China in the past two years. Another five Bell helicopters were leased for offshore oil support in 1982–83: one 212 and two 412s used by the Japan–China Oil Development Corporation (JCODC) in the Bohai Gulf near Tianjin, and two Bell 214STs under contract to Occidental for drilling activities in the Pearl River Delta, which began in March.

United Technology's Sikorsky Helicopter division also became a major actor in the South China Sea in 1983, after six of its machines were leased in rapid succession. A contract with British Petroleum involves two large work-horse S-61Ns, owned by British Airways and previously used for North Sea oil operations. Two newer model S-76s owned by Canada's Okanagan Helicopters Ltd. are under contract to Exxon. In May 1984 CAAC leased two more Sikorsky S-76s from Okanagan, which will be based in Shanghai to support British Petroleum's drilling activities off the east China coast.

A substantial expansion of China's helicopter fleet will be required in 1984, with each new active offshore oil rig requiring an average of two helicopters, according to one expert. In the South China Sea area alone, the number of helicopters in service will probably have to increase from nine to 20 by the end of this year.

French Dauphin helicopters are currently being assembled in the city of Harbin under a 1980 licensing agreement between Aerospatiale and the Ministry of Aviation. Although these helicopters were originally contracted for in anticipation of China's need for oil support helicopters, the choice of the Dauphin for this function appears to have been a poor one. According to several oil industry representatives, the Dauphin's payload range capacity is too small to carry the requisite number of rig workers to and from most of the rigs in the South China Sea, which average more than 125 miles offshore. The Aviation Ministry continues to hope that the Dauphins will be used, but so far the oil companies have opted instead for Bell and Sikorsky machines. One Dauphin is, however, now on standby for search and rescue operations in the South China Sea area and several others are available.

Another major problem with the Dauphin licensing agreement has been the difficulty of moving beyond assembly to actual production at the Harbin factory, where MIL-4s used to be produced under Russian license. According to the original terms of the contract, 50 Dauphin 365Ns were to have been made in China by 1986, with the factory gradually taking over more production responsibility. The 51st machine would have been totally Chinese-made. But production is reportedly far behind schedule, with only a handful of machines assembled so far.

Other assembly and coproduction opportunities are likely to open up as demand increases. Bell Helicopter Textron, which lost out to Aerospatiale in 1980, is still interested in future industrial cooperation with China. In the short term, the company would be willing to help China develop the capability to perform major component overhauls on the Bell helicopters it now operates. Sikorsky has also indicated a willingness to enter into technical cooperation, and is now negotiating the di-

rect sale of an S-76, which could be used to train Chinese helicopter pilots, among other things. McDonnell Douglas began to explore sales prospects in China after it bought Hughes Helicopters in 1983. Though a latecomer, McDonnell Douglas's long-standing relationships with aviation authorities could help its new helicopter company become an established supplier or coproduction partner in China.

Competition for service

The growing need for helicopters is complicated by the rivalry between CAAC (which handles most nonmilitary helicopter operations in China) and the China Ocean Helicopter Corporation (COHC), formed in 1983 with State Council approval. COHC, based at Shenzhen's new Nantou heliport, is a joint venture between the Ministry of Aviation, Ministry of Petroleum Industry, Guangdong Province, Shenzhen Economic Development Corporation, and the Maritime Aviation Co. which has close ties with the navy. COHC competes with CAAC's Civil Aviation Helicopter Company (CAHC) based in Zhuhai and Guangzhou for South China Sea oil support business. CAAC opened a helicopter service center in Shanghai in March 1984. COHC, not to be left behind, plans to open branch offices in Shanghai, Qingdao, and Tianjin.

In order to service the oil companies, COHC and CAAC have both entered into agreements with various helicopter operators that provide and maintain helicopters and train pilots. The issue of pilots is a touchy one, since some oil companies prefer that expatriate operators fly the machines until Chinese pilots, who are drawn largely from the military, gain more offshore operating experience. "Oil companies must take a hard look at how much they can reduce pilot experience requirements without compromising safety," explained one US industry representative. The Chinese appear to have become more flexible on this issue in 1984, allowing expatriate pilots in the copilot seat beyond normal training periods.

Avoiding the bureaucratic rivalry

CAAC, which reportedly cut its helicopter service rates by 41 percent in 1983, has been on the winning side of all but the Occidental tender so far, which went to a COHC–Petroleum Helicopters Inc. team. US helicopter manufacturers and operators, hoping to avoid getting caught up in this Chinese rivalry, try to take an even-handed approach to both companies.

The bureaucratic competition over helicopter services can sometimes have tragic consequences. When ARCO's Glomar Java Sea rig sank in October, the S-61N helicopters working for another oil company in the same vicinity were the only machines capable of performing search and rescue operations in the heavy storm. But these helicopters did not receive clearance to fly until 24 hours after communication was lost with the rig, because of confusion over who had the authority to authorize their takeoff.

The need for improved helicopter services can only increase. According to China Energy Ventures, substantial expansion of the helicopter fleet will be required in 1984, with each new active rig (10–15 rigs will be mobilized this year) requiring an average of two helicopters, one on active duty and another as a back-up. Lee Linthicum of Bell Helicopter Textron predicts that in the South China Sea area alone, the nine machines currently in service will have to increase to 20 by the end of this year.

US Helicopters in China

The most immediate need is to support offshore oil rigs, but China is quickly discovering how useful helicopters can be for geophysical surveys.

Type	Number	Base	Owner and Operator
Bell 212	2	Tianjin	Owned by China; operated by CAAC in Bohai Gulf
Bell 212	3	Sanya, Zhuhai, Zhanjiang	Owned by China; operated by CAAC to support ARCO and TOTAL when drilling resumes
Bell 212	2	Harbin, Jagdaqi	Owned by China; operated by CAAC for forestry and firefighting
Bell 212	2	Tianjin	Owned by China; operated by CAAC. Used for airborne geophysical work
Bell 212	1	Tianjin	Owned by Air Logistics International and leased to CAAC; used first by ARCO in south China, then transferred to Bohai Gulf for use by JCODC. May be moved back to South China Sea
Bell 412	2	Tianjin	Owned by Aero Asahi of Japan and leased to CAAC; and under contract to JCODC
Bell 214ST	2	Shenzhen	Owned by Petroleum Helicopters Inc. and leased to COHC; under contract to Occidental
Sikorsky S-61N	2	Guangzhou, Zhuhai	Owned by British Airways Helic. and leased to CAAC; under contract to British Petroleum in Pearl River Delta. Previously used in North Sea operations
Sikorsky S-76	2	Guangzhou, Zhuhai	Owned by Okanagan Helicopters Ltd. and leased to CAAC; and under contract to Exxon
Sikorsky S-76	2	Shanghai	Owned by Okanagan Helicopters Ltd. and leased to CAAC; under contract to BP for drilling off east China coast

SOURCES: US industry representatives and National Council files. Table prepared by Madelyn C. Ross.

Export Controls: Where China Fits In

At one time or another China has been a Y, Z, P, and now a V nation. Is it any wonder export controls spell confusion?

Madelyn C. Ross

High-technology goods have become an important component of US–China trade. Agricultural products, which accounted for some 60 percent of US exports to China in the recent past, are now losing ground to electronics, aircraft, and capital equipment. In 1983 $1.1 billion worth of goods were granted an export license to China by the US government, up from negligible amounts prior to 1978, and a figure equivalent to 50 percent of US exports during the same period.

A good deal of confusion exists over the process of granting export licenses, much of it due to the sheer weight and complexity of the export regulations themselves. Another problem stems from the fast evolution and contradictory nature of our policy toward China. Trade is viewed both as a means to cement Sino–US ties and as a risky business proposition with an unpredictable partner. Our official view of China seems to waiver between that of a friendly free-world country whose modernization we support, to a communist country that could threaten our national security or divert our goods to enemies such as North Korea. While numerous trade issues are the source of friction between the US and China, the problem of high-technology trade policy will be especially crucial in the long term. It is not only an area in which a huge potential market exists and in which US firms are anxious to remain competitive, but also an issue that China regards as an important test of the bilateral relationship.

