

THE GENERAL WORLD ADMINISTRATIVE RADIO CONFERENCE

Introduction

In 1979 approximately 145 nations, all members of the International Telecommunications Union (ITU), will meet together for from four to six months in Geneva, Switzerland to attend the General World Administrative Radio Conference (GWARC-79). The purpose of the meeting is to review and update the entire International Radio Regulations. A list of countries which are members of ITU and which are scheduled to attend the meeting is shown in Figure 1.

The necessity and importance of International Radio Conferences can be very briefly summarized as follows; the spectrum is a limited resource which can only accommodate a finite number of users and if these users were not bound by regulations there would be complete chaos. The results of the forthcoming GWARC can readily effect designers, developers and users of all types of electronic materiel.

The following will attempt to discuss the various principal organizations involved in this most important task and reflect the complexity of this meeting.

Our counterparts of yesteryear recognized more than a century ago that international agreements were necessary and formed in 1865 the International Telecommunications Union which is now an organ of the United Nations. International Radio Conferences have been held since 1906. Figure 2 lists those conferences and gives an appreciation of

the expansion of the usable spectrum and increases in radio services particularly since World War II, and further pinpoints the immensity of the problems confronting the attendees. This meeting of GWARC-79 will be the first conference since 1959 which will completely review and update current International Radio Regulations. Interestingly, the meeting in Berlin in 1906 was convened because the British Marconi Company, in 1902, had refused to deal with its German competition in relaying a message from Prince Henry of Prussia to President Theodore Roosevelt. A principal output of that conference was the establishment of 500 kHz as the frequency for maritime calling and distress which is still in current use.

The International Telecommunications Union

The ITU serves as advisor to the United Nations on telecommunication matters; however, their major materiel output is in the form of Radio Regulations. Such regulations have treaty status and which upon adoption by a country become part of the law of the land. The ITU is composed of four permanent groups; the Secretariat, the International Telegraph and Telephone Consultative Committee, the International Radio Consultative Committee (CCIR) and the International Frequency Registration Board (IFRB) as shown on Figure 3. The CCIR and IFRB are directly concerned with spectrum management. Other

FIRST WORLD: Industrialized Democracies

AUSTRALIA	IRELAND	SOUTH AFRICA
AUSTRIA	ITALY	SWEDEN
BELGIUM	JAPAN	SWITZERLAND
CANADA	LUXEMBOURG	UNITED
DENMARK	NETHERLANDS	KINGDOM
FINLAND	NEW ZEALAND	UNITED
FRANCE	NORWAY	STATES
ICELAND	PORTUGAL	WEST
		GERMANY

SECOND WORLD: Communist Countries

ALBANIA	CZECHOSLO-	NORTH
BULGARIA	VAKIA	VIETNAM
CAMBODIA	EAST GERMANY	POLAND
CHINA	HUNGARY	ROMANIA
CUBA	MONGOLIA	SOUTH
	NORTH KOREA	VIETNAM
		U.S.S.R.

FOURTH WORLD: Economically Troubled States

AFGANISTAN	INDIA	SIERRA LEONE
BANGLADESH	KENYA	SOMALIA
BENIN	LAOS	SRI LANKA
BHUTAN	LESOTHO	SUDAN
BURMA	MALAGASY	TANZANIA
BURUNDI	REP.	TOGO
CENTRAL	MALAWI	UGANDA
AFRICAN	MALI	UPPER VOLTA
REP.	MAURITANIA	WESTERN
CHAD	NEPAL	SAMOA
ETHIOPIA	NIGER	YEMEN ARAB
GAMBIA	PAKISTAN	REP.
GUINEA	RWANDA	YEMEN,
HAITI		PEOPLE'S
		REP. OF
		ZAIRE

FIGURE 1

"THE WORLD'S ECONOMIC DIVISIONS"

THIRD WORLD: Developing Nations

ALGERIA	GUYANA	PARAGUAY
ARGENTINA	HONDURAS	PERU
BAHRAIN	INDONESIA	PHILIPPINES
BARBADOS	IRAN	QATAR
BOLIVIA	IRAQ	RHODESIA
BOTSWANA	ISRAEL	SAUDI ARABIA
BRAZIL	IVORY COAST	SENEGAL
CAMEROON	JAMAICA	SINGAPORE
CHILE	JORDAN	SOUTH KOREA
COLOMBIA	KUWAIT	SPAIN
CONGO	LEBANON	SWAZILAND
COSTA RICA	LIBERIA	SYRIA
CYPRUS	LIBYA	TAIWAN
DOMINICAN	MALAYSIA	THAILAND
REP.	MALTA	TRINIDAD AND
ECUADOR	MAURITIUS	TOBAGO
EGYPT	MEXICO	TUNISIA
EL SALVADOR	MOROCCO	TURKEY
EQUATORIAL	MOZAMBIQUE	UNITED ARAB
GUINEA	NICARAGUA	EMIRATES
FIJI	NIGERIA	URUGUAY
GABON	OMAN	VENEZUELA
GHANA	PANAMA	YUGOSLAVIA
GREECE	PAPUA	ZAMBIA
GUATEMALA	NEW GUINEA	
GUINEA-BISSAU		

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responsibilities include:

(1) Fostering the creation, development and improvement of telecommunications in new or developing countries.

