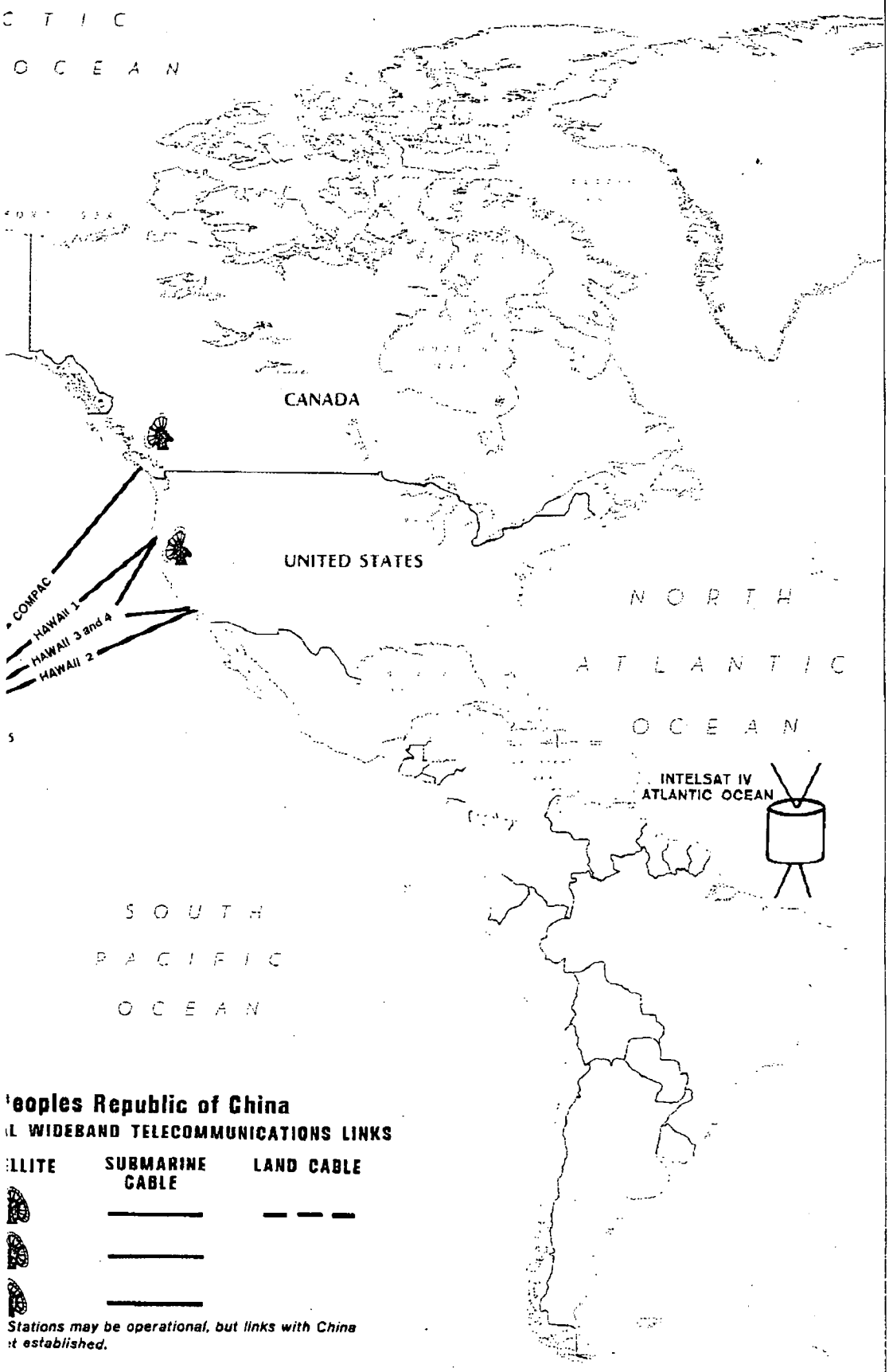
The vigorous modernization of the international telecommunications system will enable China to handle the sharp growth in traffic anticipated in the remainder of the decade. Communications experts predict that international telephone communications between China and the United States and Japan, alone, will grow from 35,000 messages in 1973 to 775,000 messages in 1980.

