JPRS L/9732

13 May 1981

Worldwide Report

TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT

(FOUO 7/81)

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APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000400010028-6

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WORLDWIDE REPORT

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CONTENTS

JAPAN

NTT'S TELECOMMUNICATIONS TECHNOLOGY FOR INFORMATION-ORIENTED SOCIETY DESCRIBED

Tokyo BUSINESS JAPAN in English Vol 26, No 4 Apr 81 pp 65-74

[Article by Masaya Yamauchi, Managing Director and Chief Engineer, Nippon Telegraph & Telephone Public Corporation]

[Text]

TODAY telecommunications networks in Japan have spread to cover every part of the nation, becoming indispensable for business, industry and the people in general. The role played by telecommunications as the central nerve center of our economic and social activities has become increasily important. At the end of fiscal 1979, the total number of telephones in use in Japan reached 53,630,000, which made Japan second in the world following only the United States, while the number of telephones per 100 people was 46.0, which ranked Japan in seventh spot.

On the other hand, the development of electronics such as LSI has accelerated creation of new telecommunications media, and is making required telecommunications services more sophisticated and diversified.

Under such circumstances, the role to be played by Nippon Telegraph & Telephone Public Corporation (NTT), Japan's principal provider of telecommunication services, is considered to be of vital importance as a knowledge-intensive industry. As such, it has a great responsibility for promoting techonological research and development.

For that reason, we of NTT must, first of all, strive for qualitative improvement in our telephone service so as to meet the needs of our technically advanced society, taking into account that telephone service will continue to be the main part of NTT's business, and that we have already become able to fully meet the quantitative demand for telephone service. In the future, NTT will promote the development of new, easy-to-use, low-cost telephone services, while at the same time improving the style concept and convenience of the equipment.

Secondly, NTT also must strive for expansion of various services other than the telephone service. To accomplish this, formation of a new communications network will become necessary. In addition to this, we must strive for further expansion of digital data exchange systems such as circuit switching and packet switching systems, construction of a public facsimile communication network, and the development of visual information services represented by CAPTAINS (Character and Pattern Telephone Access Information System) and VRS (Video Response System).

Thirdly, although our telecommunications technology has already attained the highest level in the world, we must continue our efforts, laying emphasis on the development of both basic and new technologies such as LSI, digital and optical fiber communication technology.

Digitalization of a network is very effective in terms of economy, re-

liability and flexibility. NTT plans to digitalize individual networks such as the digital data network, public facsimile communication network and others whose digitalization is urgently required, while at the same time digitalization of the telephone network also is to be promoted. As a future plan, the individual networks will be integrated, and further efforts will be made to construct an integrated-services digital network (ISDN) aiming at a telecommunications network that enables economic and efficient provision of convenient, easy-to-use and diverse telecommunications services.

Improvement of Telephone Service

As to the telephone service, the basic service that enables us in general to talk with anyone no matter how distant the place on a real-time basis has already been realized. However, this situation is still far from the ideal telephone service where any person can communicate with any other person anytime and anywhere. For example, even though telephone conversations can be made from vehicles such as automobiles, trains and ships, or with the hard of hearing, these services are utilized only to a limited extent. It cannot be claimed, therefore, that the demands of the nation are fully being met.

Automobile radio telephone service was first provided in December 1979 in 23 Wards of Tokyo as a mobile communication service. At present, the service is provided in the Tokyo and Osaka areas. The service area will be gradually expanded to meet future demands.

Furthermore, NTT began selling in January 1980 the "Silver Phone Hibiki," a bone conduction telephone, for those with serious hearing problems who were not aided by "Silver Phone Meiryo," an earlier model for the hard of hearing.

Cordless telephone sets equipped with a radio circuit (using frequencies of 250 MHz band and 400 MHz band) replacing the cord on regular subscriber telephone set can be carried anywhere for convenient use. Cordless telephone sets were introduced into service in May 1980 in four cities, Tokyo, Yokohama, Nagoya and Osaka.

Collect call service was inaugurated in August 1980.

Data telephones equipped with an instrument to display the telephone number called on pushphones (push-button telephone sets) and provided with a store-and-forward function of the telephone number called can be used as an input/output device for data communication as well by connecting it to a data processing center for processing such transactions as credit card verification, sales management, reservation and credit advice. Sales of this data telephone began in December 1980 in Tokyo, Osaka and Nagoya.

In addition, the development of the EK-50 type key telephone system is being promoted to realize improvement in service functions and miniaturization of paired cables through introduction of microprocessors in an area where the number of extension telephones exceeds 20.