(2) Conducting studies, makes regulations, formulates opinions and collects and publishes information concerning telecommunication matters for benefit of all members.

Related International Organizations

In addition to the ITU, other organizations such as the Intergovernmental Oceanographic Commission, the World Meteorological Organization, the International Civil Aviation Organization and the Intergovernmental Maritime Consultative Organization all participate on items bearing on the use of the radio spectrum. Coordination with these organizations is effected by the ITU.

International Radio Consultative Committee

The function of the International Radio Consultative Committee (CCIR) is to study technical and operational questions relating to the use of radio and to issue reports and recommendations on those studies. Its work is accomplished by 14 study groups each dealing with a specific phase of radio-communications such as transmitters, receivers, line-of-sight radio relay systems, wave propagation,

space systems and radio astronomy, broadcasting, mobile systems, vocabulary, etc. Plenary assemblies of the CCIR are held every three years to update, correlate and ratify the work accomplished in the intervening period by the individual study groups which, in turn, work through national committees. The published output of a CCIR Plenary Assembly represents its official opinion on any given subject at that time. The CCIR does not adopt standards per se, but rather adopts "preferred characteristics", which constitute the technical basis upon which actions of subsequent administrative radio conferences are established. This is too fine a distinction for many countries to make and they accept anything issued by CCIR as indisputable truth. This is particularly true of European and African countries. In Europe, the countries are concerned with compatibility and interconnections; whereas, in Africa, the problem relates to a limited reservoir of technically trained people. Therefore, instead of preparing technical specifications for equipment to be purchased, many administrations merely specify that the equipment must meet current CCIR "preferred characteristics". In the past the United States has had a tendency to go its own way on equipment characteristics; however, the world market and the increasing need for international coordination is changing that tendency.

FIGURE 2

EXECUTIVE OFFICE OF THE PRESIDENT OFFICE OF TELECOMMUNICATIONS POLICY

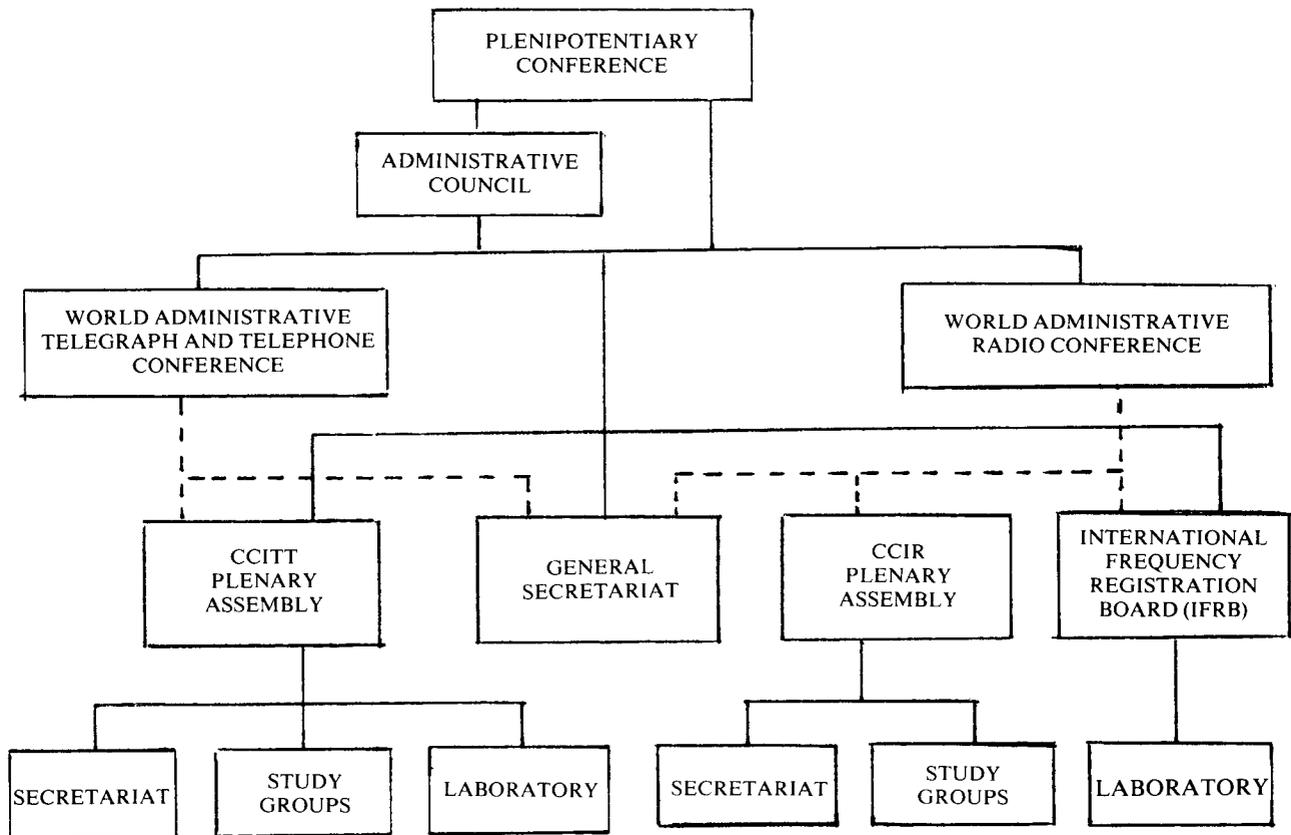
FCC BROADCAST SERVICES STATISTICS (January 1972)