Table 1

China: International Telecommunications Links, January 1972

| | Domestic Terminal | Type of Connection |
|---|---|---|
| Albania | Peking | HF radio |
| Algeria | Peking | HF radio |
| Burma | Shanghai/K'un-ming | HF radio/wireline |
| Cambodia | Shanghai | HF radio |
| East Germany | Peking | HF radio |
| France | Peking/Shanghai | HF radio (leased service) |
| India | Shanghai | HF radio |
| Indonesia | Shanghai | HF radio |
| Hong Kong | Shanghai/Canton | HF radio/microwave radio relay |
| Japan | Peking | HF radio |
| North Korea | Peking/Harbin | HF radio, cable |
| North Vietnam | Peking/K'un-ming/Nan-ning | HF radio/wireline/wireline |
| Pakistan | Peking | HF radio |
| Poland | Peking | HF radio |
| Switzerland | Peking | HF radio |
| Syria | Peking | HF radio |
| USSR | Peking/Man-chou-li/Pan-chiang/ Wu-lu-mu-ch'i | HF radio/wireline/wireline/wireline |

voice carrier, which allows submultiplexers for telegraph. A 6-channel capability was available on the Harbin-Pyongyang cable, which had been installed during the Japanese occupation of Manchuria. International HF radio telephone circuits, while employing sideband equipment, seldom were used to provide more than a single voice-grade channel. China's highest capacity international link was a 12-channel microwave radio relay system between Canton and Hong Kong, installed in the early 1950s.



~~Confidential~~

(b)(1)
(b)(3)

# Intelligence Report

*China: Modernization of International Telecommunications*

~~Confidential~~
ER IR 74-14
June 1974

Copy № 278

*The People's Republic of China became active in* CCITT *affairs shortly after that country joined the United Nations. Chinese delegates shown here are attending a meeting of Study Group XII (on transmission), along with an Australian delegate (left rear) and N. Nachfolger of Bell of Canada with Canadian delegates (right rear). Placards are in French, the language spoken in Geneva.*

Table 3

Estimate of PRC Satellite Circuit Requirements, by Country[1]

| | 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|
| **Total** | **106** | **130** | **152** | **177** |
| Australia[2] | 4 | 5 | 6 | 7 |
| Austria | 2 | 2 | 2 | 2 |
| Canada[2] | 2 | 2 | 2 | 2 |
| France[2] | 7 | 8 | 10 | 12 |
| West Germany[2] | 6 | 8 | 12 | 16 |
| Greece[2] | 2 | 2 | 2 | 3 |
| Hong Kong[2] | 6 | 8 | 10 | 12 |
| India | 2 | 2 | 2 | 2 |
| Indonesia | 3 | 3 | 3 | 3 |
| Iran[3] | 2 | 2 | 2 | 2 |
| Italy[2] | 7 | 8 | 12 | 16 |
| Japan[2] | 19 | 25 | 25 | 25 |
| Kenya | 2 | 2 | 2 | 2 |
| Kuwait | 2 | 2 | 2 | 2 |
| Malaysia | 2 | 2 | 2 | 2 |
| New Zealand | 2 | 2 | 2 | 2 |
| Nigeria[3] | 2 | 2 | 2 | 2 |
| Pakistan[2] | 3 | 3 | 3 | 3 |
| Singapore | 2 | 3 | 3 | 3 |
| Sri Lanka[3] | 2 | 2 | 2 | 2 |
| Thailand[2] | 2 | 2 | 2 | 2 |
| United Kingdom[2] | 4 | 5 | 6 | 7 |
| United States[2] | 19 | 28 | 36 | 46 |
| Zambia[3] | 2 | 2 | 2 | 2 |

1. Does not reflect actual circuit utilization, which may vary considerably from projected requirements.
2. Operational.
3. Stations not completed.

probably will be imported from the United States

## DISCUSSION

### Background

1. Political and economic developments over the past several years have created a need for the People's Republic of China to improve and expand its international telecommunications facilities. Following the PRC's admittance to the United Nations in 1971, many countries moved swiftly to establish diplomatic relations with Peking. China now has diplomatic representation in 90 countries – compared with only 45 in 1969 – and is playing a much more active role in international organizations.

2. In 1972, as part of a major re-assessment and revision of economic strategy, the Chinese leadership embarked on an important new round of purchases of large plants from leading industrial nations. Purchases of whole plants amounted to US $1.2 billion in 1973 and will amount to a like sum in 1974. Furthermore, the PRC negotiated for the delivery of record quantities of grain in 1973-74. The resulting increase in the volume of international trade and technological dealings has substantially increased the requirements for communication services.