Data Communications Services

Data communications have made steady progress. With the recent development of communications and computer technology, the variety of material processed by data communications has become wider and the equipment more sophisticated. The number of domestic data communications systems at the end of fiscal 1979 reached 4,668, while at the same time domestic data communications circuits in use totaled 107,086,

Since the telephone network has its limitations in transmitting digital signals, NTT has promoted the development of a digital data exchange network to overcome this problem. A circuit switching service was inaugurated in December 1979 and packet switching service in July 1980 as advanced data communication services for digital transmission and switching. In the circuit switching service, a circuit is set up for each communication, as in the case of the telephone network, and communication is made between two terminals at the same rate of speed. The multiplex time-division signals are transmitted over a digital transmission route. Since digital signals are switched without conversion, high reliability can be secured. In case of the packet switching service, data is not directly transmitted and received

between the sender and receiver, but is first divided into single packets of 256 octets (1 octet = 8 bits). After they are once stored in the switching equipment as packets with address information, they are transferred through the switched network and sent to the addressee. Each time a packet is transferred, error control is conducted, resulting in very high transmission quality. Furthermore, the packet switching system allows communication between terminals with different rates of speed, and thereby permits flexible system configuration.

Visual Communication Services

Visual communication services now under development are facsimile, CAPTAINS, VRS and video conference services.

Facsimile service has rapidly come into wide use in Japan where complicated kanji characters form the basis of writing since transmission of the kanji is possible and because no full-time operator is needed for this service as is required for telex service, this system has become widely used. At present, Japan ranks second in the world – the United States is first – in facsimile-transmitting equipment in use with a number that now exceeds 100,000. From the viewpoint of popularization of facsimile, NTT has promoted the development of a subscriber facsimile communication system, incorporating easy-to-use, inexpensive and compact facsimile equipment with a network having diverse service functions suitable for facsimile communications such as multiple address communication and automatic reception. This system is expected to be put into service very soon.

The development of an interactive visual information system is now in progress in technically advanced countries. This system enables a user to obtain whatever information he wants from the large volume of information stored whenever and however much he wants as visual information through his access to visual information centers from his terminal combining a regular TV set with a pushbutton telephone set. In Japan, the system called CAPTAINS has been under joint experiments since December 1979 by the Ministry of Posts and Telecommunications and NTT.

Furthermore, NTT began experiments on VRS in January 1979 in the center of Tokyo, for the time being on an inhouse VRS system serving some 100 terminals as the test subjects. This system, differing from CAPTAINS based on character and pattern information, is capable of handling instantaneously color pictures, information in motion and sounds, in addition to character and pattern information. At present, experiments are being conducted by adding a new digital-type information file and expanding the functions of the system.

Finally, the video conference system, which can connect two conference rooms located at a distance from each other by video and audio, enables its users to see the conferees in another conference room on a TV screen, and to participate in a video conference as if they were in the same room. NTT has been conducting since 1976 a monitor test on the video conference service offered for public use between Tokyo and Osaka. Furthermore, NTT has developed a low-cost video conference system which can be installed in a user's building or on his premise. This system has been undergoing tests since March 1978 between Tokyo and Osaka with satisfactory results.

Basic Technologies to Support Services

We are promoting the development of various basic technologies in order to support the previously mentioned services, to add sophisticated functions and to meet the ever-increasing needs for new services.

LSI Technology: LSI is expected to contribute not only to computers but also to other telecommunications equipment such as switching equipment, transmission equipment and terminal equipment as very important elements to support the future telecommunications systems. LSI made of a large number of interconnected fine elements has shown rapid improvement. The number of elements we can put on a chip has been doubled each year, thanks to the improvement in fine element processing techniques such as the electron beam exposure technique. At present, a 64 Kbit/chip RAM (random access memory) containing tens of thousands of memory elements on a silicon chip of several

mm. square is being introduced into information processing equipment in the DIPS 11/5 series. Furthermore, we have developed a 256 Kbit/chip MOS memory, the highest integration in the world, which contains some 580,000 elements on a silicon chip some 6 mm. square, and successfully confirmed its performance.

Digital Technology: The rapid development of LSI technology in recent years has brought about drastic changes in circuit systems, mounting, equipment constitution and software technologies, and has had a great impact on transmission and switching systems. Furthermore, it was LSI technology that made the digital system possible, replacing the traditional analog system. The digital system translates every signal into a combination of "1" and "0" pulses, and a pulse train is multiplexed on a time division basis for transmission and switching.

NTT is vigorously promoting the development and introduction of digital transmission and switching systems. Digital transmission systems which have already been introduced into commercial use are the DC-100M System (1,440 voice channels/system) applicable to medium and short distance routes over coaxial cable, the DC-400M System (5,760 voice channels/system) having the largest transmission capacity in the world as a digital transmission system and applicable to long distance routes, and the 20 GHz Band Radio PCM System (20L-PI System having a capacity of 5,760 voice channels/system) applicable to long distance transmission routes up to 2,500 kilometers. Furthermore, for a digital radio transmission system, we are promoting the development of 5 GHz Band Digital Radio System (transmission capacity of 200 Mb/s/sys) through the improvement of utilization efficiency of frequencies by using the 16QAM modulation system, thanks to the development of multilevel modulation and demodulation technology.