Our changing China policy

In May 1983 President Reagan announced that China would be moved into the "V" country category for export control purposes. The V category consists of "free world" countries including most of our Western European allies and other friendly, non-allied nations. The political statement implicit in this move—that the US regards China as a friendly country—carried great symbolic significance, since such country classifications reflect, and in turn influence, the state of political relations between countries. Eugene Lawson, deputy assistant secretary for East Asia and the Pacific at the Department of Commerce says, "I think it's fair to say that the single most important factor in the recent upturn in Sino–US relations was the president's decision last May to liberalize our technology transfer policy toward China." In Commerce Secretary Baldrige's words, the move "succeeded in removing US export control policy as a major irritant in our relations."

Things haven't always been so rosy. For a brief initial period after 1949, the People's Republic of China was placed in the "Y" group category for the Soviet Union and its allies. But during the Korean War, China was moved into the total embargo category—Z—where it remained for some 20 years. In 1971, as Sino–American relations began to thaw, the regulations were revised to permit US export of a few nonstrategic items, and in 1972 China was moved back to its original Y status, where it remained until 1980. Category Y allowed for shipment of nonstrategic items similar to those allowable for the USSR.

The lumping of Russia and China together in Category Y became increasingly untenable in the late 1970s, as political relations with China improved while those with Russia worsened. The Soviet invasion of Afghanistan was a turning point, after which it became impossible to maintain even the pretense of an even-handed policy toward China and the Soviet Union. In 1980 Carter created a brand-new category for China alone—Country Group P—accompanied by less stringent technical guidelines for exports. For the first time, China could buy "dual-use" items with potential military applications.

In June 1981 Reagan went one step further by announcing that China-bound exports would have a presumption of approval at technical levels twice as high as those permitted the Soviet Union, based on the assumption that it was in our national interest to foster a strong, secure, and friendly China. This new policy, coupled with the move to category P, set in motion the snowballing of export license applications to China that Commerce Department officials are still trying to manage.

But Reagan's "two-times" policy, as it came to be called, was merely a vague benchmark not easily applied to all controlled commodities, and led to serious implementation problems. According to an official in the Office of Export Administration (OEA), "The policy worked for computers, but for some items a twofold increase made very little difference and for others it was a ridiculously large increase. The policy made political, but not common, sense."

The two-times policy also posed political problems. The Chinese objected to the direct comparison with the USSR implicit in the rule, and argued that they should be viewed in a wholly different light. This is exactly what happened in 1983 when China was moved into category V, although a number of substantive issues still remain to be worked out.

Country Group V

China's move to Country Group V did not end the controversy. The V category is essentially a catchall for countries outside of North and South America not included in other groups. (South American countries have their own free world category, T, while Canada remains the only country except for the US not in a country group.) As such, V countries are a mixed bag ranging from NATO allies to India and Yugoslavia, and are not treated equally in the export administration regulations.

The "free world" countries of categories V and T generally have access to most items on the Commodity Control List (CCL), a catalogue of 215 dual-use items that the Commerce Department monitors and restricts for foreign policy, national security, and short-term supply reasons. One can find just about anything, from aviation gasoline to viruses and zirconium metals, on the list. But for the PRC, a major caveat in the regulations states that: "... certain commodities, data, and end-uses may require extended review or denial. Of particular concern are exports that would make a direct and significant contribution to nuclear weapons and their delivery systems, electronic and anti-submarine warfare, intelligence gathering, power projection, and air superiority." This qualification requires numerous specific technical restrictions for China in the Advisory Notes that follow each CCL category. So many exceptions to "routine" V policy remain in effect for China that some exporters are reminded of the days when China was in its own group, P. These exceptions are a major irritant to traders, who claim many are unjustified and lead to cumbersome procedures and long delays. Representatives from a broad range of private industries have voiced the hope that China's V group status will gradually be normalized.

The new zones: green, yellow, and red

Faced with an avalanche of China cases, and recognizing the inherent contradiction in placing China into the V category while maintaining major exceptions, the Commerce Department took the unprecedented step of announcing three "technology zones" to be used in the evaluation of applications for China. The zones establish a framework for reviewing export applications and, it is hoped, will speed the US licensing process. "Green zone" items should be approved rapidly, while a special interagency group under the direction of the National Security Council was set up to review the implementation of the zones on a quarterly basis.

China is the first country for which such a system has been tried. While laying out the general technical parameters of each zone, the Department of Commerce has avoided publicizing specific technical levels, since other factors, such as the trustworthiness of the end user, must be considered in determining the treatment of each case.

Since it was impractical to complete the time-consuming and technically demanding job of formulating special zones for all 215 CCL entries, the Commerce Department focused on the areas of most pressing need and selected seven categories that account for roughly 75 percent of all license applications for China. The seven categories:

- Semiconductor Production Equipment (1355A)
- Electronic Instruments (1529A)
- Microcircuits (1564A)
- Computers (1565A)
- Recording Equipment (1572A)
- Oscilloscopes (1584A)
- Computerized Instruments (4529B)

Of these, the Commerce Department claims that 1565A alone accounts for 41 percent of all license applications to China, and 4529B another 15 percent. First quarter 1984 figures confirm that these seven categories are capturing the bulk of license applications, and account for 82 percent or 944 cases out of a total of 1,163 cases approved so far this year. (*See* table page 60).

Items in the green zone, the least technologically advanced of the three zones, will receive expeditious approval by the Office of Export Administration, and need not go to interagency review—a process by which other government agencies, and in particular the Department of Defense, review sensitive cases. "Basically what we did is negotiate with the Department of Defense the levels they didn't need to see, and called it a green zone," explains one Commerce official. Green-zone items are considered to pose little or no national security risk if sold to China, and include: most medium-scale computers with processing data rates of up to 155 megabits per second; 16-bit microcomputers; most commercially available oscilloscopes and magnetic tape recorders; electronic systems with embedded microprocessors not otherwise controlled; and a wide range of LSI-level integrated circuit production and test equipment.

The yellow, or intermediate, zone encompasses items of higher technology, which will be reviewed by Commerce and other government agencies on a case-by-case basis and approved unless a demonstrable threat to US security interests is identified. The red zone contains items (which have not been made public) with direct applicability to the development of advanced military systems, and carries with it a strong presumption of denial.

Most government and industry representatives feel there hasn't been enough time to judge the success of the zones in clarifying policy and speeding the export control process. Still, industry views the move very positively in theory and hopes to see more green zones established for new CCL categories.

The Department of Commerce is now at work doing just that, with plans to complete technical guidelines for 10 new CCL categories by June.

Coping with the deluge

Even the new "zoning" system may not speed cases enough to meet OEA's own target of processing applications to V category countries within four weeks. OEA comes under the Commerce Department's International Trade Administration and administers export controls for all items on the Commodity Control List, though it works closely with other government agencies. The office is seriously overburdened, and in the midst of reorganizing to cope with the deluge of applications.

The total number of applications for export licenses to all destinations rose from 87,000 in 1982 to 95,000 in 1983, and could reach between 120,000 and 140,000 in 1984.

The problem of speeding up operations is being tackled at OEA in several ways. A new, and as yet unnamed, division of exporter assistance will be created to handle all

exporter services. A budget increase for fiscal year 1985 will allow for approximately 60 new licensing officers on top of the 176 there now—still far too few to handle the workload, according to most observers. OEA officials readily admit their difficulty in attracting licensing officers at a time when private sector salaries are rising.

