APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

23 JULY 1979 (FOUO 9/79) POL AND DEVELOPMENT

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

FOR OFFICIAL USE ONLY

JPRS L/8584

23 July 1979

Worldwide Report

TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT

(FOUO 9/79)

FBIS FOREIGN BROADCAST INFORMATION SERVICE

FOR OFFICIAL USE ONLY

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

For further information on report content call (703) 351-2811.

COPYRIGHT LAWS AND REGULATIONS GOVERNING OWNERSHIP OF MATERIALS REPRODUCED HEREIN REQUIRE THAT DISSEMINATION OF THIS PUBLICATION BE RESTRICTED FOR OFFICIAL USE ONLY.

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

JPRS L/8584

23 July 1979

WORLDWIDE REPORT

TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT

(FOUO 9/79)

CONTENTS PAGE

ASIA

JAPAN

Briefs

Software Distribution 1
VLSI Association Subsidy 1
Optelectronics Program Proposed 1
Fiber Optics Laser 2
Optical IC Laser 2
VLSI Resist Technology 2
Electron Beam Resist 2
Gallium Arsenide Etching 2
Multilayer Hybrid IC 2
POS Scanner 3
Japanese-Language Processing 3
Fujitsu Minifax 3
DCNA Protocols 3

SUB-SAHARAN AFRICA

GABON

Telecommunications Center Inaugurated
(MARCHES TROPICAUX ET MEDITERRANEENS, 25 May 79)..... 4

MALAWI

Improvements in Telecommunications Facilities Described
(MARCHES TROPICAUX ET MEDITERRANEENS, 27 Apr 79)..... 5

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

CONTENTS (Continued) Page

USSR

The 1980 Olympic Press Service
(V. Kulikov; SOVIET UNION, No 7, 1979)..... 7

Establishing Throughput Capabilities for Geostationary Orbits
(L. Ya. Kantor; RADIOTEKHNIKA, Apr 79)..... 8

Development of TV Transmitting Networks Reviewed
(V. A. Shamshin; ELEKTROSVYAZ', Apr 79)..... 20

WEST EUROPE

FRANCE

July Decision Awaited on Telecom 1, TDF 1 Satellites
(Pierre Langereux; AIR & COSMOS, 16 Jun 79)..... 24

Direct TV Satellite Decision Awaited
(Pierre Langereux; AIR & COSMOS, 26 May 79)..... 27

Briefs
Telecommunications Satellite Priority 30

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

JAPAN

BRIEFS

SOFTWARE DISTRIBUTION--To promote general-use software development and use, a "General-use Software Development Reserves System" will be set up within a year. Qualifying software will be registered by the Information Processing Association, upon sale 50 percent of the proceeds or service proceeds will be held for 4 years as a reserve, and thereafter the money can be withdrawn in equal amounts spread over 4 years. Establishment of the system is expected to further efforts at unbundling by Japanese computer makers. Imported software will not qualify for registration, but software of computer makers affiliated with foreign capital may qualify, contingent upon suitable conditions being established. [Tokyo NIKKAN KOGYO SHIMBUN in Japanese 15 Jun 79 p 12]

VLSI ASSOCIATION SUBSIDY--The Ministry of International Trade and Industry has decided to end the VLSI national project research and development subsidy at the end of JFY 1979 as scheduled. The computer industry is greatly desirous of extending the program, but the Ministry of Finance is opposed due to the cost, particularly in view of start-up this year of a 5-year program to cost 47.1 billion yen (government subsidy 23.5 billion yen) for work on the next-generation computer operating system and Japanese-language processing terminals. Also, the VLSI Association program has been criticized by U.S. semiconductor makers as "cartel behavior." The researchers will be transferred to the operating system/terminals program upon the end of the VLSI program. [Tokyo NIKKAN KOGYO SHIMBUN in Japanese 9 Jun 79 p 3]

OPTELECTRONICS PROGRAM PROPOSED--The Japan Society for the Promotion of Machine Industry has proposed that the government establish an "Optical Information Industry" promotion program to include setting up an optical information industry promotion center foundation to handle project FOXS (fiber optics "X" system) as well as 1. securing R&D funds, 2. setting up a rental and sale organization, 3. setting up a loan guarantee system, 4. expanding government procurement, 5. stimulating use by law and government regulation, etc. FOXS candidates proposed include an expressway optical information system (1.7 trillion yen), an ocean resources utilization system (5 trillion yen), a business information system (700 billion yen), a wide-area energy conservation system (1.5 trillion yen), and a garden cities center optical network system (3.5 trillion yen). [Tokyo NIKKAN KOGYO SHIMBUN in Japanese 14 Jun 79 p 1]

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

FIBER OPTICS LASER--Hitachi Ltd has developed an InGaAsP laser diode enabling transmission of 1 gigabit per second over a distance of 50 km without a repeater. The diode operates in the 1.3 micron band. Sale of two models will start in September at 40,000 to 60,000 yen per diode. Initially, Hitachi Central Laboratory will produce 50 a month, but production is scheduled to be shifted to the Takazaki plant and output upped to 500 a month after 1 year. [Tokyo DNEPA SHIMBUN in Japanese 13 Jun 79 p 1]

OPTICAL IC LASER--"The Institute of Physical and Chemical Research...is starting on development of optical ICs in JFY 1979 as one element in laser science specified research." The Institute will study the wave path structure of three- and four-element compounds of gallium, aluminum, phosphorous, arsenic, and such with the aim of developing a visible-light semiconductor laser. [Tokyo NIHON KOGYO SHIMBUN in Japanese 12 Jun 79 p 5]

VLSI RESIST TECHNOLOGY--Nippon Telegraph & Telephone has announced its intent to provide technological know-how on its recently-developed VLSI resist to semiconductor makers in a compensation basis. The resist, which is 50 to 100 times as sensitive as and provides twice the contrast of PMMA, is presently being made and sold by co-developer Daikin Kogyo, and is described as a high sensitivity floride electron beam positive resist known as FBM-110. NTEC (Nippon Telecommunications Engineering) will handle actual provision of the know-how to the manufacturers. [Tokyo NIKKAN KOGYO SHIMBUN in Japanese 2 Jun 79 p 7]

ELECTRON BEAM RESIST--Nippon Telegraph and Telephone's Ibaraki Electrical Communications Lab has developed a chloromethylated polystyrene (CMS) negative resist suitable for pattern width of 0.2 micron. The CMS resist material has a sensitivity of 4×10^{-7} coulomb and a resolution index gamma value of 1.4. Development of this new resist is expected to accelerate VLSI research and development. [Tokyo NIKKAN KOGYO SHIMBUN in Japanese 21 Jun 79 p 14]

GALLIUM ARSENIDE ETCHING--Matsushita Electronics Industries has developed an "optical control positive acid etching method" for use on GaAs Ics and LSIs that allows free control of the active layer thickness in the 0.05 to 0.3 micron range. Five patents have been applied for on the etching method and equipment. [Tokyo DENPA SHIMBUN in Japanese 8 Jun 79 p 1]

MULTILAYER HYBRID IC--Fujitsu has recently test-produced a five-layer hybrid IC on an alumina (FGA) substrate by using a combination of thick-film technology. The FGA ground layer is insulated with glass, metal paste is applied, and polyvinyl alcohol or such resist is mounted. The mask is then used to create the wiring negative in the light-sensitive resist, prior to the paste drying. The dried paste along the resist negative image is etched by spraying with organic solvent, and upon low-temperature firing the resist volatizes, leaving the wiring pattern. Glass is used to provide an insulating coating, and the process is repeated. Pin poles are used to connect