As to digital switching systems, we are promoting the development of digital switching equipment which forms message channels with electronic components such as LSIs, differing from the ones of the existing switching equipment, and converts the pulse train of digital signals passed through a transmission route, changing the positional relationship in terms of time and space for every message unit. Digitalization of switching equipment will be undertaken starting with interoffice switching equipment and followed by local switching equipment.

Software Techonology: With the progress of electronization of equipment due to the advance of electronic technology, software is expected to become the nucleus of all technologies, while at the same time the volume of software and its importance are increasing rapidly. Since an enormous amount of expenditure is needed for the development of software, and its preparation is labor-intensive viewed from the international point of view, it is a challenge to improve software programming productivity.

To meet this challenge, and to promote reduction in software development costs, productivity improvement such as curtailment of the development period, quality improvement such as reliability, flexibility and capability, and improvement in maintenance, we are striving to adopt software development techniques, and to develop equipment to automatically produce software products and high level language capability to facilitate programming and maintenance.

Optical Fiber Communications Technology: The optical fiber communications system uses optical fibers as its transmission line, and transmits information over lightwaves. We have developed completely OH free VAD optical fiber system of less than 0.5 db/km with longer wavelengths ranging from 1.2μm to 1.7μm by refining the optical fiber manufacturing method (VAD method) which was developed by the joint efforts of Ibaraki Electrical Communication Laboratory and three electric wire manufacturers in 1976, and by adopting a high-degree purification method by which impurities in the fiber can be reduced to less than one ppb (one billionth). This has removed some restrictions on optical fiber communications, made a wavelength division multiplexing system possible, and taken a great step toward the develop-

ment of lightwave communications.

The first field trial of a lightwave communications system was conducted in 1978, centering on a 48-core multi-mode optical fiber cable over a distance of approximately 20 kilometers between the Karagasaki Controlling Radio Relay Station and the Hamacho Telephone Office in Tokyo. Subsequently, the second field trial was carried out over an 18 kilometer distance in Kawasaki in 1980 with satisfactory results. Commercial testing is scheduled to start this year.

Satellite Communications Technology: Satellite communications has the capability of transmitting high-quality information to any place on earth, irrespective of geographical features, providing signals over a wide area, as compared with the existing communications lines. In December 1977, "Sakura," a medium-capacity geostationary communications satellite for experimental use, was launched from Japan to undertake various experiments.

NTT is now developing demand-assigned time division multiple access equipment capable of improving the utilization efficiency of communications satellite channels by severalfold, and a lightweight (some 2.2 tons) 30/20 GHz band small earth station that can be installed on a rooftop, aiming at the development of the communications satellite II (CS-2) which is scheduled to be launched in 1982. For the time being, CS-2 will be used for public communications circuits with the purposes of providing reliable communications at times of emergencies, setting up communications lines with isolated islands and remote areas, and setting up additional circuits at ordinary times.

Establishment of an Integrated Digital Network

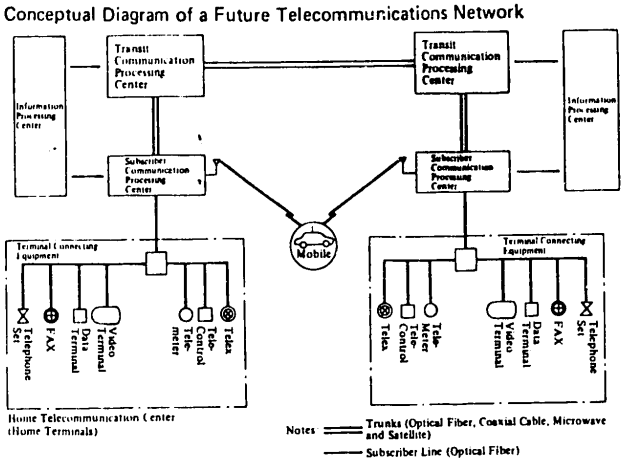
Telecommunication services have been provided so far by separate and independent networks such as the telephone network for telephone service, the telex network and the telegraph switching network. In recent years, however, computers have come to be used widely in every field of our social and economic activities. As a result, the volume of digital information has increased, while at the same time semi-conductor components technology such as LSI or digital signal processing technology has shown remarkable progress. It has become practical to transmit in a digital form not only data signals but video signals such as facsimile which is analog information in itself and even telephone signals. Consequently, it is now possible to establish an integrated services digital network (ISDN) aiming at a telecommunications network capable of providing convenient, easy-to-use and diverse telecommunications services economically and efficiently through integration of individual digital networks at the final stage. Prior to that, individual digital networks suitable for data communications and facsimile communication must be constructed and the telephone network also must be digitalized.