3. This report describes China's program for modernizing and expanding its international telecommunications system. An appendix briefly describes the administration of the system.

### System Prior to 1972

4. Until early 1972, China accorded a low priority to the development of international telecommunications. High-frequency (HF) point-to-point radio and open wirelines handled most of China's international traffic; the remainder was carried by multiconductor cable or low-capacity microwave radio relay. While almost all of China's international circuits provided some form of telegraph services, less than half provided telephone service. A still smaller number of circuits were equipped with facsimile service. Telex service was available to only a small number of overseas terminals, and no facilities were available for relaying television between China and other countries.

5. Before 1972, direct voice circuits between China and the outside world were few. Most of these cirucits terminated in Communist countries or in countries contiguous to China's borders (see Table 1).

6. Until 1972 the traffic-handling capability of China's international telecommunication facilities fell considerably short of national requirements. None of the international wireline circuits was capable of providing more than 3 two-way voice channels on a single wirepair, the majority being equipped with single-channel

7. The radio communications facilities of the Ministry of Posts and Telecommunications were hard pressed to meet China's expanding requirements. Most Chinese international HF transmitting and receiving stations were capable of using single sideband, independent sideband, and voice frequency multiplexing for Morse, radiotelephone, radioprinter, and facsimile transmission; the equipment, however, was substandard, a mixture of obsolete foreign equipment and simple telecommunication devices of domestic manufacture. Domestic equipment was generally custom made at the stations rather than built in modern specialized plants. The resulting lack of both quality control and uniform equipment standards created maintenance problems, led to early replacement of equipment, and complicated the orderly expansion of China's international communications facilities.

8. Continued operation of China's international radio communications had been supported by drawing heavily on Western countries for equipment. Although the Chinese produce their own long-distance HF transmitters and receivers, they imported much of the ancillary equipment commonly used in international telephone and telegraph service. They had succeeded in producing copies of some imported equipment, including automatic error correction, voice frequency telegraph, voice-operated device anti-singing equipment, teleprinters, facsimile equipment, telephone switchboards, and the like.

9. The reliability of international radio communications frequently was impaired by the inherent sensitivity of HF transmission to atmospheric interference and weather disturbances. Natural calamities, including dust storms in the area of Peking's receiving facility at Ta-hsing, had often been the source of equipment malfunctions, causing temporary communications stand-downs. In general, conditions were ripe for a large-scale program to renovate and expand China's entire international communications system.

## Modernization Starting in 1972

### *Satellite Communications*

10. China acquired its first modern broadband international telecommunications facility at the time of President Nixon's visit in February 1972. Temporary earth stations capable of transmitting voice and television from China to the world were established at Shanghai and Peking by US engineers. The Peking station was removed at the end of the President's visit; the station at Shanghai, which was purchased by China, was refitted with a standard 98.4-foot antenna and additional circuits by RCA, the US contractor. The Shanghai station has been carrying China's traffic with the western hemisphere via the Pacific Intelsat since August 1973. It now furnishes 60 telephone channels plus one television channel and can be expanded to 120 telephone channels.

## APPENDIX

### CHINA: ADMINISTRATION OF THE INTERNATIONAL TELECOMMUNICATIONS SYSTEM

China's main international radio communication terminals and associated transmitting and receiving facilities are concentrated in the Peking and Shanghai areas. Most are incorporated in the system operated by the Ministry of Posts and Telecommunications (MPT). A few are controlled by the Ministry of Foreign Affairs (MFA) in a separate system. The international functions of the MPT in Peking are handled by the Central Telegraph and Long Distance Telephone Offices, which are linked by multiconductor cable and microwave radio relay to transmitting and receiving stations located in the suburbs of the capital. Separate transmitting and receiving stations serving the MFA are also located in the Peking suburbs and are connected to their headquarters by multiconductor cable.

The PRC operates three major international radio communications networks: commercial, diplomatic, and press. The most highly developed of these in terms of routings and facilities is the commercial network. The diplomatic and press networks maintain their own separate identities; much of their traffic is handled via commercial channels. The international commercial radio circuits, most of which originate in Shanghai, connect the PRC with six continents and more than 50 countries. These circuits are operated by the MPT in cooperation with the commercial communications entities of the countries in which the circuits terminate.