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

the layers. Using this method, 25 IC chips (250 gates) have been mounted on a 40 by 60 mm substrate, an order smaller than conventional hybrid IC packaging. [Tokyo NIHON KOGYO SHIMBUN in Japanese 5 Jun 79 p 20]

POS SCANNER--Nippon Electric intends to actively enter the point-of-sale equipment market with its new system employing an aperature-laser scanner and a hologram disk. Advantages of the new scanner over high-speed rotating mirror scanners include low cost, 1.95 million yen or half the price of conventional scanners, size half that of conventional scanners, and much greater reliability. NEC has started taking orders as a prelude to mass production, and expects to sell 200 or 300 units of this LSB-3 a year. Production of the LSB-2 is being halted. [Tokyo NIKKAN KOGYO SHIMBUN in Japanese 11 Jun 79 p 12]

JAPANESE-LANGUAGE PROCESSING--According to an industry source, IBM Japan will commercialize a Japanese-language information processing system within the year. [Tokyo NIHON KOGYO SHIMBUN in Japanese 1 Jun 79 p 11]

FUJITSU MINIFAX--Fujitsu Ltd has announced conversion of its Kanuma plant, presently making printed circuit boards, to exclusive production of facsimile machines. The move is in response to demand to materialize when NTT inaugurates commercial Minifax service in late 1979. [Tokyo NIKKAN KOGYO SHIMBUN in Japanese 19 May 79 p 7]

DCNA PROTOCOLS--Yokosuka Electrical Communication Laboratory of the Nippon Telegraph & Telephone Public Corporation has prepared a revised DCNA (Data Communications Network Architecture) featuring added protocols and expanded high-level protocol functions. [Tokyo NIKKAN KOGYO SHIMBUN in Japanese 15 May 79 p 14]

CSO: 5500

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

GABON

TELECOMMUNICATIONS CENTER INAUGURATED

Paris MARCHES TROPICAUX ET MEDITERRANEENS in French 25 May 79 p 1317

[Excerpt] Gabonese Vice Prime Minister Jean-Stanislas Migolet on 17 May opened the Nkol Ogoum National Telecommunications Center in Libreville. It will provide the southeast sector of Gabon (this is, the Franceville region) with telephone, telex, telegraph and television service. The center provides direct microwave contact between Libreville and Franceville, as well as Akieni and Okondja, including Ndjole, Booue, Lastoursville Koula-Moutou and Moanda,

The system consists of 21 relay stations 80 km apart. The equipment for the microwave system consists of FH 685 Thompson-CSF's, operating in the range of 6 gigahertz. Over the 827 km of microwave transmission, there are 4,715 km of channels: 1,654 km of them to be used for telephone service, 1,407 for television service, and 1,654 to be used as an emergency channel.

The total length of the telephone circuits installed is 45,628 km, serving ten communities in the Libreville area and six in the Franceville area.

The establishment of the system represents an investment of 3.7 billion CFA francs, covered by the budget of the Gabonese Government.

The maintenance of this system, which is under the Office of Postal Services and Telecommunications (OPT) of Gabon and Gabonese Radio-Television (RTG) is on the order of 550 million CFA francs a year. The microwave transmission system will provide one channel for television, and three for radio broadcasts to Franceville and for the transmission of four programs over short wave to Moyabi.

COPYRIGHT: Rene Moraux et Cie Paris 1979

8956
CSO: 4400

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

MALAWI

IMPROVEMENTS IN TELECOMMUNICATIONS FACILITIES DESCRIBED

Paris MARCHES TROPICAUX ET MEDITERRANEENS in French 27 Apr 79 p 1079

[Text] The Malawi development plan for 1978-1981 calls for expenditures as follows in the postal and telecommunications sector: 1978-1979, 5,248,000 kwacha; 1979-1980, 4,866,000 kwacha; 1980-1981, 5,058,000 kwacha. This makes a total for the three years of 15,172,000 kwacha, representing 3.73 percent of the total planned funds. The British Fund for Development, Danish loans, the European Development Fund (EDF) and local resources will contribute to the financing of these projects.

Present and Future Equipment

Individual projects amounting to a total of more than 12 million kwacha are being carried out in order to improve the urban and rural networks and to step up international communications.

An automation project financed by a Danish loan is designed to extend the potential of five automated centers built with the aid of a loan from that same country.

Denmark is also helping Malawi in the installation of equipment at an international communications center which should substantially improve telephone and Telex service.

British aid has been allocated to the extension of the microwave system on the Limbe-Lilongwe and Lilongwe-Mzuzu interregional networks. Where satellite communications equipment is concerned, the terms of the agreement signed between the Malawi Post Office and the Cable and Wireless Company in London in 1976 provide that the equipment offered by that firm will be leased to Malawi for five years, with the lessee being entitled to decide to purchase after two years of use. This is what the Malawi Post Office decided to do (see our 9 March 1979 issue, p 643).

Traditionally, communications from Malawi to foreign points went through London. The use of Intelsat IV did not change this situation. But since 1 September 1978, a new satellite, Intelsat V, has been in service, linking Malawi directly with the United Kingdom to be sure, but with South Africa, Kenya and France as well.

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

The equipment required by the norms for the use of Intelsat V was purchased in South Africa, and since the London facilities were not adapted for the use of this equipment, it is via Paris, preferred over Rome, that the communications initially passing through the British capital were channeled. Thus since the end of 1978, Paris has been the turntable for local communications not only directed toward Central Europe, but also, in terms of secondary circuits, for traffic to the rest of Europe, the United Kingdom, the American continent, North Africa, and the Middle and Far East.

Within the framework of French cultural and technical cooperation with Malawi, five local telephone and telegraph operators benefited from scholarships in 1978 enabling them to take an initial six months of intensive courses in French at the University of Caen, followed by two months of technical apprenticeship at the Cachin central telephone exchange.

Five scholarships are planned for 1979 again, and the government of Malawi has expressed the wish to send its engineers in space communications for apprenticeship in France in 1980.

COPYRIGHT: Rene Moreux et Cie, Paris 1979

5157
CSO: 5500

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

USSR

THE 1980 OLYMPIC PRESS SERVICE

Moscow SOVIET UNION in English No 7, 1979 p 54

[Article by V. Kulikov, TASS correspondent]

[Text] The 1980 Olympic Games in Moscow will be attended by about 7,500 journalists, TV and radio commentators, and film-making staff. They will be faced with the truly titanic task of covering daily sports competitions involving some 12,000 athletes.

The Olympic press service will help to provide representatives of the media with ideal conditions for their job of speedily, comprehensively and objectively reporting on the sports events. Journalists and photographers will be able to take advantage of the services offered by the main Olympic press centre. Over 23,000 sq m in floorspace, this modern building houses all essential services for instant communication with all agencies and leading world newspapers. Over 2,000 sq m of this area will be taken by hundreds of desks equipped with typewriters, telephones and TV screens for journalists. Photographers will have at their disposal premises totalling 1,000 sq m and containing a variety of services—dark rooms, repairs, hiring facilities and a display hall. Another 1,000 sq m will be occupied by multi-purpose press blocks, which can be rented out for private use by foreign agencies and newspapers. Teletype and telegraph facilities will be available adjacent to the journalists' work-desks and the Olympiada Automatic Information System will provide journalists with up-to-the-minute reports from the sports arenas. An automatic inquiry service is also to be set up.