For the above reasons, NTT is steadily promoting digitalization of individual networks such as the digital data network and the public facsimile communication network, aiming at creating an integrated system.

Conclusion

For NTT, whose business has entered into a more creative area along with the progress of the so-called information society, there can be no obvious indicators of future developments as we could count on before, and it seems that the smooth technological developments as we have progressively achieved in the past can no longer be expected in the future. However, we accept this as a challenge. It is our intention to make further efforts to meet the expectations of the nation through our vigorous research and development activities so as to provide new and improved services economically and efficiently by merging new ideas with new technologies. ◻

Conceptual Diagram of a Future Telecommunications Network



CSO: 5500

JAPAN

TELECOMMUNICATIONS HEAD DISCUSSES PROGRESS IN COMMUNICATIONS SYSTEM

Tokyo BUSINESS JAPAN in English Vol 26, No 4 Apr 81 p 61

[Article by Arinobu Morizumi, Director General of Telecommunications, Ministry of Posts & Telecommunications]

[Text]

THE greatest problem relating to Japan's telecommunications immediately after World War II was to establish policies to rehabilitate and expand the telecommunications facilities that had suffered a crushing blow during the war so as to restore telecommunications services to the people. In order to achieve this goal, the government introduced legislation concerning telecommunications in the first half of the 1950s and established the basis for the current monopolistic setup for supplying public telecommunications services. These consist of Kokusai Denshin Denwa Co., Ltd. (KDD) and Nippon Telegraph and Telephone Public Corp. (NTT). As for domestic public telecommunications services, NTT has, since fiscal 1953, been exerting efforts to complete its facilities to fill the backlog of orders for installing telephone sets and to computerize all telephones throughout the country. Plans to expand telegraph and telephone services have been undertaken six times. Along with the marked growth of the nation's economy and the raising of the standard of living, demand for telephones increased at an unexpectedly rapid pace. NTT achieved its main targets through its managerial efforts and technical renovations in the first half of the 1970s. As a result, Japan's telecommunications are recognized by many nations for the quality of its uniform nationwide services as well as its technology. The number of telephone subscribers is expected to reach some 38,660,000 soon, about 25 times that at the time when NTT was established.

In the field of international telecommunications, KDD has exerted great efforts in installing wide-band communication trunk lines such as submarine cables and international satellite communications. Along with the diffusion and expansion of domestic communication networks in many countries, KDD has formed a global network of communications, thus enlarging Japan's vital role in the international society.

The diffusion and expansion of telephone services have thus reached a very high level, both domestically and internationally. In accordance with the improvement in the people's living, and the diversification and enhancement of society, new telephone equipment has been developed and communication services with moving vehicles – automobiles, trains, ships and aircraft – are being steadily expanded.

Along with the rapid progress of electronics and new demands from business, industry and the general public, more advanced and diversified communication means such as data communication and picture communication are becoming widespread.

Data communication, which uniformly transmits and processes data by connecting computers with communication circuits, was launched in fiscal 1964 in Japan. Since fiscal 1971 when restrictions placed on the use of telecommunications circuits were lifted, data communication has rapidly become widespread. During fiscal 1979, NTT counted for data communication 4,668 systems including management of inventories for sales, scientific and technical computations, information on the distribution of perishable foods and medical information. These services are now playing a vital role for the nation's industrial and economic activities.

In order to cope with such rapidly increasing diversified and improved utilization of telecommunications, the existing communication networks centered around telephone networks are rarely sufficient. New digital communication networks that can fit new technologies represented by very large scale integration and computers will be needed. For this purpose, NTT has begun to offer network services designed for new types of data communication. Known as DDX, a circuit exchange service was introduced in December 1979 and packet exchange service in July 1980. In addition, KDD has started in 1980 an international computer access service (ICAS) which maintains direct connection with a data base in the U.S., allowing retrieval of various information on line. Data communication between both countries is thus actively being promoted.

Along with data communication, facsimile communication is also rapidly growing. This method of communication is most suitable for Japan as complex Chinese characters are used in writing. Since 1971 when telecommunications systems were revised, facsimile communication has shown rapid diffusion, supported by the fact that the performance of facsimile has improved and costs have been reduced. The number of facsimile units now being used in Japan totals more than 100,000, the second largest number after the U.S.

The development of telecommunications heavily depends on technical progress. Constant efforts to promote research and development are needed. It is also necessary to establish highly reliable and economical telecommunications networks on a nationwide scale. Specialized equipment is a basic requirement. Negotiations between the United States and Japan concerning NTT's equipment procurement based on GATT (General Agreement on Tariffs and Trade) regulations on government procurement, as agreed to at the Tokyo Round (multiple trade negotiations) for the purpose of expanding trade, were concluded at the end of last year. As a result, NTT adopted ths so-called three-level system including competitive bidding and two stages of joint development. The new system took effect on January 1, 1981.