China was admitted to the International Telecommunications Union (ITU) in May 1972, following the expulsion of Taiwan. China subsequently has taken an active role in ITU proceedings and has sent delegations to a number of ITU conferences. However, Peking has not become a member of the 84-nation International Telecommunications Satellite Organization (Intelsat), which owns and operates the Intelsat system. A move, led by Pakistan, to give Taiwan's membership to the PRC failed at the February 1974 assembly of parties; the issue will not be raised again until the September 1974 session. Meanwhile, the PRC will continue to use the Intelsat system as an non-member through the good offices of the US Comsat Corporation, China's agent in Intelsat.

*New Cable Facilities*

14. In February 1973, after 8 months of negotiations, the PRC signed an agreement with Hong Kong Cable and Wireless, Ltd. to construct a 112 statute mile buried coaxial cable line between Hong Kong and Canton. This system, valued at about $1 million went into operation on 15 April 1974, the opening date of the Canton Spring Trade Fair. The cable system can provide 300 high-quality two-way telephone channels suitable for transmission of telegraph, telex, data, and facsimile as well as for voice communications. The initial capacity of the system will be 60 voice channels, with provisions for expansion at a later date. The cable will replace an antiquated, low-capacity microwave radio relay link, which no longer meets current traffic requirements.

15. The new cable system is controlled by the Kwangtung Administration of Telecommunications and by Hong Kong Cable and Wireless, Ltd. The Chinese propose to send all of the overseas traffic from southern China through this system. Its most important task will be to transmit the voluminous traffic of the semi-annual trade fair in Canton.

16. In May 1973, China and Japan agreed to install a 500 nautical mile coaxial submarine cable across the South China Sea, linking Shanghai with Japan at Kumamoto on Kyushu. In addition to linking China to Japan, it will eventually carry China's traffic with other nations through switching centers in Japan linked to the international submarine cable system.

17. This new cable will be capable of carrying 480 high-quality two-way telephone channels, with provision for submultiplexing telegraph, telex, data, facsimile, and radiobroadcast traffic. It will take 3 years to install. The $22.6 million tab will be shared equally by the two countries.

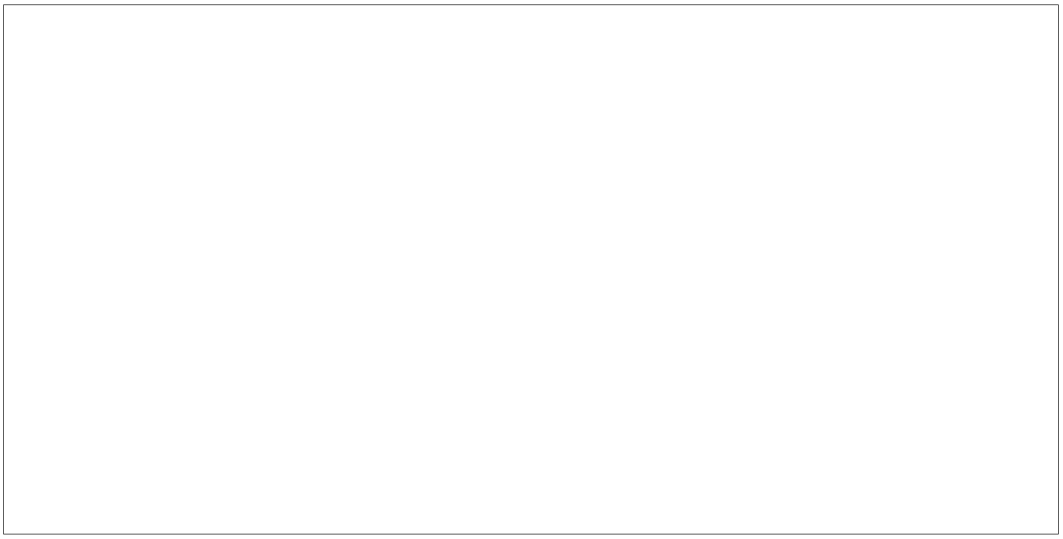


Table 5

International Transit Service Established
by China in 1973

| Transit Center | Telephone | Telex | Correspondent |
|---|---|---|---|
| Bern | | X | France/Romania/United Kingdom/ Yugoslavia/Chile/Canada/ Turkey/Greece/Argentina |
| Hong Kong | X | X | Australia/New Zealand/ Singapore/Japan/East Africa/ Sri Lanka |
| London | X | | Jamaica/Norway |
| Montreal | X | | Chile (via Hong Kong) |
| Moscow | | X | Cuba |
| Paris | X | | Yugoslavia/Lebanon |
| Rome | X | X | Romania/Hungary/Bulgaria/ Poland/Yugoslavia/East Germany Ethiopia/Kenya |
| Tokyo | X | X | France |
| Vienna | | X | Turkey |