The press centre will house a post office, a bank branch, medical facilities, a restaurant and several bars. Journalists will also be able to get to the competitions with the minimum of delay: the centre is located close to the main sporting arenas, which will have regular bus services running between them.

Special priority has been given to radio and television, which will serve some 2,500 million people—over half the world's population. For several hours every day radio and TV journalists will transmit some 20 colour TV and up to 100 radio programmes to more than a hundred countries of the world. A special Olympic Radio and TV Complex is being set up for them.

COPYRIGHT: "Soviet Union," 1979

CSO: 1812

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

USSR

ESTABLISHING THE MAXIMUM CAPACITY OF GEOSTATIONARY ORBITS

Moscow RADIOTEKHNIKA in Russian No 4, Apr 79 pp 5-12

[Article by L. Ya. Kantor: "Concerning an Evaluation of the Maximum Capacity of a Geostationary Orbit"]

[Text] The problem of the efficient utilization of a geostationary orbit for communications through the use of artificial earth satellites is drawing wide interest amongst specialists insofar as serious difficulties exist in the disposition on orbit of new communications satellites. This problem was examined in detail in the materials of the CCIR [International Consultative Commission on Radio Communications] Research Committee [1].

It appears interesting if only to evaluate approximately the limit to which one may attain within the bounds of technological progress the capacity of all satellite communications systems, the satellites of which are positioned as densely as possible in geostationary orbit.

This value--we shall call it the maximum capacity of a geostationary orbit C_{go}--may be determined through the fundamental hypothesis that the energy resources of each satellite communications system are sufficiently great so that its own noise (both heat and nonlinear) is negligible compared to the interference from neighboring systems. In other words, this hypothesis means that the maximum capacity of each system is totally determined by the interference from neighboring satellite communications systems. Such a trend is already developing in practice: the CCIR upon the initiative of the USSR adopted a recommencation concerning increasing the allowable noise from neighboring systems with a corresponding decrease in the system's own noise [2]. An analogous hypothesis is given in [3].

The present day limitation for current density created by AES's at the earth's surface through an efficient dispersion of the energy of the carrier does not eliminate the given hypothesis.

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

We shall accept that AES signal separation by polarization is utilized and that this allows a two-fold utilization of the frequency band and thereby double value of C_{go} (we shall define the corresponding coefficient as K_{band}; $K_{band}=2$). It should also be proposed that the efficient (planned) arrangement of satellites in orbit be accomplished so that the AES positioned alongside service as well as possible the far off zones distributed on the earth's surface and that the beam patterns of the AES antennas correspond to the maximum to the serviced territories. A detailed analysis of that which has been attained thanks to this success seems superfluous here because of the necessity to make a number of hypotheses concerning the configuration of the zones being serviced and other parameters of the systems. Nonetheless, experience in the development of a plan for satellite television broadcasting within the 12 GHz band which was adopted by WARC-77 allows for the acceptance as a rough evaluation a two-fold advantage according to this principle ($K_{plan}=2$).

For the conduct of specific calculations it was accepted that the entire band being used by the system be divided into a number of transmitter-receiving trunks with an identical pass band (for example, $\Pi_{trunk}\sim 35$ MHz, since this now exists within the majority of satellite communications systems, and which overlap the entire band of the separated frequency spectrum without frequency gaps.

It is proposed that within each trunk, a message is transmitted in a single-signal mode without a distinctive satellite communications systems of multi-station access. It is not necessary to understand this hypothesis literally; it means that multi-station access is accomplished without losses. Actually, the systems being created now for temporary multi-station access yield very small losses in throughput capacity in comparison with the single-signal mode [4].

Finally to simplify the analysis for the present we shall make a hypothesis concerning the uniformity of all interacting satellite communications systems. It is normally considered that in this case the capacity of the orbit is maximum [1]. This question will be discussed in greater detail below.

The necessary separation between neighboring satellites for closely positioned ground stations of neighboring systems is determined by the directivity of the ground-station antenna*. Gain of the antenna outside the main lobe of the beam pattern in accordance with the CCIR Recommendation No 465-1 is usually made by the equation

$$G_{db}=-32 - 25\lg\theta, \quad 1^\circ < \theta \leq 48^\circ, \qquad (1)$$

*The directional characteristics of onboard AES antennas appear only through an efficient selection of the servicing zones and AES positions, and are taken into account by the previously introduced coefficient K_{plan}.

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

where θ is the angle taken from the axis of the main antenna beam.

However, considering the success in the development of antennas with a remote (nonaxisymmetric) irradiating unit where the level of the side lobes is significantly reduced (for example, the antenna of the Japanese national satellite communications system has a range of 11-14 GHz [5]), for future evaluations we should adopt a more progressive relationship, for example

$$G_{db} = 22 - 25 \lg\theta. \qquad (1')$$

In the area of the main lobe [6]

$$\frac{G}{G_0} = 2\frac{I_1(kR\sin 2\theta/\theta_{0,5})}{kR\sin 2\theta/\theta_{0,5}}, \qquad (2)$$

where I_1 is the Besselian function of the first order from the actual argument; $k=2\pi/\lambda$; $\theta_{0,5}=70\lambda/D$ is the angular width of the main antenna beam at the half-power level; R is the radius of the antenna aperture; G_0 is the maximun antenna gain (in the direction of the axis of the main beam) which is determined by the usual formula

$$G_0 = q\frac{\pi^2 D_A^2}{\lambda^2}, \qquad (3)$$

where D_A is the diameter of the antenna reflector (usually $D_A = 12 \div 32$M); λ is the wave length; and $q \approx 0.5 \div 0.7$ is the usage coefficient for the surface of the antenna aperture.

Finally, to complete the calculations we must in some manner determine the antenna pattern between the main beam and the region where (1) - (1') are accurate. Taking into account the instability of the first null's position and its "loading" due to the structural imperfection, as well as keeping in mind [5], the possibility of reducing the maximum of the first side lobe to minus 30 dB, we shall combine the regions described by the formulas (2) and (1') and by the horizontal segment at the minus 30 dB level. We shall accept the derived beam pattern (figure 1) for all future calculations. The author does not insist on the pattern in figure 1; for other beams patterns the calculations may be simply corrected with the aid of the ratios presented below.

When performing the calculation, one should take into account interference not only from the pair of closest satellites but also from those more distant. In the hypotheses made above concerning the uniformity of satellite communications system, it is sufficient to consider a second pair of satellites. In the area where the ratios (1) and (1') function, the second pair of interfering satellites increases the interference by approximately 18 percent; in the region of the main beam the interference from the second pair is negligible; and in the horizontal part of the pattern is equal to the interference from the first pair of interfering satellites.

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

All that has been stated is sufficient to calculate C_{go} if we still select the threshhold interference value in the channel of neighboring systems and determine a technique for calculating the required ratio of signal power to interference at the ground-station (ρ) transmitter input.