Development of the most advanced technologies through international competition and joint research and development among advanced industrial countries will assure the further progress of pioneering technologies. To promote this goal, NTT is responsible for encouraging competitive biddings, both internationally and domestically, concerning the procurement of required equipment and materials. On the basis of the newly concluded agreement, NTT is exerting efforts to implement the new procedures for procuring equipment and materials. □

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UGANDA

BRIEFS

JAPANESE RADIO ASSEMBLY PLANT--The Japanese Matshushita Company presumably intends to install a small plant to assemble radios and to manufacture dry-cell batteries in Kampala. Matshushita had already tried one in Uganda beginning in 1975 but had to give it up because of the country's economic situation. [Text] [Paris MARCHES TROPICAUX ET MEDITERRANEENS in French 20 Mar 81 p 795]

CSO: 5500

FRANCE

'SPOT,' 'LANDSAT' COMPATIBILITY SEEN BENEFITING FRANCE

Paris AIR & COSMOS in French 21 Mar 81 pp 53-54

[Article by Pierre Langereux]

[Text] The future looks favorable for the putting in place of an operational "SPOT" [Earth Observation Probe System] system, considering the inherent features of the French satellite (high resolution, stereoscopy) and its operating characteristics (Band X transmission), which make SPOT receiving stations compatible with "Landsat D" receiving stations. This compatibility between the French and American systems was indeed planned beginning as far back as 1978 by the CNES [National Center for Space Studies] and NASA. The consequences are significant. They will make the SPOT and Landsat D systems the two major space teledetection systems worldwide.

Currently, there are 12 Landsat stations in service throughout the world; five others are being built, and eight new ones are being projected between now and 1985, bringing the total of Landsat receiving stations to 25, of which some 15 will be compatible with the SPOT system when it goes into service. Eventually, all Landsat stations will be compatible with SPOT, since the new Landsat D generation of American satellites will all operate only in Band X.

These stations will be the access key to future Landsat D and SPOT teledetection satellite operational networks to be placed in service in the coming years. France will thus occupy the place of one of the world's principal suppliers of future teledetection data, alongside the United States!

Landsat Shortcomings

The American Landsat system, the world's first space teledetection network, has operated 9 years now without interruption. Three experimental satellites have been launched successively. The first, Landsat 1, launched in July 1972, operated until February 1978, that is, 5 years (instead of the expected 1 year). The second satellite, Landsat 2, launched in January 1975, was restored to service in June 1980 after an interruption of several months. The third satellite, Landsat 3, launched in March 1978, broke down operationally in early 1981.

Landsat Stations in Service and in Planning Stages
and
Compatibility with SPOT

(1) PAYS	(2) LIEU	Mise en service (3)	Compatibilité Spot (4)
(5) En exploitation : 12 stations			
Argentine	Mar Chiquita	1980	—
Australie	Alice Springs	1980	oui
Brésil	Cuiaba	1974	oui
Canada	Shoe-Cove	1977	oui
Canada	Prince Albert	1972	oui
Italie	Fucino	1978	oui
Suède	Kiruna	1979	oui
Inde	Hyderabad	1980	oui
Japon	Tokyo	1979	oui
Etats-Unis	Fairbanks (Alaska)	1972	(*)
Etats-Unis	Goldstone (Calif.)	1972	(*)
Etats-Unis	Greenbelt (Maryl.)	1972	(*)
(6) Incertaines : 2 stations			
Iran	Téhéran	1978	(**)
Zaire	Kinshasa	—	—

(1) PAYS	(2) LIEU	Mise en service (3)	Compatibilité Spot (4)
(9) En construction : 5 stations			
Afrique du Sud	Johannesburg	1981	oui
Chine	Pekin	1982	oui
France	Toulouse	1983	oui
Thaïlande	Bangkok	1981	—
Bangladesh	Dacca	1981	oui
(10) En projet : 8 stations			
Chili	Santiago	—	—
Chine	(deuxième)	1985	oui
Haute-Volta	Ouagadougou	1984	oui
Kenya	Nairobi	1985	oui
Nouvelle-Zelande	—	—	—
Roumanie	Bucarest	—	oui
Equateur	—	—	—
Indonésie	Djakarta	—	—

(7) (*) Ces stations seront remplacées par les satellites-relais « TDRSS ».
(8) (**) L'exploitation de cette station a cessé depuis 1979.

Key:

1. Country.
2. Location.
3. In-Service Date.
4. SPOT Compatibility: "oui" = yes.
5. In operation.
6. Uncertain.
7. These stations will be replaced by TDRSS relay satellites.
8. Operation of this station discontinued since 1979.
9. In construction.
10. Planned.