A beefing up of the computer system will also help the application processing system, according to Dick Isadore, who will head the new OEA exporter assistance division. "Previously we used rotary cards and ran manual checks" on the past history of exporters, consignees, and end-users, he explained. But during 1984 a separate division for computer services will be split off from the operations division, to promote the more effective use of computers in the processing of export licenses. In March 1983 the Commerce Department claimed that a new "Automatic Enforcement Screen" had shaved eight days off regular processing times. It is a computerized data bank that speeds intelligence checks on end-users, consignees, and exporters. Eventually they hope the system will cut 15 days off the processing time.

Not everyone is so sure, though. According to one disgruntled exporter, "I take all such claims with a very large grain of salt. They [the Commerce Department] have been talking about improving processing times for years. The system's just unworkable and there's not much that can be done about it short of a total change in procedure."

Bulk licenses for China?

Another fact China traders must contend with is the time-consuming process of obtaining individual validated licenses for most controlled items. The Commerce Department issues two basic types of license: general licenses, which confer authority to export a certain commodity without submitting an application each time, and validated licenses, which permit shipment of a specified commodity to an identified consignee in a particular country for a designated use. Under the exceptions to V country procedure in the export regulations, China is an ineligible destination for most general licenses.

In fact, there are ways to avoid filling out a license for each and every product, by using one of the "special licensing procedures" that China qualifies for in limited cases. A "project license" permits multiple shipments of approved commodities to a single end-user. These are granted for major projects, and could prove particularly important for oil companies conducting petroleum exploration off the China coast. A service supply license is also possible in limited cases when an exporter maintains a service center in the PRC. But many exporters were keenly disappointed in November when the new V guidelines for China were made public and explicitly excluded China from the distribution license (DL). This special licensing procedure permits multiple shipments of a specified item to approved consignees in eligible countries.

The absence of any widely applicable bulk license for China is burdensome to the Commerce Department and exporters alike, and involves a questionable use of the licensing officer's limited time. Because of this, the Commerce Department is looking into options for some modified form of the DL for China, despite opposition from the Department of Defense and some congressional leaders.

The munitions list

While the CCL is the most comprehensive compilation of restricted export items, it is by no means the only list. Relatively short lists of other commodities are controlled by various government agencies ranging from the Nuclear Regulatory Commission, which oversees the exportation of nuclear equipment and materials, to the Department of Interior, which looks after endangered wildlife. But the most important list other than the CCL is the US Munitions List, administered by the Office of Munitions Control under the State Department. Munitions fall under State Department purview, since determination of who can and cannot buy US arms is viewed basically as a foreign policy decision.

China first became eligible to buy items on the list in March 1980, when then-Defense Secretary Brown announced that sales of certain categories of nonlethal military equipment would be considered. In 1981 the Reagan administration opened the door further by making the sale of any item on the list possible after a case-by-case review.

Despite this change, very few items have actually been sold. What has changed hands has mainly been peripheral items such as military communications equipment, deciphering devices, and spare parts. China has been unwilling to make major purchases of military equipment, in protest over US government policy toward Taiwan. In 1982, at the height of the political controversy over Taiwan, sale of items from the US Munitions List to China totaled only $151,000, down from $2.8 million in 1981, the first year in which China could shop from the entire list. But that situation is changing now. In 1983, Munitions List sales to China rose to $71.7 million. According to an official from the Office of Munitions Control: "The atmospherics have improved. Since last spring the

Licenses Approved for China

	Number processed	Number approved	Value *(million $)*	Number denied	Number returned without action
1981	1,916	1,508	306.3	132	276
1982	2,355	2,020	354.7	80	255
1983	3,954	3,314	1,108.0	28	612
1984 (Est)	6,000	5,040	2,000.0	42	918

Cases Approved in Seven CCL Categories

(first Quarter 1984)

Commodity and control No.	Number of cases approved	Value *(million $)*
Semiconductor production equipment 1355A	29	3.7
Electronic instruments 1529A	141	3.2
Microcircuits 1564A	77	.9
Computers 1565A	374	98.2
Recording equipment 1572A	46	6.4
Oscilloscopes 1584A	43	.9
Computerized instruments 4529B	234	14.6
Subtotal (1st Q 1984)	**944**	**127.9**

SOURCE: Office of Export Administration, US Department of Commerce, April 1984.

Chinese have been more interested in discussing defense cooperation, including arms sales." The visit of Defense Secretary Weinberger to China last September, and the upcoming visit of Defense Minister Zhang Aiping expected later this year, indicate that defense sales are likely to move ahead faster. It's not yet clear how export controls will proceed in this area, since the water is largely untested.

Multilateral export controls

A majority of US high-technology sales to China are subject to an additional layer of multilateral review in COCOM after unilateral US government review. China's inclusion on the list of communist destinations to which COCOM monitors free-world exports raises some fundamental questions about export policy, begging the question of whether we view China as a friendly or unfriendly destination for our exports. China is the only category V country subject to COCOM review, and even most of the new green-zone items must still be sent to COCOM in Paris. This adds a lengthy delay to the already slow US processing time, and in some cases cancels out the US government's efforts to streamline the review process.

COCOM was established in 1949 at the behest of the US, and charged with controlling the export of militarily relevant technologies to communist countries. Japan and the NATO countries, minus Iceland and Spain, make up the member nations of COCOM. According to the State Department, COCOM "has no formal relationship to NATO and is not based on any treaty or executive agreement. Although members have no legal obligation to participate in COCOM or to abide by commitments made there, in practice there have been few instances when a member country has deviated from COCOM's unanimous decisions."

The reality behind that statement is a barrage of charges and countercharges on both sides of the Atlantic that COCOM members deliberately delay and thwart each other's exports for their own commercial gain, or simply ignore the COCOM process altogether. US government officials confirmed that they have heard numerous reports of "cheating" on the part of some COCOM members, but as one commented: "We're long on charges but short on proof." US companies that submit evidence are often told there is no use in tracking down a *fait accompli*, and in the future they should submit proof of acts in progress. But, says one exporter, "I'm not the Gestapo with time to run around guessing what other people are up to. I only know what's happened when I see the equipment in place. I'm convinced that the US is the only country that honors the spirit of COCOM."

The treatment of China cases is a particularly sensitive issue in COCOM now, symbolizing the different world views held by the US and its allies. Some COCOM members view the recent change in US export regulations for China as an attempt to manipulate trade policy to US commercial advantage. They claim that if the US can make things easier for a favored trading partner, restrictions should also be loosened for East European nations such as Romania, Bulgaria, and Czechoslovakia, which are important markets for West European goods. But the US strongly opposes the idea of easing restrictions to Eastern Europe, a move it sees as merely facilitating Soviet access to advanced Western technology. Former US National Security Advisor Zbigniew Brzezinski has joined the voices in the US suggesting the possibility of taking China off the list of COCOM-proscribed countries altogether, but here again COCOM members disagree over which countries are most worthy of being removed.

A possible alternative to taking China off the COCOM list altogether is bringing the technical guidelines more up to date. Many feel that the technical parameters of the COCOM list have not been revised upward quickly enough to reflect world realities. For example, more advanced computers may be approved under the new US green-zone guidelines than under COCOM. According to William Root, former director of the Office of East–West Trade in the Department of State, "The recent explosion of low-cost, relatively high-performance computers will soon overload the COCOM system unless List Review action (the process whereby COCOM updates its technical guidelines) provides relief. . . . The single most helpful action to ease the problem of COCOM processing of China cases would be decontrol of relatively low-performance computers."

Another problem for the US is that any attempt to open general licensing procedures for China—such as the DL—are rendered impossible by the fact that we must submit records for each export of controlled items to satisfy COCOM's reporting requirements.

COCOM has three lists of essentially embargoed items to which

Photo courtesy of China Features

A new computer station at the China International Travel Service

Photo by Li Changyong courtesy of New China Pictures Co.

Most high-technology sales to China are subject to review by COCOM, the Paris-based organization that controls exports to most communist countries. Approval by COCOM can take from 45 to more than 120 days. "If only one COCOM member objects, the case is vetoed," claims one authority. Here a Chinese operator adjusts the foreign instruments installed at the new Semiconductor Elements Factory in the Shantou Special Economic Zone.