We shall examine the beginning of the simplest and widely used variant of multichannel telephony signal transmissions in a similar format with the usual frequency density and frequency modulation. In this case, the limit of the interference value from the neighboring systems should be considered as the norm for the total noise power in a telephone channel--10,000 picowatts.* The required value ρ may be calculated for an above threshhold mode according to the method developed in [7], using the formula for interference power (at the point with a zero relative signal level);

$$P_{noise} = \frac{\Delta F_k k_n^2 10^9}{\rho F_2 B'(\Omega)} \left(\frac{F}{\Delta f_k}\right)^2 F(\Omega, \delta\omega), \qquad (4)$$

where ΔF_k = 3.1 kHz is the telephone channel band; k_n =0.75 is the psophometric coefficient; F_2 is the upper frequency for the spectrum of modulated

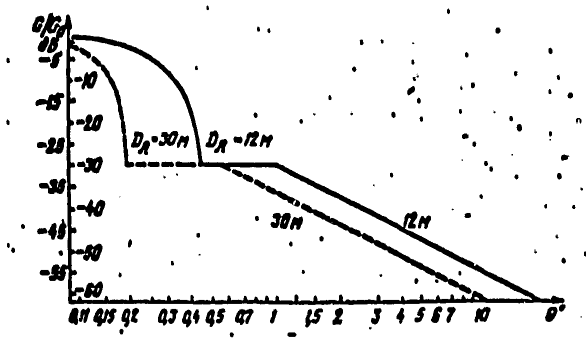

Figure 1

signal and interference frequences; F is the frequency of the modulated frequencies' spectrum which corresponds to the channel in which the measurement is taken; in the upper channel $F=F_2$; B (Ω) is the coefficient which takes into account the influnece of the standard linear preselections which have been received through the transmission of the multichannel telephony along radio relays and satellite communications system with $\Omega = 2\pi F_2$ $B^2(\Omega)=2.5$; $\Delta f_k'$ is the effective frequency deviation which corresponds to the measured level of a single telephone channel; $F(\Omega, \delta\omega)$ is the function calculated by means of a spectrum package of useful and mixed signals with a mutual misalinement which is dependent on the effective modulation index M_0 of the

*Apparently, in practice after the deduction it is difficult to eliminate the channel imaging equipment noise P ≅ 2500 Wt

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

signal and interference. Function graphs F (Ω, $\delta\omega$) were given in [7]; and we shall calculate it for the case where $\delta\omega=0$, which corresponds to the continuous pursuit of spectra in useful and intermixed systems, although when intelligently planning the frequency schemes of neighboring systems one may through $\delta\omega \neq 0$ somewhat diminish the influence of the interference.

To determine the necessary value ρ, there should be a two-fold decrease in the value 10,000 picowatts which has been substituted in the left portion of (4) in order to make allowance for the interference from a neighboring disturbing AES which has been positioned on another side; we should also take into account interference from a second pair of more distant AES with the aid of figure 1, as has already been described, and finally, interference from the region both below and above. Interference which arises in the regions from below-upward, and from above-downward in idential systems, may be considered as approximately identical and added together in terms of power as a result of which P_{noise} should be decreased two-fold. Thus, for the angular dispersions $\theta > 1^0$ we should substitute the value $\frac{10000 - P_{noise}}{2 \times 2 \times 1.18}$ picowatts in the formula (4), and for $\theta > 1^0$ the selection is accomplished with the aid of figure 1. We shall perform the calculations for the upper channel, since, as was shown in [7], the transient noise in this channel which has been caused by radio interference is close to the maximum (this solution is the result also of the fact that in the upper channel all other forms of interference are usually maximum, including those nonlinear).

Let us accept for the first evaluation that in each trunk there are formed N=1920 channels (F_2=8525 kHz) with Δf_k = 140 kHz which is realized in practice as a variant of a system with a number of channels close to maximum: then, using (1) - (4), we derive that the dispersion between the neighboring AES should amount to $\theta \approx 1.9^o$, but taking into account the allowable instability of the AES position in orbit $\pm 1.1^\circ \theta_1 \approx 2.1^\circ$. Further, using the obvious ratio:

$$C_{go} = \frac{N}{\pi_{trunk}\theta_1} K_{band} K_{plan} \frac{\text{channels}}{\text{MHz} \cdot \text{deg}}$$

we derive $C_{go} \sim 105 \frac{\text{channels}}{\text{MHz} \cdot \text{deg}}$

Thus, in the 500 MHz band and on the actually utilized orbital curve of 180° one may distribute satellite communications system with a total capacity of 9×10^6 channels. These results were derived through application of antennas with a diameter of D_A = 12 m ($G_o \approx$ 52 dB); if D_A = 30 m the capacity of the orbit is approximately doubled.

Since the objective of this article is to evaluate the limit of the capacity of the orbit, it makes sense to examine the variant of an ideally corrected (by amplitude-frequency and phase-frequency characteristics) transmission

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

channel which makes it possible to apply the increased deviation value for the frequency on the channel Δf_k. The limiting factor for increasing Δf_k in this case will be the appearance of the natural noise in the channel which is caused by cutting off a part of the spectrum; this phenomenon is examined in detail in [7].

According to the method in [7] for a system with FM and frequency-division multiplexing with the number of channels in the trunk N=1020, 1920 and 3600, the relationship of the noise in the channel arising within a path with a limited band as a result of frequency deviation on the channel Δf_k was examined. This relationship results in the ratio

$$P_{noise} = k \frac{N_\Delta}{\Delta f_k^2} \qquad (6)$$

where $N_\Delta = \int_{q_\Delta}^{q_\Delta + b} g(q)g(b-q)dq$ is the convolution of the spectra for the FM signal $W_{FM} = g(q)/\Omega_2$ which is also the function Δf_k, $q=\Omega/\Omega_2$, $\Omega_2=2\pi F_2$, $q\Delta = \Pi_{trunk}/2F_2$, $b=\Omega_k/\Omega_2$, and Ω_k is the channel frequency in which the noise is calculated.

Calculation of the required dispersion angle between the AES in orbit may now be accomplished through the formulas given above and in figure 1. Thus, it is possible to identify the optimum value Δf_k for an ideally corrected path and which corresponds to the maximum orbital capacity. For this, given the value of Δf_k, we determine P_{noise} with the aid of (6). Then, as the limiting value for transient interference from neighboring AES's we use in place of 10,000 picowatts the value $P'_{noise} = 10{,}000 - P_{noise\,(n)}$. Increasing Δf_k raises the noise stability of the communications system and permits a decrease in the angular dispersion, but it increases $P_{noise(n)}$ and thereby, while decreasing $P_{noise(n)}$ it acts in the opposite direction; moreover N_Δ is increased, and consequently $P_{noise(n)}$ is also.

The optimum for N-1920 channels is achieved through $\Delta f_k \sim 700 \div 800$ kHz by the dispersion angle between the neighboring AES $\theta_1=1.05^0$ (taking into account the instability $\theta_1-1.25°$). The capacity of the orbit, therefore, reaches $C_{go}=175$ channels MHz · deg.

The optimum modulation index turns out to be sufficiently great (especially with less than 1920 channels), but the allowable noise is relatively great; therefore, the method for calculating the noise due to limiting the path band was developed in [7], apparently, imprecisely since it did not take into account the "liminal" effect which is connected with the formulation of a large phase error and suppression of the signal at the moment when the deviation for the instant frequency exceeds one-half the band of the path. In this case, the signal deviation should be limited by a value such that the probability of the excursion of the instant frequency beyond the limit of the band path approaches zero.

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

For the number of channels within the trunk N=1020, 1920 and 3600 the capacity of the orbit C_{go} turns out to be approximately identical, since the growth in the number of channels within the trunk is accompanied by a significant decrease in the optimum frequency deviation at the Δf_k channel and, as a result, with an increase in the angular dispersion of the neighboring AES.