messages in 1973 to about 775,000 messages in 1980. This expected dramatic increase will result in large measure from a phenomenon known in the industry as "impulse jump" which expresses the effects of plenty of good telephone channels becoming available where previously there was a repressed demand. A continuation of the initial increase will be fueled primarily by increases in international commercial transactions. Commercial messages will stimulate traffic growth between China and the other industrialized countries as well, but to a lesser degree. On the other hand, China's expected increase in traffic with developing countries will result mostly from political intercourse.

11. Since early 1972, China has imported four earth stations for international communications by satellite and is in the process of constructing a fifth station in Shanghai (see Table 2). The Peking No. 1 station is linked to the Pacific Ocean satellite. The Peking No. 2 station recently was linked with the Indian Ocean satellite, replacing a nonstandard Japanese-made station in that capacity. What will

Table 2

China: Status of Intelsat Ground Stations, June 1974

| Location and Supplier | Type | Antenna Diameter (feet) | Telephone Channels Available | Region | Date of Operation | Value (Million US $) | Remarks |
|---|---|---|---|---|---|---|---|
| Peking, Nippon Electric Company (NEC) | Nonstandard | 33 | 24 plus television | Pacific Ocean<br>Indian Ocean | Sep 72<br>Oct 73 | 1.0 | Replaced by standard station, June 1973.<br>Reactivated for Indian Ocean on 8 October 1973. |
| Peking No. 1, RCA | Standard | 98.4 | 60/240 plus television | Pacific Ocean | Jun 73 | 3.7 | Replaced nonstandard NEC station. |
| Peking No. 2, Western Union International/GTE | Standard | 98.4 | 132/240 plus television | Indian Ocean | Feb 74 (test) | 3.8 | Will replace nonstandard NEC station. |
| Shanghai, RCA | Standard | 98.4 | 60/120 plus television | Pacific Ocean | Aug 73 | 5.0 | Modernized RCA station which originally had a nonstandard antenna. |
| Shanghai, PRC | Standard | 98.4 | Unknown | Possibly Indian Ocean | Under construction | N.A. | May be equipped with standard antenna copied from US equipment. |

happen to the latter station is not known; being portable, it can readily be reestablished elsewhere. The Chinese-produced ground station now being erected in Shanghai probably will be linked with the Indian Ocean satellite, thus providing full world satellite communications through Shanghai as well as Peking.

12. As shown on the map, China's satellite earth stations are providing high-quality voice and recording service with 12 countries, and will provide service with 12 more by the end of 1974.[1] China expects to have nearly 200 satellite circuits in operation by the end of 1977 (see Table 3). Of these, 46 will be with the United States and 25 with Japan.

13. The earth station now under construction by China in Shanghai is [redacted] for use with the Indian Ocean satellite. While ostensibly a domestic endeavor, most of the equipment for the Chinese station

1. Presently, China has satellite links with Australia, Canada, France, West Germany, Greece, Hong Kong, Italy, Japan, Pakistan, Thailand, the United Kingdom, and the United States. Links with Austria, India, Indonesia, Iran, Kenya, Kuwait, Malaysia, New Zealand, Nigeria, Singapore, Sri Lanka, and Zambia are expected by the end of 1974.

# CONTENTS



## Appendix



## Tables



## Illustration

# China: Modernization of International Telecommunications

Rapid expansion of foreign economic and political activities has compelled China to substantially upgrade its international telecommunications facilities.

- Three standard Intelsat ground stations were purchased from the United States during 1972 and have been installed at Peking and Shanghai.
- A coaxial cable link has been established between Canton and Hong Kong, and agreement has been reached with a Japanese consortium to lay a coaxial submarine cable from Shanghai to Kumamoto on Kyushu.
- Negotiations for purchase of switching equipment are in progress, and construction of a new international telephone exchange center in Peking is nearly completed.
- New equipment is being installed to improve the quality of radio telephone circuits and to reduce fading, a common problem in international radio communications.
- China is seeking to expand its international high-quality telecommunications circuit capability by using the transit relay services offered by major world telecommunications centers – for example, London, Paris, and Tokyo.