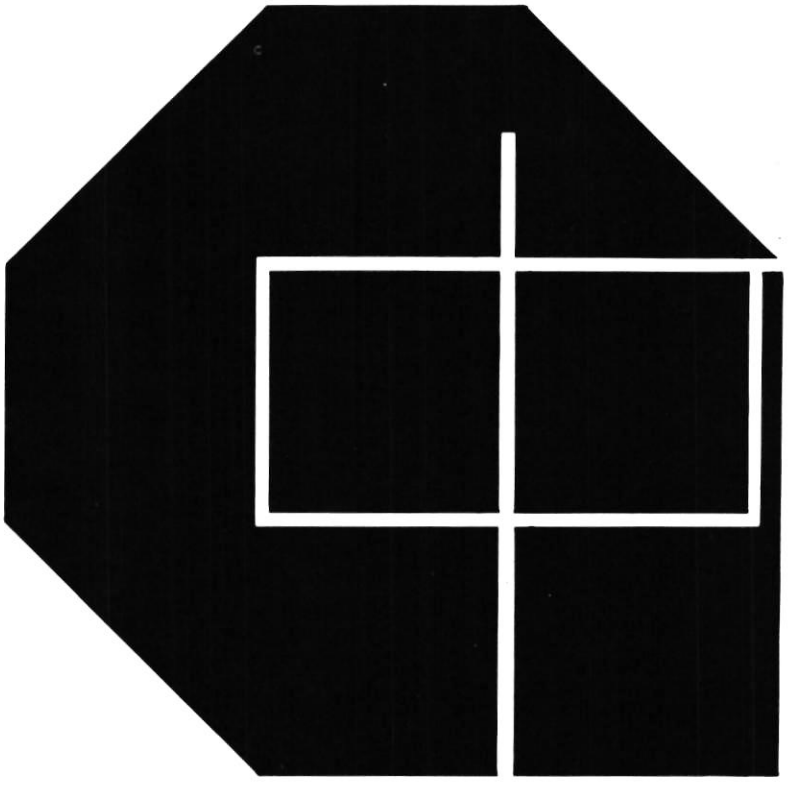
unanimous exceptions can be made: the International Atomic Energy List, the International Munitions List, and the International List. Although none of these lists is public (the US only began to discuss COCOM publicly in the 1970s, although it was formed in 1949, and a considerable amount of secrecy still surrounds the organization), the International Munitions List corresponds roughly to the US Munitions List, and the International List to item numbers followed by an "A" on the US CCL list. Since most items sold to China from the CCL list are A list items, including the new green-zone commodities with the exception of 4529B, the new liberalization of US guidelines for China has not affected COCOM review much. In 1983 COCOM members began a "harmonization program" to ensure that the licensing practices of each country conform to COCOM standards, and do not work at cross purposes.

Delays in COCOM are especially frustrating to exporters whose patience has already been sorely tried during the US review process. According to the State Department, the COCOM procedure usually takes 90 days. Delegates meet once each week to consider cases. After submission of a case, member countries can ask questions for a period of up to 60 days. When a question is asked, the 60-day clock stops while the country that submitted the case has time to reply, so the 60-day period may actually last much longer. When the question and answer period closes, there is a final 30-day period for approval. The entire process can often take six months or more, and the number of cases moving through COCOM is only about 100 a month during "good" periods.

It would seem that COCOM has more detractors than supporters, particularly in the business communities on both sides of the Atlantic. But for all its shortcomings, the alternatives to such an organization are far from clear. Allowing each free-world country to unilaterally decide what to export to communist countries would lead to chaos. For the time being the US can do little more than it already has, which means taking steps to improve administrative support for COCOM and working to ensure the "harmonization" of each country's actions.

A commercial fact of life

Export controls have been around in one form or another since 1940, when they were imposed mainly to control shortages during World War II. The Cold War led to the new concept of politically motivated restrictions on strategic goods. These restrictions, codified in the Export Control Act of 1949, forbade exports that would support either military or economic development in countries where it might prove detrimental to US security. A series of Export Administration Acts since 1969 has replaced the earlier Export Control Act of 1949. In 1969 the rules of the game were revised somewhat to allow for trade that would benefit the economic development of communist nations. Since then, export policy has had the sometimes contradictory goals of promoting trade among nations at the same time that it regulates and limits certain forms of trade. The pressure to increase mutually beneficial economic trade will not let up, even though trade must continue to coexist with export controls, which are a commercial fact of life today.



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GEOEXPO '84 August 1–10, 1984, Beijing. Geological machinery and instruments. *Contact:* US Commerce Department's International Trade Administration, Washington, DC 20230. Tel: (202) 377–5361, 377–2952

EMETEX '84 October 9–15, 1984, Shanghai. Environmental control, measuring and testing equipment. *Contact:* SHK International Services Ltd., 2 Broadway, 10th Floor, New York, NY 10004. Tel: (212) 709–2946

POSTEL' 84 October 30–November 5, 1984, Beijing. First international and Hong Kong-area post and telecommunication exhibition and conference. *Contact:* Hong Kong Expositions Ltd., 607 Wayson Commercial Bldg., 28 Connaught Rd. W., Hong Kong. Tel: 5–479203, 5–479274. Telex: 75388 EXPO HX, 72062 HAPS HX

CHINA COMTRANS '84 November 1–7, 1984, Tianjin. First international communications and transport exhibition and conference. *Contact:* Hong Kong Expositions Ltd., 607 Wayson Commercial Bldg., 28 Connaught Rd. W., Hong Kong. Tel: 5–479203, 5–479274. Telex: 75388 EXPO HX, 72062 HAPS HX

CHINA COMM '84 November 5–13, 1984, Beijing. International Telecommunications, computer, electronics and defense electronics exhibition and conference co-sponsored by NCUSCT and Electronic Industries Association. *Contact:* Clapp & Poliak International (A Cahners Exposition Group Co.), P.O. Box 70007, Washington, DC 20088. Tel: (301) 657–3090

INTER PETRO CHINA '84 November 6–12, 1984, Shanghai. International petroleum equipment and technology exhibition including aircraft, communication equipment, computers and DP equipment and services, and CAD/CAM systems. *Contact:* International Transworld Exhibition Center, 501 Fifth Avenue, New York, NY 10017. Tel: (212) 867–1150/1

MEDEX '84 November 16–21, 1984, Guangzhou. Medical instruments and health protection equipment. *Contact:* Guangdong Exhibition Service Corporation, 774, Dongfengdong Rd., Guangzhou. Telex: 44176 GDESC CN

COMPUTER CHINA '84 November 25–December 1, 1984, Xiamen SEZ. International computer technology exhibition and conference including full range of computer systems, Chinese data systems, and communications networking. *Contact:* Adsale Exhibition Services, 21/F Tung Wai Commercial Bldg., 109–11 Gloucester Rd. Wanchai, Hong Kong. Tel: 5-8920511. Telex: 63109 ADSAP HX

CIME '84 November 28–December 4, 1984, Shanghai. Second China medical exhibition. Details to be announced. *Contact:* Hong Kong Expositions Ltd., 607 Wayson Commercial Bldg., 28 Connaught Rd. W., Hong Kong. Tel: 5–479203, 5–479274. Telex: 75388 EXPO HX, 72062 HAPS HX

ADVANTECH '84 December 4–10, 1984, Shanghai. International exhibition on advanced electronic technology including computer, communications, and radar systems. *Contact:* SHK International Services Ltd., 2 Broadway, 10th Floor, New York, NY 10004. Tel: (212) 709–2946

AVIATION EXPO/CHINA '84 December 8–15, 1984, Beijing. Aircraft, airport equipment, aircraft production equipment, aircraft and avionics systems. *Contact:* China Promotion Ltd., International Bldg., Room 2503, 141 Des Voeux Rd., Central, Hong Kong. Tel: 5-412268. Telex: 76270 CHOCH HX