In this manner, the assessment of limiting capacity for telephone communications satellite systems with FM and FDM should be calculated as the value from 105 to 175 $\frac{\text{channels}}{\text{MHz}\cdot\text{deg}}$ (for systems with an ideal correction of the path and an optimally increased frequency deviation).

Now we shall turn to an analysis of the signal transmission variant within a discrete format with the aid of a more widely applied, in this case, phase modulation. As before, we shall assume that the inherent noise in the system is insignificantly small. An evaluation of the allowable ratio of useful and interfering signals may be made on the basis of an allowable probability value of the error during reception.

For the sake of simplicity we shall perform this evaluation initially for a situation with only two interfering signals from two of the closest satellites. Thus the error through the elementary reception of data with the simplest solution arises only in the case if (see figure 2) the total interfering vector (U_1+U_2) intersects the line passing under the ϕ_0 angle to the vector of the useful signal U_0 and separates the regions of the neighboring discrete phase values, that is

$$2\phi_0 = 2\pi/n, \tag{7}$$

where n is the number of modulation phases.

In other words, projection of the vector (U_1+U_2) in the direction perpendicular to the dividing line for initiating the error should exceed the value $U_0 \sin\phi_0$. The following equation corresponds to this

$$U_1 \cos\varphi_1 + U_2 \cos\varphi_2 > U_0 \sin\varphi_0 \tag{8}$$

and with $U_1=U_2$

$$\cos\varphi_1 + \cos\varphi_2 > \frac{U_0}{U_1} \sin\varphi_0. \tag{8'}$$

It is apparent that there exist two (identical in area and shape) regions of values ϕ_1 and ϕ_2, where the condition (8') is fulfilled and the probability of error may be determined as the ratio of the area for these regions (cross-hatched in figure 3) to the total area $4\pi^2$ (in the simplest hypothesis for the uniform distribution of phases for interfering signals), that is

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

$$P_{error} = \frac{2}{\pi^2} \int_0^{\arccos \frac{U_0 \sin \varphi_0 - U_1}{U_1}} \arccos \left[\frac{U_0 \sin \varphi_0 - U_1 \cos \varphi_1}{U_0} \right] d\varphi_1. \quad (9)$$

Through the small P_{error} which interest us and, consequently, the small ϕ_1 and ϕ_2, the equation $\cos\phi_1+\cos\phi_2=\text{const}$ most closely corresponds to the circumference, and therefore instead of (9) the calculation may be performed by the simple formula ($U_1=U_2$):

$$P_{error} = \frac{1}{2\pi} \left[\arccos \left(\frac{U_0 \sin \varphi_0}{U_1} - 1 \right) \right]^2. \quad (10)$$

With the small P_{error} from (10) it follows that $\frac{U_0 \sin \varphi_1}{U_1} \to 2$ or

$$U_1 + U_2 < U_0 \sin \varphi_0. \quad (11)$$

Thus, with four-phase ($N=4$, $\phi_0=\pi/4$) and $P_{error}=3\cdot10^{-7}$ through the calculation according to (9) or (10) we derive $U_0\sin\phi_0/U_1=1.999999$. It is apparent that for an evaluation of C_{go} one may utilize (11). Through the activity of four interfering signals one may apply the generalized ratio

$$\sum_{k=1}^{k=4} U_k < U_0 \sin \varphi_0. \quad (12)$$

From (12) for n=4 we obtain $\Sigma U_k \leq 0{,}7U_0$.

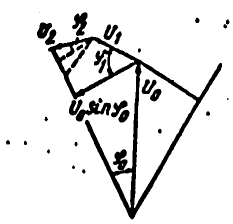

Figure 2.

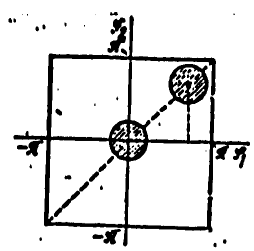

Figure 3.

Since (12) corresponds to the probability of error $P_{error}\to0$ and the relative interference level from neighboring AES's in the segment from below upwards is approximately the same as in the segment from above downwards, then the noise accumulation in these two segments may be taken into consideration (keeping in mind that recording of the signals is being performed onboard the AES).

Then for four identically orbited and similar interfering AES's the relative interference level from the closest pair should amount to ~-9.8dB, and the necessary dispersion between the neighboring AES's is approximately $\Theta=0.33°$, and taking into account instability $\Theta_1=0.53°$.

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

In the earlier adopted band of the 35 MHz trunk when n=4 one may transmit practically on the order of 60 megabits, or nearly 1000 telephone channels (normally 64 kilobits are expended on each channel). Then the limiting capacity of a geostationary orbit, as determined by (5), is C_{go}=216 channel/MHz X deg, or C_{go}=12.9 megabit MHz·deg. Application of a more multi-phase modulation (n>4) permits an increase in the speed of transmission within each trunk (proportional to $\log_2 n$), but as a result of the decrease in ϕ_0 according to the formula (7) an increase in ρ and the angular dispersion between AES's is required. The calculation showed that the maximum is achieved when n=16 and is C_{go}=22.1 megabits/MHz·deg, or 368 channels/MHz·deg.

When using delta modulation one may use up only ~30 kilobits per channel (although a telephone channel, in so doing, is not totally universal), and then the evaluation of C_{go} according to the number of telephone channels is doubled. The permutation of the maximum capacity of the orbit when n=16 is determined by the accepted antenna beam pattern and its diameter.

For example, for the worst antenna [the equation (1)] the maximum is achieved when n=8.

It is apparent that the capacity of a geostationary orbit in the transmission of signals in digital form is significantly greater than in analog form. This is caused basically not by an increase in the capacity of each trunk and satellite but by a decrease in the dispersion between them. One should also emphasize that the initially performed hypothesis concerning the absence of losses as a result of multi-station access is successfully approximated only through the transmission of signals in digital form.

In the previous statement not included was the application of interference-free coding, modulation of the carrier simultaneously in phase and amplitude, reception "as a whole" and other techniques whcih are enhancing the throughput capacity of the communications system. A specific analysis of these measures is very time-consuming; however, one may most simply evaluate the limit through optimal processing of the transmitted signals and through noise-stable reception if one is to propose that a series of several (four or more) interfering signals modulated simultaneously in amplitude and phase is sufficiently close to the normal noise fluctuation with normal dispersion. Then to calculate the throughput capacity of the trunk under the influence of interference from neighboring satellites with a total power capacity of P_{noise} one may utilize the formula of C. Shannon

$$C' = \Pi \log_2 \left(1 + \frac{P_{sig}}{P_{noise}}\right). \qquad (13)$$

Since (13) determines C when the probability of error approaches zero, then we can ignore the influence of the segment from below upwards where the conditions are no worse than in the segment from above downwards, as was done above. Assigning different values to $\rho = P_{sig} / P_{noise}$, we may use (13), (1'), (2), (3) and (5) to determine the appropriate dispersion between adjacent satellites and then C_{go}. The optimum is observed approximately when $P_{sig}/P_{noise} \approx 250$, angular dispersion θ=0.44°, θ_1=o.44° and amounts to

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

$$C_{go} = 50 \text{ megabits/MHz}\cdot\text{deg}; \quad (14)$$

Thus, the possible advantage from the application of optimal transmission and reception methods is accomplished (by more than two times), but it is not as great as usually occurs when comparing actual and potential communications channel capabilities. This is explained by the more "harmful" character of the noise interference characteristic. The evaluation according to (13) is less than the previous one and depends on an insufficiently rigid fulfillment of the accepted condition of an infinitely large energy resource for each system, since the addition of even a small portion of the inherent noise temperature with a normal distribution sharply reduces the evaluations made with the aid of (4) and especially (12), and has little influence on the evaluation according to (13).