Until 1972, China gave low priority to the expansion of its international telecommunications. Communications with the major capitals of the world were transmitted by a small number of low-capacity and unreliable HF point-to-point radio circuits and a few open wireline links. Terminal equipment was in poor condition, comprising a potpourri of foreign technology and locally designed equipment assembled on site.

Note: Comments and queries regarding this report are welcomed. They may be directed to [redacted] the Office of Economic Research, [redacted]

*Terminal Facilities*

22. A large new building to house China's international telecommunications terminal facilities is nearing completion in Peking. These facilities are now located in the Central Telegraph Office (CTO) in Peking. The CTO building itself is being expanded to care for rapidly growing domestic traffic.

23. Since 1971, China has been engaged in an intensive investigation of the telephone terminal equipment produced in non-Communist countries. Peking has shown an interest in both crossbar and electronic switching exchanges

*Radio Telephone (HF Systems)*

24. Despite China's determination to place primary reliance for international communications on satellite and coaxial submarine cable systems, HF radio will continue to play a vital role for the present. China's international radio telephone and telegraph service was increased substantially after 1971. Direct radio telephone service is in use between China and Australia, Austria, Canada, Ethiopia, France, Hong Kong, Italy, New Zealand, the United Kingdom, and the United States. Not only is HF radio a useful back-up system for areas that are regularly connected by satellite or cable, but also it provides an economical means for communicating with areas of low traffic volume. The quality of China's radio telephone circuits has been significantly improved by importing equipment from the West to minimize voice fading and the clipping of speech.

*Transit Switching Service*

25. In addition to using HF radio, China can reach countries with which it does not have direct wideband (satellite and cable) connections by using the transit switching services available in all advanced countries.[2] Transit service is usually a temporary expedient, used by countries whose international networks are at an early stage of development. It can provide alternative communications routes when outages occur in direct circuits. Table 5 lists some of China's transit service arrangements.

Traffic Potential

26. China's telephone traffic with the United States and Japan is expected to grow faster than with any other area. Estimates by experts in the Japanese and US communications industries predict that it will grow from about 35,000

2. Transit switching centers are telephone exchanges that switch calls from one country to another or to a switching center.

21. Cable links with Hong Kong and Japan will provide China with access to the rapidly growing trans-Pacific submarine cable network. This network is unusually reliable and provides large numbers of high-quality circuits (see Table 4).

Table 4

Trans-Pacific Cable Network

| Cable | Route | Distance (Nautical Miles)[1] | Channel Capacity | Year Undertaken |
|---|---|---|---|---|
| In service | | | | |
| Hawaii-1 | San Francisco-Honolulu | 2,200 | 48 | 1957 |
| Hawaii-2 | Los Angeles-Honolulu | 2,100 | 128 | 1964 |
| TRANSPAC-I | Honolulu-Guam-Tokyo and Manila | 4,600 | 128 | 1964 |
| SEACOM | Australia-Guam-Hong Kong-Indonesia-East Malaysia and Singapore | 7,100 | 160 | 1967 |
| Compac | Canada-Hawaii-Fiji-Australia and New Zealand | 20,000 | 80 | 1967 |
| Under plan | | | | |
| Hawaii-3 | US-Hawaii | 2,400 | 845 | 1973 (changed to 1974) |
| Hawaii-4 | US-Hawaii | 2,400 | 3,500 | 1975 |
| TRANSPAC-II | Hawaii-Japan | 4,700 | 845 | 1974 (changed to 1975) |
| TRANSPAC-III | Hawaii-Japan | 3,400 | 1,600 | 1977 |
| SAFEC | Japan-Indonesia | 4,600 | 128 | Pending mutual agreement |
| Jap-CH | Japan-PRC | 500 | 480 | 1977 |
| Jap-HK | Japan-Hong Kong | 1,300 | 1,500 | 1977 |

1. Data have been rounded to the nearest 100 nautical miles.

Japan is tied into two major routes in the Pacific area system, including the Japan-USSR coaxial submarine cable and Transpac I, the Honolulu-Manila submarine cable link. Hong Kong is tied into the southeast Asia cable SEACOM, which connects with Guam, Indonesia, and Australia and with East Malaysia and Singapore.

China's First Standard Intelsat Ground Station Under Construction in Peking