Overall, Landsat satellites have photographed more than 800,000 "scenes" (a series of images of the same zone taken on different wavelengths) in standard format (185 km on a side) covering all emergent land masses almost entirely in several spectral bands (visual and infrared) with an earth-level resolution of 80 m. More than 60 percent of these images were acquired by non-American stations, and 36 percent of the sales of Landsat data were made to foreign users.

This result obtained by the first generation of American teledetection satellites is impressive. It does not completely satisfy users, however, for several reasons:

--the space resolution (80 m) and the geometric accuracy are considered inadequate for most mapping work;

--the repetitional rate of observations (18 days, then 9 days) of the same site is not adequate, especially for the surveillance of vegetation and pollution;

--the choice of spectral bandwidths (0.5-1.1 microns in the visual and 10.5-12.4 microns in the infrared ranges) is not optimum for the surveillance of vegetation;

--and the data supply delivery time (6 weeks) is much too long for certain users who need a fast restoration (48 hours).

The New Landsats

The United States has therefore prepared a new generation of improved teledetection satellites: Landsat D1 and D2--the fourth and fifth of the series--which are to be launched by year-end 1982 and year-end 1983 respectively. The Landsat D2 satellite is to be equipped with a new instrument (Thematic Mapper) for shots with a resolution of 30 m and spectral bandwidths more suited to thematic missions. However, Thematic Mapper data will not be distributed operationally (50 scenes/day) before 1985, according to NASA.

In 1979, the American government also decided the creation of an operational teledetection satellite system under the NOAA [National Oceanic and Atmospheric Administration], which was already responsible for the American system of civilian meteorological satellites.

On 20 June 1980, the NOAA submitted to Congress a three-phase plan--extending to the year 2000--for the creation, beginning in 1982 and using Landsat D satellites, of a system that would not be fully operational with a new generation of satellites until 1989. The cost of this future operational system--variable between $1 billion and $10 billion over a total period of 10 years depending upon various assumptions--is to be self-financed by revenues from the sale of images, estimated at $100 million-$400 million annually and based upon a general and substantial (3 to 5 times current price) increase in image marketing rates.

Comparison of Landsat and SPOT Performance Characteristics

	Multi Spectral Scanner (Landsat 1,2,3)	Camera photo Vidicon (Landsat 3)	Multi Spectral Scanner (Landsat D. 1981)	Haute Résolution Visible (HRV) (1) (Spot)
(2) Bandes spectrales	.5 - 6 µm .6 - .7 .7 - .8 .8 - 1.05 10.5 - 12.4 (Landsat 3)	0.5 - 0.75 µm	.45 - .52 µm .52 - .60 .63 - .69 .76 - .90 1.55 - 1.75 2.1 - 2.35 10.4 - 12.5	.5 - .59 .61 - .69 .79 - .90 } (20 m) .5 - .9 (10 m)
(3) Resolution linéaire	80 m 240 m IR	40 m	30 m 120 m IR	20 m 10 m
(4) Heure locale nœud descendant	9 h 30	9 h 30	9 h 30	10 h 30
(5) Largeur de balayage	185 km	185 km	185 km	2 · 60 km (8) orientable dans ± 400 km
(6) Repétitivité	18 jours (7)	18 jours	16 jours	26 jours (9) accessibilité en tout point du globe en 5 j maximum

Key:

1. High Visual Resolution.
2. Spectral bands.
3. Linear resolution.
4. Downlink local time.
5. Sweep width.
6. Repetitional rate.
7. Days.
8. 2 x 60 km orientable within ± 400 km.
9. 26 days, accessibility at all points of globe in 5 days maximum.

SPOT Images at 1 Franc/Km^2

France, for its part (see AIR & COSMOS no. 850), beginning with its first earth-probe satellite, SPOT 1, to be launched in 1984, plans to create an operational network of SPOT observation satellites calling for successive launchings of four or five satellites to maintain the system in service over a period of 10 years. The operating cost of such a system is estimated to be around 1.5 billion francs (1980 prices), not including the system installation cost, which will come to around 1 billion francs with the SPOT 1 satellite and associated earth segment. The launching of the second satellite, SPOT 2, planned for 2 years after the first one (1986), will cost an estimated round figure of 350 million francs; it could even be financed by the CNES. Beginning with the third satellite, however, the system must become self-financed by revenues from the sale of images, which are estimated by the CNES to be around $40 million/year.

The CNES market studies project possible annual sales of around 100,000 SPOT scenes (3 images at 20-m resolution and 1 at 10-m resolution) at a price of around 2,500 francs ($500) per scene, which would be substantially lower than the price of data from the future Landsat D operational satellites. SPOT high-resolution data--selling at a price equivalent to 1 franc/km^2)--could thus compete directly against high-altitude aerial photography (10-15 francs/km^2).