ISA ASIA '85 January 17–18, 1985, Shanghai, and January 21–22, Guangzhou. International instrumentation and control exhibition including equipment utilized in China's light industry sector, in petroleum exploration and petrochemical processing. This is a floating exhibition that will visit six Asian countries. *Contact:* Instrument Society of America, 67 Alexander Drive, P.O. Box 12277, Research Triangle Park, NC 27709. Tel: (919) 549–8411

MICROCOMPUTER EXHIBITION January–February, 1985 (tentative). Details to be announced. *Contact:* China Trade Promotions Ltd., 475 Fifth Ave., Suite 1210, New York, NY 10017. Tel: (212) 889–5343

CHINATRONIC '85 March 14–19, 1985, Tianjin. International exhibition on electronic testing, measuring instruments, and production technology. *Contact:* Adsale Exhibition Services, 21/F Tung Wai Commercial Bldg., 109–11 Gloucester Rd., Wanchai, Hong Kong. Tel: 5-8920511. Telex: 63109 ADSAP HX

CHINAMED '85 March 27–April 3, 1985, Beijing. Medical equipment including diagnostic, therapeutic, and monitoring instruments. *Contact:* China Trade Promotions Ltd., 475 Fifth Ave., Suite 1210, New York, NY 10017. Tel: (212) 889–5343

Calendar prepared by Susan Baugh with the assistance of Betsy Saik.

SEMICONDUCTOR/SHANGHAI '85 April 21–27, 1985, Shanghai. Semiconductor processing, wafer fabrication, inspection and test equipment, and related equipment and supplies. *Contact:* Cahners Exposition Group, P.O. Box 70007, Washington, DC 20088. Tel: (301) 657–3090

TELECOMMUNICATIONS SEMINAR MISSION June, 1985. Details to be announced. *Contact:* US Commerce Department, Room 1015 C, Washington, DC 20230. Tel: (202) 377–4642

EMETEX '85 Fall, 1985. Details to be announced. Environmental control, measuring and testing equipment. *Contact:* SHK International Services Ltd., 2 Broadway, 10th Floor, New York, NY 10004. Tel: (212) 709–2946

HEATEX '85 Fall, 1985. Details to be announced. Second international exhibition on heat treatment technology and equipment. *Contact:* SHK International Services Ltd., 2 Broadway, 10th Floor, New York, NY 10004. Tel: (212) 709–2946

ELECTRONICS & TEST EQUIPMENT SEMINAR MISSION September, 1985. Details to be announced. PCB manufacturing processes, IC manufacturing, manufacturing of passive components and test equipment. *Contact:* US Commerce Department, Room 4044, Washington, DC 20230. Tel: (202) 377–5014

COMPUTER CHINA '85 September 3–6, 1985, Tianjin. Details to be announced. *Contact:* AGS Management Consultants, Jalan Sultan Centre, South Jalan Sultan 24–05, Singapore 0719. Telex: R533505 AGS MC

DEFENSE INDUSTRY/CHINA '85 October, 1985, Beijing (proposed). Machinery and technology for the modernization of China's defense industries, including metal working, machine building, electronics, CAD/CAM, missiles and ordnance. *Contact:* China Promotion Ltd., Room 2503, International Bldg., 141 Des Voeux Rd., Central, Hong Kong. Tel: 5-412268. Telex: 76270. CHOCH HX

PETROLEUM EQUIPMENT AND TECHNOLOGY EXHIBITION March, 1986, Beijing. Details to be announced. *Contact:* Society of Petroleum Engineers, 6200 North Central Expressway, Dallas, TX 75206. Tel: (214) 361–6601

INTERNEPCON CHINA '86 April, 1986, Beijing. Electronics and semiconductor packaging, production and test equipment. *Contact:* Cahners Exposition Group, P.O. Box 70007, Washington, DC 20088. Tel: (301) 657–3090

中外貿易

Jennifer Little
Research Assistant

The following tables contain recent press reports of business contracts and negotiations exclusive of those listed in previous issues. Joint ventures, licensing arrangements, and other forms of business arrangements are included if classified as such in Chinese and foreign media reports. For the most part, the accuracy of these reports is not independently confirmed by *The CBR*.

National Council members can contact the library to obtain a copy of news sources and other available background information concerning the business arrangements appearing below. Moreover, member firms whose sales and other business arrangements with China do not normally appear in press reports may have them published in *The CBR* by sending the information to the attention of Jennifer Little.

中外貿易

CHINA'S IMPORTS THROUGH MARCH 15

Foreign Party/ Chinese Party	Product/Value/ Date Reported
Agriculture	
NA (Italy)/Guangzhou	Chicken production equipment for five farms. 2/84.
(Japan)	Signed agreement to assist China to increase its grain production. 2/6/84.
Bank America World Trade (US)	Arranged a contract for sale of 200-230 million bd. ft. of northwest US logs. $65 million. 2/14/84.
Chemicals	
(Pakistan)	100,000 tons of urea. 1/22/84.
Construction and Construction Materials	
Chung-Fat Tai-Tung Property Co. (HK)/ Shenzhen District Property Co.	Built Shenzhen's first commercial building. 5/26/83.
Delta Port Consortium (Netherlands)	Is discussing building a tunnel under the Huangpo River. 12/25/83.
Electronics	
NA (HK)/Wuhan Foreign Electronics Industrial Bureau, Radio Research Institute	Established the Wuhan Foreign Electronic Service Center under a 5-year contract to import technology and equipment and help update electronic products in Hubei. 4/83.
Digital Sound Corp. (US)/ Institute of Acoustics	A DSC-200 audio-digitizing system. 12/83.
IMS International (US)	15 8-bit multiprocessor computers for Chinese universities under a World Bank loan. 1/12/84.
Ai Electronics (Japan)	8 16-bit personal computer systems. $171,000 (¥40 million). 1/15/84.
BTU UK/Beijing Powder Metal Research Institute	Signed memorandum of understanding for a powder metal sintering furnace for semiconductor manufacture. $141,000 (£100,000). 1/19/84.
Maillefer Co. (Switzerland)/Shanghai Electric Cable Plant	Technology for lukewarm water interlock electric cable. 1/23/84.
Fuji Motor Co. (Japan)/ Wuxi Machine Tool Electric Equipment Plant	Technology for electronic time relays. 1/23/84.
International Software Systems Inc. and World Information Systems Enterprises (US)/China Software Technology Development Center	Signed memorandum of understanding to act as exclusive agent for computer hardware and to establish a software-development training school. 1/23/84.
ComputerArc (Australia) and Australasia Computing Services (HK)/ Jingjiang Hotel, Shanghai	A hotel management package. 2/84.
Thorn-EMI's Software Sciences (UK)/Lido Hotel, Beijing + another hotel	The Champs hotel management system. 2/2/84.
Sun Hing Audio Equipment Manufacturing Ltd. (HK)	Received orders for magnetic tapes. $600,000. 2/5/84.
Sumitomo Shoji Kaisha and NEC Corp. (Japan)/ INSTRIMPEX	305 microcomputers for educational and scientific research purposes. $855,000 (¥200 million). 2/7/84.
Wong's Kong King Ltd. (HK)/Fuzhou, Fujian, and Jiangxi	Reached agreement for integrated circuit plate production design and equipment. 2/12/84.
Machine Tools	
Siemens (W. Germany)/ Xiangfan Machine Tool Electric Drive Plant, Hubei	Technology for manufacturing machine tool electric drive simulating static alternating installations. 1/23/84.
Schiess (W. Germany)/ Wuhan Heavy Machine Tool Plant, Hubei	Technology for floor-type milling and boring machines. 1/23/84.
Delta Brands (US)	An aluminum tension leveling line. $1.3 million. 1/25/84.
Tools and Machinery Builders (US)/Hangzhou No. 2 Manufacturing Plant, Zhejiang	An assembly line for composite can production. $759,000. 1/25/84.
Machinery	
Riken Co. (Japan)/Wuhan Motor Vehicle Part Plant and China Automotive Industry Corp.	Signed memorandum to provide automotive piston ring production know-how. 1/23/84.
BBC Co. (W. Germany)/ Shenyang Low-Pressure Switch Plant, Liaoning	4-stage explosive-proof starter technology. 1/23/84.
Sumitomo Corp. (Japan)/ Ningbo Metal Powder Plant, Zhejiang	Technology and equipment for manufacturing ferro-base irregular shaped structures. 1/23/84.