It is possible to exceed the evaluation in (14) by: a greater than two-fold utilization of the band with the assistance of planned use of the orbit and high-directional onboard antennas ($K_{plan} > 2$); the application of ground antennas of with a better directivity pattern than in figure 1, or antennas of greater diameter; and the coordination (in particular, synchronization) of signals of neighboring satellite communications systems and the use of this apriori information during reception.

In conclusion, we shall stop on the particular question which has a rather theoretical meaning concerning the advisability of adopting similar satellite communications systems.

Usually it is proposed that system uniformity (according to sensitivity towards interference from neighboring systems) corresponds to the maximum capacity of the orbit [1]. However, it should be pointed out that the capability for the future increase of C_{go} is precisely through the application of nonuniform systems and a compensation method for suppressing noise. As was shown in [8], this method (which was accomplished by a adaptive system with an optimum linear filter based on the criteria of a minimum total of signal and interference power at the compensator output) allows for the attainment of a signal/noise ratio

$$\rho_{output} = 1/\rho_{ref} \quad (15)$$

where ρ_{ref} is the ratio between signal/noise, which was received at the reference input (that is at the output of an auxiliary receiver intended for the separation of signal interference).

In other words, for good interference compensation it is necessary to have a high signal/noise ratio (that is, cleaner interference) at the receiver interference output. If the ground stations are to be equipped with receivers for the signals of a neighboring system (for example, with the assistance of an auxiliary irradiator on the very same reflector which forms

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

a displaced beam), then through uniform systems the signal/noise ratio at the output of basic and compensating receivers is identical and the compensation method gives no advantage whatsoever.

If then we are to adopt the alternating of systems with a diversity in the power of neighboring satellites as a large number times M (figure 4), then, apparently, at the output of the ground receiver the systems with powerful satellites the signal/noise ratio grows to M times (to the value ρ_1), which permits a corresponding increase in its capacity. Therefore, at the ground station of a communications system with AES's having low power the signal/noise ratio ρ_2 is small, but accepting the method for compensating interference from neighboring AES's with respect to (15) and within this system the ratio signal-noise may be increased M times to the value $1/\rho_{ref} \to \rho_1$.

If M>>1, then the interference prevails over the second pair of AES's having the very same power, as well as the AES's of the useful system, and the compensating reception cannot offer any kind of advantage. It is apparent, therefore, that the number of AES's on orbit (and its capacity) may be increased with the aid of non-uniform AES and compensating reception no greater than two-fold.

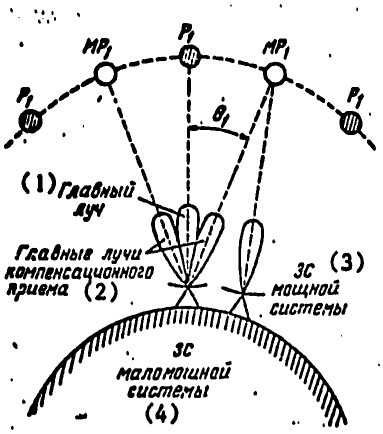

Figure 4

Key: 1. Main beam
2. Main compensating reception beams
3. Ground station of high-power system
4. Low power ground-station system

Through the adoption of non-uniform systems the condition $\rho_{ref}/\rho_2 \gg 1$ should be maintained on all stations within the limits of the zone being served by the low-power AES where an increase of ρ necessary.

Note that the useful indicator of this work is the capacity of the orbit (the number of channels or binary digits per MHz and per degrees) does not totally characterize the utilization efficiency of the orbit; for such an evaluation one should use a more general indicator--kilometer channels for an equivalent ground network [9].

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

BIBLIOGRAPHY

1. CCIR, 14th Plenary Assembly, Kyoto, Doc. 4/1042-E, Report 453-2, 1978.

2. CCIR, 14th Plenary Assembly, Kyoto, Doc. 4/1035, Recommendation 466-2, 1978.

3. "Comparison and Optimization of Techniques for the Separation and Modulation of Signals Within Radio Networks. EKSPRESS-INFORMATSIYA," PEREDACHA INFORMATSII, No 23, 1974, or D. Juilwijk PHILIPS RES. REPST., vol 28, No 4, 1973.

4. Kantor, L. Ya., and Tsirlin, V. M. RADIOTEKHNIKA, vol 32, No 11, 1977.

5. Chu, T., and others "BSTY". vol 57, No 5, 1978. See also Nippon Telegr. and Teleph. Public Corp. "Offset Cassegrain Antenna for Earth Station."

6. Askinasi, G. B.; Bykov, V. L.; and others. "Osnovy tekhnicheskogo proektirovaniya sistem svyazi cherez ISZ" [Engineering Planning Principles for Communications Systems Through Satellites], edited by Fortushenko, A. D., SVYAZ', Moscow, 1970.

7. Borodich, S. V., "Iskazheniya i pomekhi v mnogokanal'nykh sistemakh radiosvyazi s ChM" [Distortion and Interference in Multi-channel Systems for Radio Communications With Frequency Modulation], SVYAZ', Moscow, 1976.

8. Undrou, B.; Glover, D.; and others "TIIER", vol 63, No 12, 1975.

9. Kantor, L. Ya. ELEKTROSVYAZ's, No 1, 1976.

COPYRIGHT: "Radiotekhinka," 1979

9082
CSO: 5500

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

USSR

DEVELOPMENT OF TV TRANSMITTING NETWORKS REVIEWED

Moscow ELEKTROSVYAZ' in Russian No 4, Apr 79 pp 6-7

[Article by V. A. Shamshin: "Questions in the Development of TV Broadcasting Networks"]

[Text] At present television has become a powerful means for the ideological, political and artistic indoctrination of the workers. The party and soviet bodies are taking a most active part in the development and improvement of TV, and these bodies are providing enormous daily aid to the nation's communications workers.

In showing constant concern for the workers of the rural areas, the newly developed regions of Siberia, and so forth, the CPSU Central Committee and the government have provided broad opportunities for the successful and rapid solution to the honorable task of providing all Soviet people with television. And not merely to provide, but rather to give an opportunity to each worker to obtain high quality information in color on the most important political and cultural events in our nation and throughout the world, on the outstanding achievements of the Soviet people in the struggle for peace and progress, and on the heroic labor of our people. The existing opportunities must be used with initiative and creativity and with an awareness of party and civil responsibility for the assigned job.

Work has been well organized in the area of developing the TV transmitting network in Kirgizia, Belorussia, Kemerovskaya and Vologodskaya oblasts, Yakutia and a number of other republics and oblasts. The conditions are different everywhere, there are many difficulties, but the communications collectives in these republics and oblasts have been able to achieve significant successes.

At present 84 percent of the Soviet population receives television, and 50 percent of the population receives two programs, and 14 percent can receive three and more. The television network includes 405 television stations with transmitters having a power from 5 to 50 kilowatts, including 160 program retransmitters and more than 2,000 low-power retransmitters.

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

Hundreds of thousands of kilometers of radio relay trunks and space communications lines are used for delivering the TV programs. Due to the significant amount of work which has been carried out to reconstruct the radio relay lines, even now more than 40 percent of the main lines have specifications which fully correspond to the State Standards. In virtually all the cities which receive the central television program, it can be received in color.