9399
CSO: 5500/2164

FRANCE

NEW, SPECIALIZED SATELLITE SERVICES DISCUSSED

Paris AIR & COSMOS in French 28 Mar 81 pp 37-38

[Article by Pierre Langereux: "Space Telematics"]

[Text] Development of the New Specialized Services Using Satellites

The telecommunications satellites are, as is known, simple space relays whose best-known uses are the retransmission of telephone communications and television programs, as well as transfer of data between computers. But other and more specialized information can also transit via satellites, whether moving (in low orbit) or geostationary (at 36,000 km altitude). Jean-Claude Husson, director of the Toulouse Space Center of the CNES [National Center for Space Studies], has cited some 10 of these new applications, either under way or proposed.

Direct TV

To the present, no TV viewer in the world receives directly the television programs transmitted by satellites; the signals are first picked up by large national stations and then sent out over the conventional networks (radio waves, cables, etc) to the viewer, under the control of the television administrations or companies. The imminent advent of the direct remote-broadcasting satellites is going to overturn this situation. The programs transmitted by a central station to the satellite will be broadcast directly to the TV viewer via small individual or community antennas. It will thus be possible for a TV program to be broadcast directly to 100 million households in Europe (the case with the Luxembourg satellite).

The progress achieved in satellites (power of 6 W for 5 channels, TOP of 200 W and more, stabilization to better than 0.1°, large multisource antennas, high frequencies, etc) makes it possible as of now to build such satellites, the mass of which will reach 1 to 2.5 tons (in transfer). The new launchers (Ariane and Shuttle) will be able to put these satellites into geostationary orbit. Practically all countries, if they have the means and the know-how, will be able to make use of direct TV via satellite. Indeed, almost 1,000 possibilities of direct transmission over nearly 250 zones in the world have been planned for by the international telecommunications organization (ITU [International Telecommunication Union]), on the basis of 35 orbital positions, to cover more than 150 countries individually.

Retransmission of Meteorological Images

The geostationary weather satellites, such as GOES in the United States and Meteosat in Europe, the principal function of which is to take pictures of the earth and of

clouds, also serve to rebroadcast the processed images to the community of users. Thus, the meteorological images received and processed in Darmstadt (FRG) are rebroadcast by the Meteosat satellite in analog form (WEFAX) over 2-meter stations (SDUS [expansion unknown]) or in digital form to 4-meter stations, on the L band (1.6 GHz] gigahertz]).

An experiment in distribution of weather data via satellite to Africa is going to be conducted by the ESA [European Space Agency] with the Sirio 2 satellite, the launching of which is planned for 1982. This experiment, which is aimed at supplementing the conventional weather-data distribution network, will make it possible to transmit at the rate of 100 to 2,400 bits per second on the L band to 1.5-meter and 2.5-meter stations.

This system of broadcasting of weather data via satellites could later be provided on a permanent basis with the future operational Meteosat satellites.

Broadcasting of Images and Remote Detection

The images of the future French remote-detection satellite Spot could be broadcast far more rapidly in Europe with the aid of the French telematics satellite Telecom 1.

These images, which will be received in Europe by the French station of Aussaguel and the Swedish station of Kiruna, will necessarily have to be preprocessed by a specialized center at Toulouse before being rebroadcast to the users, via the Spot-Image company. But exploitation of these images will require of the users remote consultation of the Spot photolibrary, with transfer of a simplified image (quick-look) representing a flow of 256 Kbits/sec. In order for consultation to take no longer than 10 seconds, a flow of 100 Kbits/sec will be required. But for retransmission of a "scene" (three Spot images in the different wavelengths) in less than 1 minute, more than 3.6 Mbits/sec will be necessary, and to do so in less than 10 seconds, nearly 34 Mbits/sec will be required. This would justify the use of a specialized-telecommunications satellite such as Telecom 1.

Later, it would even be possible do the transfer of processed images automtically by computer in order to provide an orthophotomap directly to the user.

Collection of Data and Localization

The CNES placed in service several years ago an Argos operational system for data-collection and localization of automatic beacons throughout the world. This system operates automatically and is used by several dozen French and foreign users who take measurements in the most diverse places: atmosphere, ocean, rivers, icebergs, volcanoes, from balloons, ships, buoys, platforms, etc, and even by means of animals (bears, dolphins, sharks, turtles, etc).

The CNES' Argos system simply uses a special piece of interrogation equipment (EMD [Marcel Dassault Electronics)] mounted on American weather satellites of the Tiros N series which revolve in polar orbits. The data, processed by IRIS 80 computers at the Argos center in Toulouse, are then sent to the user by simple telex call (No 530 255), sometimes with the aid of telecommunications satellites of the INTELSAT network.

The Meteosat weather satellite can also be used for data-collection, but only in the satellite's zone of visibility and with an output (at 400 MHz) that requires bigger beacons.