NA = Not Available

NOTES: Contracts denominated in foreign currencies are converted into US dollars at the most recent monthly average rate quoted in *International Financial Statistics (IMF)*. Contracts concluded over two months ago are also included if they were not reported in the last issue of *The CBR*.

Siemens (W. Germany)/ Beijing Machine Tool Electric Appliance Plant	Limit switch technology. 1/23/84.
AEG-Telefunken (W. Germany)/Shenyang Low-Pressure Switch Plant	Technology for manufacturing mining explosive-proof combined switches. 1/23/84.
Krebsoege Co. (W. Germany)/Xiamen Metal Powder Plant	Technology for manufacturing metal powder filter parts. 1/23/84.
AEG-AIK (W. Germany)/ Xi'an Insulating Material Plant, Shaanxi	Copper foil applied pressboard technology. 1/23/84.
Peter Schwabe Co. (US)/ Zhengzhou No. 2 Abrasive Wheel Plant, Henan	Technology and equipment for manufacturing abrasive belts and high-speed grinding disks. 1/23/84.
GOETZE AG (W. Germany)/Changsha Zhengyuan Power Part Plant, Hunan	Piston ring technology. 1/23/84.
Westinghouse Electric Corp. (US)/Shanghai, Harbin, and Xiangtan Motor Plants	Technology and equipment for manufacturing large and medium box-type motors. 1/23/84.
Torrington (US)/Suzhou Bearing Plant	Needle-bearing technology. 1/23/84.
Micafil Co. (Switzerland)/ Baoding, Xi'an, and Shenyang Transformer Plants	Technology for vapor-phase drying equipment. 1/23/84.
National Forge Co. of Belgium and US/Sichuan Deyang No. 2 Heavy Machinery Plant	Ultra-high tension equipment. 1/23/84.
MR Co. (W. Germany)/ Zunyi Changzhen No. 1 Electric Appliance Plant, Guizhou	Technology for load switches. 1/23/84.
ARECO Co./Shenyang Gas Compressor Plant	Technology for oilless lubricating compressors. 1/23/84.
Johnson Controls Inc. (US)/Shanghai Battery Works	Signed contract to provide equipment and technology for an automotive battery plant. $5 million. 2/2/84.
Chen Hsong Machinery Co. Ltd. (HK)	An injection moulding machine for a Guangdong plastics factory. $128,000 (HK$1 million). 2/5/84.
Medical Equipment	
Omron Tateisi Electronics Co. (Japan)/Medical Instruments Manufacturing Co., Fujian	Order for 40,000 electronic thermometers and 4,000 electronic tonometers. 1/25/84.
NA (Australia)/MOFERT and Tianjin No. 3 Medical Instruments Factory	Signed memorandum of understanding to provide equipment to manufacture plastic blood donor packs. 2/16/84.
Metals and Minerals	
Season-all Industries, Inc. (US)	A used 1800 ton Sutton extrusion press. 12/83.
Crabtree Vickers (UK)	Won order to supply sheet fed, offset metal decorating presses and coaters. $1.4 million (£1 million). 1/12/84.
Centre d'Etudes et Recherches de Charbonnages de France/ Central Coal Mining Research Institute	Signed scientific and research exchange agreement. 1/25/84.
Schloemann-Siemag AG (W. Germany)/Ma'anshan Iron and Steel Works, Anhui and TECHIMPORT	Signed contract for a wire rod rolling mill. 2/17/84.
Italimpianti (Italy)/ Ma'anshan Iron and Steel Works	Contract to design and construct a furnace for a steel plant. $4 million. 2/22/84.
Mitsui SRC Development Co. (Japan)/Ministry of Coal Industry	Donated a coal liquefaction plant. 3/6/84.
Mining Equipment	
Alpine Co. (Austria)/ China National Coal Development Corp.	Signed contract to jointly produce AM-50 tunnellers. 2/84.
Sieger Ltd. (UK)	Environmental monitoring equipment for the Lu Ling coal mine and technology to manufacture Sieger catalytic sensors in Chongqing. $916,000 (£650,000). 2/84.
Rotheroe & Mitchell Ltd. (UK)	Dust monitoring equipment. $1.06 million (£750,000). 1/6/84.
Packaging	
Bone Markham (UK)	Contract to supply material for the production of toothpaste tubes. $704,000+ (£500,000+). 1/6/84.
Petroleum	
Gearhart Geodata (UK)/ Nanhai West Oil Corp.	Signed contract for mud logging services. 1/84.
Shell (Singapore)/ SINOCHEM	Signed agreement to process 20,000 b/d of oil for a year. 2/10/84.
Petroleum Equipment Tools Co. (US) and South Pacific Oilfield Trading Co. Ltd. (HK)/Nanhai West Oil Corp.	Signed agreement to provide fishing and rental tools and services for the oil base in Zhanjiang and possibly Shekou. 3/2/84.
Power	
Moylan Engineering Associates Inc. (US)	Will assist in utility power distribution in Sichuan. 11/83.
Associated Technical Services, subsidiary of Hong Kong Electric Group	Is designing a coal-fired power station in Shenzhen. 2/19/84.
Scientific Instruments	
Tintometer Ltd. (UK)	340 color measuring instruments for edible oil refineries in Beijing and Hubei. $296,000 (£210,000). 12/15/83.
Quantel International (France)	Six dye lasers and several Q-switched mode-locked YAG lasers. $750,000+. 1/84.
Solartron (UK)	Order for digital multimeters, data logging, and dynamics analysis equipment. $592,000 (£420,000). 1/19/84.
Oxford Instruments (UK)	Order for scientific instruments. $704,000+ (£500,000+). 1/19/84.
Rochester Co. (US)/ Shanghai Instrument and Meter Plant	Technology for a heat alarm system. 1/23/84.
Landis & GYR (Switzerland)/Harbin Electric Meter Plant	Technology for kilowatt-hour meters. 1/23/84.
Yamatake-Honeywell (Japan)/EQUIMPEX	Contract to provide skills in production of field type indicating controllers used in steel, oil, and chemical factories. 2/28/84.
Yokogawa Hokushin Electric Corp. (Japan)/Shanghai Ninth Automation Instrumentation Factory	Technology for vortex flow meters. 2/28/84.
Yokogawa Hokushin Electric Corp. (Japan)/Xi'an Instrument Factory and Beijing Electric Meter Works	Electronic control systems technology. 2/28/84.
Yokogawa Hokushin Electric Corp. (Japan)/Sichuan Instrument Complex	Industrial recorder technology. 2/28/84.
Chino Works Ltd. (Japan)/ Shanghai Instrumentation Corp.	Negotiating provision of industrial recorder know-how. 2/28/84.
Ono Sokki Co. (Japan)/ Beijing Automation Technology Institute	Plan to reach agreement for KD production of fast fourier transform analysis systems. 2/28/84.
Shipping	
Seereederei Frigga AG (W. Germany)	A 146,000 dwt bulk carrier. $8.75 million. 1/10/84.