It is essential to note the clearly expressed tendency for the rapid development of the TV transmitting network and the reduction in the number of program TV centers. More and more the responsible task of providing the Soviet people with television is being shifted to the shoulders of the communications workers. In increasing amounts, recent local TV information is being incorporated in the central and republic programs, and the program delivery routes are being significantly lengthened. All of this requires a continuous improvement in the network for exchanging the TV programs, and the incorporating in it of space hookups both by using stationary (for frequently used program sources) as well as mobile Mars-type ground satellite communications stations. The main tasks in the area of television over the next few years are:

1) A further rise in the coverage of the population by colored TV broadcasting;

2) The accelerated introduction of technology for providing TV programs to the most remote and inaccessible population points of our nation;

3) The development of multiprogram color TV broadcasting and an improvement in its quality.

Extensive work is being done to solve the designated problems by improving the existing TV broadcasting and program transmission equipment as well as the development of new equipment. The most important area of this work remains a continuous improvement in the quality of TV broadcasting, with the harmonious pooling of the efforts of the creative and technical workers from State TV and Radio and the Ministry of Communications.

New types of transmitters have been developed and are beginning to be introduced such as the ATRS-5/1 kilowatt, Zona-II, the RPTDA and Rutan TV rebroadcasters, the new Kurs radio relay line systems and the Ekran ground satellite communications stations. All this equipment meets the requirements of the State Standard for the parameters of transmitting color TV signals.

Satellite communications equipment is playing an ever increasing role in organizing TV broadcasting. While the Orbita stations which were developed at the end of the 1960's made it possible to transmit TV programs only to the large population points of Siberia, the Far East and Far North using the Molniya and later the Raduga satellites, at present new distribution

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

systems are being put into service and these provide TV broadcasting in the smallest most inaccessible population points for the television network in Siberia, the Far North and virtually the entire territory of our vast country.

Precisely the satellite communications systems combined with the developing network of ground lines and retransmitters make it possible to solve the problem of providing the nation with the Central TV Broadcasting completely and within a short period of time. Here the transmitting of the first and later the second program of Central TV will be carried out according to several time zones.

In the future the basis of the TV transmitting network will be powerful TV transmitting stations connected by radio relay lines with the sources of the republic and local programs and by ground satellite communications stations of various systems to the program sources of Central TV for the given regions. The necessity of this is determined by the multinational composition of the population in our country, by the national economic specialization of the individual regions and by the tasks of the harmonious development of the radio communications and TV equipment.

Due to the complex of ground and satellite communications lines, the existing TV transmitting network of the European USSR already provides (with an increase in the TV duplex trunks up to two only on individual sections, the use of the existing Orbita stations and individual trunks in direct and two-way directions for transmitting various programs) the transmitting of two programs of Central TV, and the republic and local programs virtually over the entire European territory of the nation up to the Urals inclusively.

For the regions of Kazakhstan, the Central Asian republics and Siberia with a large number of inhabitants, the solutions are similar. In the Tenth and 11th five-year plans, we must be restricted only to the Central TV broadcasting for the sparsely populated and inaccessible regions of Siberia.

The difficulties of finding "free" channels for providing multiprogram TV broadcasting have necessitated a fundamental reconstruction of the existing TV transmitting equipment. Thus, instead of one transmitter with a power of 5 kilowatts from a tower of 180-230 meters and several low-power transmitters (up to 100 watts with towers of 50-100 meters), more powerful stations are being built with transmitters of 25-50 kilowatts and a tower of 350 meters. This provides an opportunity to increase the number of simultaneously transmitted programs up to two, as well as to sharply improve the quality of TV broadcasting in the oblasts. This work has been completed in Tul'skaya, Vladimirskaya, Ivanovskaya and a number of other oblasts. There are also plans to increase the number of TV stations in the decimeter wave band, the stations sending vertical polarization signals, and so forth.

On the plains territory of the nation, the TV broadcasting problem has been solved by building powerful stations on tall towers. The providing of television for small settlements in mountainous areas is a separate question.

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

During the years of the pervious five-year plans, in such areas the population made do with the receiving of black-and-white programs of satisfactory quality provided by airwave signal receiving retransmitters. Often these were set up in points with a reduced level of the received signal. At present this problem should be solved on a modern level, using scientific achievements and design and operating experience. New types of retransmitters are being developed with a broadened range of powers, with highly efficient receiving antennas, and economic radio relay systems. Passive retransmitters are being ever more widely used. The use of satellite broadcasting systems will substantially facilitate the transmitting of the central programs to the retransmitters in inaccessible mountain settlements.

An improvement in the quality of color TV broadcasting to all TV viewers remains an important task of the Tenth Five-Year Plan. This should be solved both by replacing the obsolete equipment with more modern, as well as by modernizing the operating equipment. In particular, the TV transmitters are being modernized to improve their parameters. For this purpose, a device for incoming stabilization and correction of the TV signal has been developed. Broad plans are being successfully carried out to reconstruct the basic main links, the radio relay lines of the ground space communications stations and the connecting lines to them.

Various correctors, antihum chokes and transformers have been developed for keeping the connecting lines in proper working order. For monitoring the TV signal in the transmission process, the "test line" method is widely used. New instruments have been developed and are being introduced in the network, such as the input signal level meter (IUTS) and the television transmitter parameter meter (IPTP). The wide use of all this equipment will make it possible to significantly improve the quality of transmitting the colored TV signals.

COPYRIGHT: Izdatel'stvo "Svyaz'", "Elektrosvyaz'", 1979

10272
CSO: 5500

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

FRANCE

JULY DECISION AWAITED ON TELECOM 1, TDF 1 SATELLITES

Paris AIR & COSMOS in French 16 Jun 79 pp 61, 63

[Article by Pierre Langereux: "Decision in July on Telecom 1 and TDF 1 Satellites"]

[Text] France's first Telecom 1 communications satellite system will become operational in July 1983 pursuant to a recent French Government decision. The system will have two principal functions: provide communications links between business firms in France and television and telephone transmissions between France and the DOM-TOM [Overseas Departments and Territories], with the supplementary capability of handling telephone traffic for African countries. These details were revealed by Andre Giraud, French minister of industry, during his 11 June visit to the CNES [National Center for Space Studies] exhibit at the Paris Air Show. His statement confirmed a government decision made early this year.

Bids for construction of the three Telecom 1 satellites were submitted on 5 June to CNES and the DGT [General Telecommunications Directorate], the two agencies responsible for the program.

At the opening of the Paris Air Show it had been said that the Telecom 1 program's prime contractor would be announced on 15 June. But on 11 June, the minister of industry explained that "the French prime contractor would be selected during the month of July" so that "after a preliminary phase, production could begin in January 1980." In other words, the official decision on selection of the Telecom 1 satellite's prime contractor is being delayed somewhat.

Cooperation With FRG on Direct Broadcasting TV Satellite

Andre Giraud also officially confirmed that Paris and Bonn intended to cooperate in the direct broadcasting television satellite field: "A study is being conducted jointly with the Federal Republic of Germany on the feasibility of developing a preoperational system employing a French satellite and a German satellite, each with three channels."

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

The ministry of industry informed us that France and Germany actually have the same technical concept and roughly the same estimate of the market, and that the terms and conditions of their cooperation have been defined. In this latter connection, there is talk of a slightly asymmetric distribution of shares in the project: 46 percent to France and 54 percent to Germany whose industry will reportedly assume leadership of the operation.