Relay Satellites

The networks of ground stations for control of satellites in orbit--doing the functions of telemetry, remote control and localization--are destined to disappear in the future so as to permit better exploitation of the frequency spectrum. They will be replaced by relay satellites which will provide for the service connections between a central station on the ground and the satellites in low orbit (200 to 2,000 km) or geostationary orbit (36,000 km).

NASA has already started the setting-up of such a system with the future TDRSS relay satellites to be launched in 1982-1983. Two TDRSS geostationary satellites separated by 130° longitude will thus be able to provide S-band and K-band connections, with single or multiple access and with flows that can reach 300 Mbits/sec. NASA's "Space Shuttle" will be one of the principal users of the TDRSS network, as well as the future Landsat D remote-detection satellites.

The CNES has also planned for the placement in orbit of a STAR relay satellite for control of the future French, and possibly European, satellites.

Teleconferences

The use of several telecommunications satellites makes it possible to organize remote conferences among several countries on different continents. Experiments or demonstration projects of this kind have already been carried out, since 1978, with the French Symphonie, the America ATS 6, and the Canadian Hermes satellites.

Symphonie has made possible international teleconferences between France, the United States and Canada, while ATS 6 has provided for retransmission to 48 stations in the United States; Hermes has done the same service between the United States and Canada.

Other operations are planned on the national level, notably with the French satellite Telecom 1, one channel of which is specifically devoted to videoconferences (remote conferences with sound and image).

Time Transfer

A very original use of satellites is time transfer and synchronization of atomic standard-chronometers at various points on the globe.

Until now, time was distributed with a precision of only 1/1,000 sec, using radioelectric propagation of time signals around the earth, by reflection from the ionosphere.

Satellites now make it possible to do much better. The American Transit military navigation satellites are already distributing time signals with a precision of 50 to 100 microseconds. But experiments done in recent years (1976-1980), notably with the Franco-FRG Symphonie satellites, have made it possible to achieve precisions of 10 to 100 nanoseconds. These experiments have taken place among France, the FRG, Canada, India and China.

Precisions of 1 to 10 nanoseconds throughout the world could even be achieved by using the geostationary satellites, at 4-6 GHz for intercontinental connnections and 11-14 GHz for national connections.

Furthermore, the ESA is preparing a new atomic-clock synchronization experiment on an intercontinental scale with the Sirio 2 satellite.

Amateur-Radio Satellites

Ham radio operators throughout the world are also among the most assiduous--and most misunderstood--users of the telecommunications satellites. It is estimated that a million ham radio operators are presently using the specialized satellites devoted to them for their long-distance connections.

In the last 20 years (since 1961), 9 Oscar amateur-radio satellites have been launched by the American association AMSAT [expansion unknown]. Two American satellites are still operational at present (on the frequencies of 145 and 435 MHz). The launching of a new FRG amateur-radio satellite failed last year with the loss of the Ariane launcher.

But the CNES is preparing for 1985 the launching of a French amateur-radio satellite, Arsene.

Search and Rescue

The satellites are also going to be used for search and rescue of airplanes and ships in distress; they will make it possible to ensure security of reception of distress calls as well as localization (with precision of a few kilometers) of the site of distress, thus facilitating search-and-rescue operations.

An experimental system will be set up for the first time on a world scale in 1982, within the framework of cooperation among France, Canada, the United States, the USSR and Norway. This system will utilize in particular some specialized Sargos (EMD [Marcel Dassault Electronics]) distress-signal reception and localization equipment mounted on American Tiros N polar weather satellites, as well as analogous equipment on board specialized Soviet satellites of the Intercosmos 21 type. This system will thus bring into association the Western SARSAT [expansion unknown] system and the Soviet COSPAS [expansion unknown] system.

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CSO: 5500/2178

BRIEFS

NEW DIGITAL EXCHANGE--Turin--Within the framework of the modernization of the Italian telephone network, the Higher Institute of Post and Telecommunications has approved the AFDTI [expansion unknown] electronic automatic switching system, using a digital recorded program, that has been entirely designed and developed by Telettra at its establishment in Gorgonzola. There are already four specimens of this type of digital electronic exchange for public telephone transit--the first approved in Italy--installed in the SIP [Italian Telephone Company] network: at Turin, Milan, Rome and Naples. By virtue of this new electronic system, it will be possible to start up the voice and data (computer-connection) network whereby the users requesting it will be able to use throughout the national territory advanced services such as the multifrequency keyboard with the possibility of abbreviated dialing, complete documentation of charges, communication of data even with fixed destination, and finally--most important of all--through-dialing for international and intercontinental connections from the entire country. After state-agency approval, which is expected to be granted very shortly, the Italian system will be capable of offering services that will be among the most advanced in Europe. The voice and data network makes user connections by means of UFD [expansion unknown] concentrators of Italtel. It therefore involves collaboration between the two Italian manufacturing firms under SIP direction. [Text] [Turin LA STAMPA in Italian 18 Mar 81 p 11] 11267

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