Hayashikane Shipbuilding & Engineering Co. (Japan)/COSCO	Order for nine freighters. 2/14/84.
Kasado Dockyard Co. (Japan)/COSCO	Four bulk carriers. 2/14/84.
Telecommunications	
Radio-Holland (Netherlands)/Shanghai Marine Telecommunication and Navigation Aids Co.	Signed contract to service marine electronic radio communication and navigational equipment and provide training. 2/1/84.
Nippon Telegraph and Telephone Public Corp. (Japan)	Cross-bar switching systems. 2/21/84.
(W. Germany)/Ministry of Space Industry	Signed accord to develop a communications satellite system for China. 3/8/84.
Textile Plants and Equipment	
NA (Singapore)/Everbright Industrial Co. (HK)	131 weaving machines. $3.8 million. 11/1/83.
Tourism	
Gammon Building Construction (HK)/Xi'an Tourist Service Co.	Will manage construction of the Golden Flower Hotel in Xi'an. 1/29/84.
He Xing Engineering Co. (HK)/Haikou City Tourist Service, Guangdong	Signed contract to build the Hai Tian Hotel. 2/7/84.
Transportation	
ASG Transport Development (Sweden)/SINOTRANS	Signed air cargo transport agreement. n.d.
Crvena Zastava (Yugoslavia)	500 Zastava 1100-GTL 55 cars. 1/5/84.
Nissan Motor Co. (Japan)/Beijing Tourist Motor Co.	256 compact cars for use as taxis. 1/17/84.
Mannesmann Co. (W. Germany)/Changchun No. 1 Motor Vehicle Plant	Signed contract for technology and equipment for manufacturing truck wheels. 1/23/84.
Japan Airlines/CAAC	Signed agreement to increase air transport. 1/31/84.
NA (Chile)/Everbright Industrial Corp.	1,500 used trucks and tractors. $15.8 million. 2/84.
Ohbayashi-Gumi Ltd. (Japan)	Signed contract to reconstruct the Shanghai airport terminal. 2/27/84.
Toshiba Corp. and Mitsui & Co. (Japan)/TECHIMPORT	Order for a railway electrification system for the Beijing-Qinhuangdao line. $14 million (¥3.2 billion). 2/28/84.
Kori Corp. (US)	32 amphibious vehicles for geophysical exploration. $4 million. 3/5/84.
Jardine Air Cargo (HK)/SINOTRANS	Signed air freight agreement covering transportation between the UK and China. 3/7/84.
Miscellaneous	
Canadian International Development Agency/Ministry of Education	Signed memorandum of understanding to strengthen the economic management courses at eight Chinese universities. 1/19/84.
Daido Oxygen Co. (Japan)/Sichuan Air Separator Plant	Technology for manufacturing low-temperature containers. 1/23/84.
Chinn Ho Foundation (US)	Donated 25,000 volumes of microfiched law publications to seven Chinese universities and institutes. 2/8/84.
Takugin International (Asia) Ltd. (HK), subsidiary of Hokkaido Takushoku Bank (Japan)/Shenzhen SEZ Development Co.	Signed financial consultant contract. 2/10/84.
Swedish Institute of Management	Will provide month-long training programs beginning in March. 2/24/84.
(Australia)	Assistance for city reservoir development near Beijing. $7,000 (RMB 14,000). 2/27/84.

CHINA'S EXPORTS THROUGH MARCH 15

Foreign Party/ Chinese Party	Product/Value/ Date Reported
Agriculture	
(Thailand)/CEROILS, Anhui Branch	Fresh crabs. 1/84.
(Middle East)/CEROILS, Nei Monggol Branch	11,000+ sheep. 1/84.
(Libya)/China International Agriculture, Animal Husbandry and Fishery Engineering Corp.	350,000 freshwater fish for breeding. 2/21/84.
Construction	
(Iraq)/China State Construction Engineering Corp.	Contract to build four dams for the Kifil-Shinasiya irrigation project. $170 million. 2/18/84.
Electronics	
General Electric (US)/Tianjin Electroacoustic Appliances Factory	1.24 million loudspeakers. 1/84.
Conic Investments Ltd. (HK)/Sin King Enterprises Co. Ltd.	Sin King bought a 35 percent share of the Hong Kong electronics manufacturing firm. 1/22/84.
Food Processing	
Reading & Bates (US)/Nan Lian Food Co. (HK-PRC joint venture)	Won two-year contract to provide food catering services to offshore oil rig crew members. 2/15/84.
Foreign Aid	
(Zambia)	Design and construction of the headquarters for Zambia's United National Independence Party. 2/6/84.
(Nepal)/Hydro Engineering Corp. of China	Construction of the second-phase hydropower project at Kulekhani in collaboration with a Japanese company. 2/16/84.
(Gambia)/Chinese Red Cross Society	£14,000 for drought relief. ($20,769). 2/20/84.
Metals and Minerals	
Nukem GmbH, Transnuklear GmbH, and Alfred Hempel KGaA (W. Germany)/China Nuclear Energy Industry Corp.	Signed letter of intent of store German radioactive waste material in China. 2/7/84.
Power	
Daya Bay Nuclear Power Plant/Everbright Industrial Corp.	Everbright will undertake the cable work connecting Hong Kong and Guangzhou to the power plant. 1/22/84.
Shipping	
Osco (Norway)/Dalian Shipyard	A 69,000 t. tanker for refined oil. 1/16/84.
Tourism	
(Macao)/Everbright Industrial Corp.	Agreed in principle to invest in a tourist complex. $40 million. 2/5/84.
Trade Agreements	
(Turkey), (Poland), (Thailand), (USSR), (Mongolia), and (Italy)	Signed trade agreements during January, February, and March 1984.

In the twelve months ending December 31, 1983, the National Council for US–China Trade's revenues totaled $1,951,200. Expenses for the year were $1,976,300, resulting in a deficit of $25,100 and leaving a fund balance of $495,400. An audited report prepared for the Council by Arthur Andersen & Co. is available to member firms.