Andre Giraud told us, in fact, that the decision to develop a French direct broadcasting TV satellite is now at the political level. But "as this program is no longer a mere research program,"--allusion undoubtedly to the Symphonie experimental communications satellites--"the timetable will be adapted to the appearance of potential markets." The minister then added that the program "is currently being examined by both countries with a view to a concerted decision."

This decision is expected, in principle, to be announced before the end of June. The French minister did not confirm this target date, however, and remained deliberately evasive about the actual date of such a decision.

It does seem, therefore, that firm commitments relative to the national Telecom 1 communications satellite and the French TDF 1 direct broadcasting TV satellite program will be determined later than initially expected, and this particularly because of industrial policy reasons common to the two operations.

Competition Between Matra and Aerospatiale

The problem to be resolved stems from the duality of the two French aerospace firms--Matra and Aerospatiale--who are prime contractor candidates for these new satellites.

Initially it was planned to award, by mutual agreement, the contract for development of the Telecom 1 satellites to Matra. The DGT had, in fact, announced that the national satellites would be derived from the ECS (European Communications Satellites) being built by the MESH consortium of which Matra is one of the principal members.

Such an award would restore the balance between Matra's workload and Aerospatiale's workload, the latter firm having been selected earlier by ESA [European Space Agency]--along with Germany's MRB [Messerschmitt-Boelkow-Blohm] and Belgium's ETCA [Aerospace Design and Manufacturing], members of the Eurosatellite consortium--to build the European H-Sat direct broadcasting TV satellite. But abandonment of this latter project and the now bilateral negotiations on development of French and German television broadcasting satellites have completely upset the initial plan and the expected balance between the two major French firms.

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

That is why Aerospatiale made a point of bidding against Matra on the Telecom 1 contract. That is also why both firms will each be candidates for development of the national direct broadcasting TV satellite.

Actually, the "consultations" on bids are largely a formality in this case. With only two projects for two competing companies, and with the necessity of maintaining each company's capacity, the solution is obvious: there will inevitably be an apportionment!

Hence the question is simply which firm will get what project. But here again, no real surprise is expected inasmuch as the capabilities of each one of the firms are virtually established, including those of Thomson-CSF, the company which is bound to be assigned responsibility for development of both the Telecom 1 and TDF 1 payloads.

The only "sensational development" that could still occur would be the government's rejection or postponement of the construction of the direct broadcasting TV satellite! But could the government afford to do this when its powerful German neighbor claims--and it has the means--it is going to begin to build a national direct broadcasting TV satellite this year? If only to capture the Chinese market open to Europeans.

COPYRIGHT: Air & Cosmos, Paris, 1979

8041
CSO: 5500

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

DIRECT TV SATELLITE DECISION AWAITED

Paris AIR & COSMOS in French 26 May 79 p 68

[Article by Pierre Langereux]

[Text] On 16 May in Paris, professor Hubert Curien, president of the CNES [National Center for Space Studies], hosted a dinner for the Circle of Public Relations for Aeronautics and Space [CRPAE]. He announced that the decree concerning reform of CNES structures, already adopted by the interministerial council and the Council of State, would appear in the next few days. Curien stated that the reform of structures, advocated several months ago by the minister of industry, will allow the CNES "to establish new relations with the administrations (Telecommunications, Defense, etc)" for setting up and exporting operational systems, "without, however, ignoring scientific work."

Franco-German Cooperation for Direct TV?

The CNES president likewise stated that he was awaiting a decision from the French Government "in the next few weeks" on construction of a national direct TV satellite. The government is to decide if France needs such a satellite and, if so, whether to build it alone or, which is more likely, to build it in cooperation with Germany, who planned to begin construction as early as next July on the German direct TV satellite project, TV-SAT.

According to the CNES president, the discussions which took place several weeks ago between the experts, ministers, and chiefs of state of the two countries revealed that France and Germany wish to develop the most common platform possible for their respective direct TV satellites.

Curien stated that it is thus very clear from now on that "France is no longer at all interested in H-SAT, the European project for an experimental direct TV satellite. There are two reasons for this: the faster than expected development of user interest, particularly in Germany, demonstrated the necessity of building an operational satellite without the intermediate stage of the experimental satellite, H-SAT, the useful load of which turned out, incidentally, to be too "composite." In connection

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

with this, France deplores that various European countries have not understood her position and continue to spend credits (up to July) on a project which is already out-dated. However, the CNES feels that the studies of the feasibility of the H-SAT project, carried out by the Eurosatellite group (Aerospatiale, MBB [expansion unknown] and ETCA [expansion unknown]) over the past 2 years, are not wasted, notably because they prepared the industrialists for construction of an operational satellite.

Forthcoming Creation of Transpace

In connection with mass production of the European launcher, Ariane, the CNES president stated that he thought he would be announcing the creation of a new group, Transpace, within the next few months. Curien further explained that it will be "a private French group which will unite the industrialists and mass producers of the launcher which will remain under ESA [European Space Agency] ownership." He did not hide the fact that "the group will have a rather pronounced French leadership."

According to Curien, passage from a government structure (for development of the launcher) to a totally private group is justified by the "aggressiveness" necessary to Transpace in order to assert the Ariane launcher faced with international competition (mainly American).

During the European tour carried out by CNES the past 2 months, the reception of the industrialists and the governments who are to agree to the operation was "favorable in principle," stated the CNES president, who has no doubt that the matter can be settled quickly.

Furthermore, a significant stage in the creation of Transpace should be cleared at the Salon du Bourget where there will be a meeting of involved industrialists, certain ones of whom could demonstrate their approval of the project by signing an agreement.

The Future of the ESA

Bearing more directly upon European space matters, Curien remarked that the European Space Agency has arrived at a turning point due to the fact that certain large programs are terminating--Ariane, Spacelab and the telecommunications satellites, ECS and MARECS. Moreover, a few months ago, the agency held a symposium on its future, and a second meeting is scheduled a few weeks from now in an attempt to formulate a long-term European space plan.

The French position concerning the future of the ESA is based on the principle of maintaining European unity--demonstrated very remarkably by the sale of Ariane to Intelsat--not only regarding the launcher, but also in other future activities which could be conducted within the framework of the Agency. This position covers three points:

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

1) France feels that the ESA has been successful in the field of scientific satellites--COS B, for example--to such a degree that the difficulty now is to find the necessary credits to exploit the masses of data collected. Therefore, the CNES president feels that the ESA should continue to have a "good" scientific program, on the level of about 100 million units of account (600 million francs).

2) Curien feels that the ESA is also "a very good medium for development of new systems," whether of satellites or space transport systems.

3) The ESA could likewise undertake construction of applications satellites, but when development is finished, these satellites are normally lost to the Agency, "when there is an existing user community, organized and ready to take over construction."

COPYRIGHT: Air & Cosmos, Paris, 1979

9171
CSO: 5500

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2

FRANCE

BRIEFS

TELECOMMUNICATIONS SATELLITE PRIORITY--A French military telecommunications satellite for the navy is an "absolute priority." Such a satellite would enable the President to remain in touch with French ships far from France and with French aircraft carriers equipped with tactical nuclear weapons. Currently, France is forced to rent from the United States satellite telecommunications facilities whenever the President of the Republic goes overseas or if there should be need for military intervention in Africa. /Text/ /Paris VALEURS ACTUELLES in French 4 Jun 79 p 15/

CSO: 3100

END

APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000100070029-2