中外贸易

DIRECT INVESTMENT/PROCESSING/ COUNTERTRADE THROUGH MARCH 15

Foreign Party/ Chinese Party	Arrangement/Value/ Date Reported
JOINT VENTURES	
Agriculture	
Ministry of Fishery (Sri Lanka)/Ministry of Agriculture, Animal Husbandry and Fishery	Agreed to form the South China Fishery Co. Ltd. 1/27/84.
Yingwei Trading Co. (Macao) and Ming Kee Trading Corp. (HK)/Baijiao Commune, Guangdong	Signed agreement to operate a joint aquatic product farm. 2/84.
Construction	
Kanematsu Gosho Ltd. (Japan) and Hopewell Holdings Ltd. (HK)/ Guangdong provincial government	Have verbally agreed to build a highway linking Shenzhen with Zhuhai. 2/27/84.
Electronics	
Rank Xerox	Signed letter of intent to set up a copier plant in Shanghai. 1/26/84.
Sony Corp. (Japan)	Has formed the Amoy Solid Electronics Ltd. Co. in Fujian to produce videotape recorders. 1/28/84.
Data General (US)	Is a partner in a marketing venture in Tianjin. 3/84.
Machinery	
Chen Hsong Machinery Co. Ltd. (HK)	Signed agreement with a machine plant in Guangdong to set up a factory to produce injection moulding machines. 2/5/84.
Metals and Minerals	
Nisshin Steel Co. (Japan)	Reached basic agreement to set up a cold rolled stainless steel sheet manufacturing factory in Tianjin. 3/6/84.
Petroleum	
Langton Investment Ltd. (HK)/Shenzhen Development Co.	Formed the Shenzhen Caltex Petroleum Products Distribution Co. Ltd. 12/25/83.
Reading & Bates Drilling Co. (US) and Wah Chang International Corp. (Singapore)/CNOOC	Formed the China Nanhai-Reading & Bates Drilling Corp. to provide contract drilling in the South China Sea. (PRC:50%-US:25%-Sing.:25%). 2/5/84.
Occidental Equipment and Services, Inc. and SEDCO Inc. (US)/CNOOC	Signed 10-year contract to form the China Nanhai-Oxy-SEDCO Drilling Corp., Ltd. which will provide offshore oil drilling services. Registered capital: $1.5 million. 2/20/84.
Core Laboratories International Ltd. (US)/Scientific Research Institute of Petroleum Exploration and Development, CNOGEDC and Nanhai Eastern Petroleum Corp., CNOOC	Signed 10-year contract to form China-Corelab Ltd. to provide laboratory, engineering, consulting, and field services for offshore and onshore oil development. 2/28/84.
Ports	
Gladhover Ltd. (HK)/ Zhuhai Special Economic Zone Development Co. and China Nanhai Oil Joint Services Corp.	Will convert the Jiuzhou harbor into a deep water port. 3/2/84.
Shipping	
Elders-IXL (Australia)/ COSCO and Weng Chong Shipyard	Involved in a small ship repair venture near Guangzhou. 11/83.
Telecommunications	
Lynch Communication Systems (US)	Negotiating establishing a Chinese assembly plant for B-281 concentrators. 1/16/84.
Millicom International Ltd. (US), Comvik AB (Sweden), and Onwell Holdings Ltd. (HK)/Hua Ko Electronics Co. Ltd., subsidiary of China Resources Holdings	Received preliminary approval to set up China Telecom Systems (HK) Ltd. to provide mobile telephone services in Guangzhou. 1/29/84.
Tourism	
Showa Shoji Co. (Japan)/ Hangzhou Travel & Tourism Co.	Signed contract to build the 220-room Hangzhou Friendship Hotel. 3/84.
Transportation	
Citroen (France)	Negotiating a joint car-making venture. 2/24/84.
Miscellaneous	
International Exhibitions Group (UK)/Tianjin Technology Cooperative Corp.	Formed the ICE-Tianjin Technology Cooperative Corp. to help China buy licenses and create joint ventures with foreign companies. 1/22/84.
Sanyo Corp. (Japan)	Formed the Guangdong Sanyo Air Conditioner Co. Ltd. to manufacture air conditioners in Foshan and Shekou. 2/22/84.
Wing On (Holdings) Ltd. (HK)/Shanghai Industrial Investment Co.	Signed a letter of intent to set up a commercial and industrial venture involved in light industry, food processing, and retailing. 2/24/84.
LICENSING	
Siemens (W. Germany)/ EQUIMPEX	Signed agreement to produce vacuum circuit-breakers for MV switchgear. 12/83.
Armstrong Equipment (UK)/China National Automotive Industry Corp. and Shanghai Chassis Works	Signed seven-year contract to produce shock absorbers. 1/4/84.
General Robotics (US)	Minicomputer technology. 1/12/84.
BASF Co. (W. Germany)/ Changchun No. 1 Motor Vehicle Plant and Shanghai Yanfeng Machinery Model Plant	Concluded contract for technology and equipment to produce polyurethane motor vehicle parts. 1/23/84.
Perfex Co. (US)/Changchun No. 1 Motor Vehicle Plant	Signed contract for motor vehicle radiator technology. 1/23/84.
Schroeder Co. (Norway)/ Dalian Shipyard	Signed contract to build two 69,300-ton oil tankers. 2/84.
Hutchison China Trade Holdings Ltd. (HK) and Beiersdorf AG (W. Germany)/Shanghai Daily Chemical Industry Corp. and Shanghai No. 2 Daily Chemical Products Factory	Have reached an agreement to provide equipment to produce Nivea Cream products in China. 2/23/84.
Hitachi Ltd. (Japan)/Fujian Hitachi Television Co. of China (PRC-Japan joint venture)	Licensed color TV tuner technology. 3/6/84.
COMPENSATION TRADE	
NA (HK)/Sansui County Down Factory, Guizhou	Signed contract for down processing equipment in exchange for the factory's products. 1/23/84.
COPRODUCTION	
EB Communications (Norway)	Signed memorandum of understanding to produce radio link and satcom equipment. 1/19/84.
Mark Controls (US)/ Tanggu Valve Factory, Tianjin	Signed seven-year contract to produce valves and accessories used in petrochemical and shipbuilding industries. 2/23/84.

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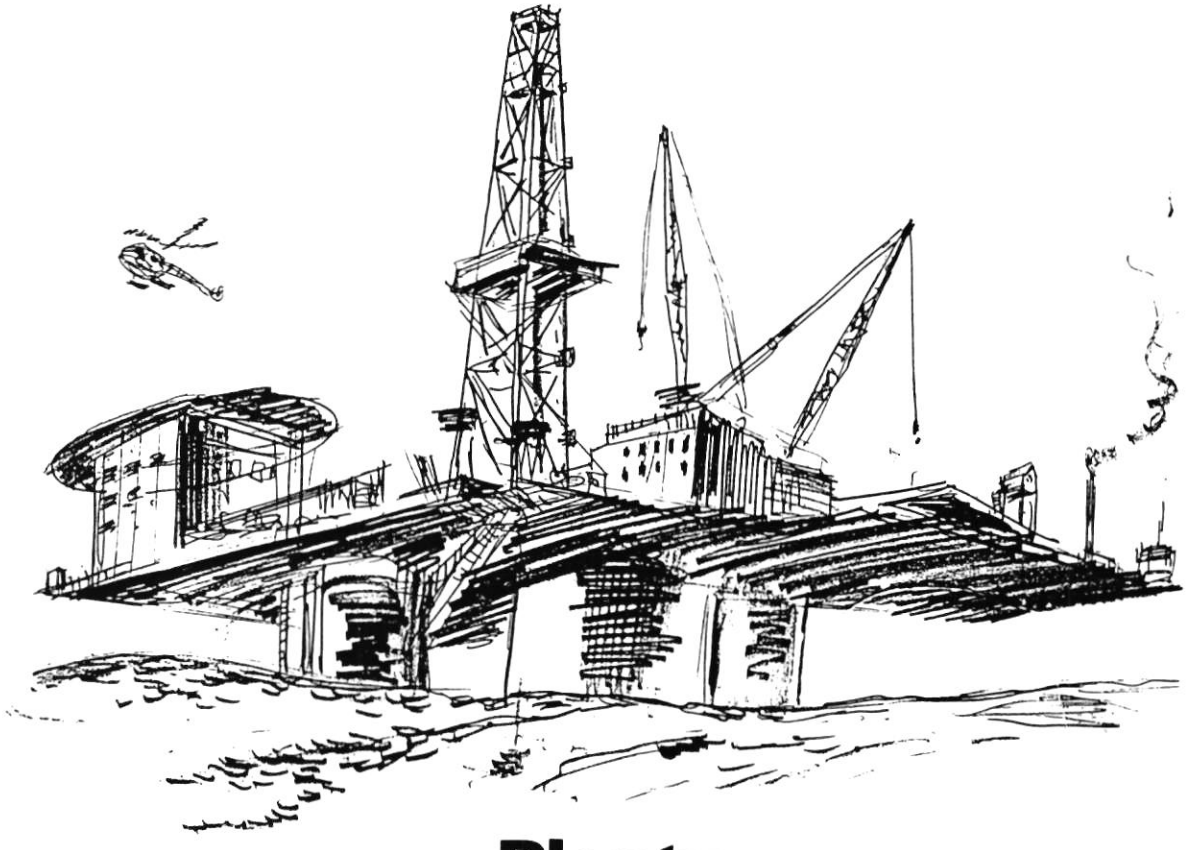

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Address
1050 17th Street, NW, Suite 350
Washington, DC 20036 USA
(202) 429–0340
Telex: 64517 NCUSCTUW
Cable: USCHINTRAD WSH

BEIJING OFFICE
Vice-President for China Operations: WILLIAM W. CLARKE
Advisor: LI WENDA
Assistant Advisor: CHENG LILI
Suite 1136, Beijing Hotel
Telephone: 552231, 556531, ext. 1136
Cable: USCHINTRAD
Telex: 22637 NCPEKCN

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Jianguomenwai, Beijing
Telephone: 52–3831
Telex: 22701 AMEMB CN

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Washington, D.C. 20008
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