Broadcast Service	Band-width MHz	No. Channels	Author- izations	Stns. Operat- ing	Not on Air
AM Standard	1.07	107	4,413	4,358	55
FM Commercial	16	80	2,421	2,313	108
FM Educational	4	20	561	484	77
<u>TV</u>					
VHF Commercial	72	12	526	510	16
VHF Educational			91	89	2
UHF Commercial	420*	70*	256	189	67
UHF Educational			132	122	10
Translators & Boosters			2,855	2,715	140
Others			<u>16,168</u>	<u>15,801</u>	<u>367</u>
Total	513.07*	289*	27,423	26,581	842

*42 MHz (7 channels) shared with Land Mobile Service in the ten largest urbanized areas of the United States. 84 MHz (14 channels) being transferred to the Land Mobile Service.

FIGURE 3

INTERNATIONAL TELECOMMUNICATION UNION ORGANIZATION



The International Frequency Registration Board

The International Frequency Registration Board of the ITU has two major concerns. This five man elected board:

- (1) Maintains an up-to-date international register of station assignments made by the many administrations and approved by the board.
- (2) Furnishing advice to administrations to assure the operation of the maximum practicable number of channels in the bands where harmful interference may occur.

The Administrative Radio Conferences

The Administrative Radio Conferences decisions are based on the technical output of the CCIR and on the recommendations of individual administrations with respect to what is considered an equitable distribution of space among the various radio services. In addition to naming specific bands, such conferences may also specify that the bands be channeled in such fashion that only discrete frequencies are available for assignment. In some instances, an allotment plan is established so that these discrete frequencies may be assigned at only a limited number of widely separated locations. As might be expected, there are undesirable features to international agreements which inevitably grow out of a mechanism as cumbersome as conferences having roughly 145 voting members. One of these is the built-in inertia involved in trying to update equipment standards to meet the current state-of-the-art. The long intervals between conferences is a principal reason for this difficulty. The CCIR holds its Plenary Assemblies regularly

every three years, but the Administrative Radio Conferences at which international radio regulations are established are much less predictable in their timing as shown in Figure 2. Similarly, international allocation provision generally lags national allocations and experimentation. It is difficult in advance of proof of need for a new radio service or that a new technique will be successful, to persuade a majority of the ITU member countries to agree to changes which may require them to adjust existing operations at considerable expense, particularly when they are not in a position to play a significant role in connection with the new technique. Therefore, pending such proof, it is frequently necessary to develop new techniques as was done for space radio communications, radio astronomy and oceanography, within the general provision that any frequency may be used other than as provided in the ITU Table of Frequency Allocations on the express condition that harmful interference shall not be caused to services operating in accord with Radio Regulations.

Geopolitical Spectrum Allocation

The world is divided into three regions for purposes of geopolitical spectrum allocation. The United States and its possessions fall into Region 2, as does South America. A particular type of service may be the same in all three Regions, or it may vary among the regions in accordance with international agreements. A result of these differences, for example, an Army tactical transmitter/receiver set which technically and functionally is effective in the US Army communication system can operate in Regions 2 and 3 but

not necessarily in Region 1 (major parts of Europe and all of Africa). This, of course, results in numerous problems, consultations, bargaining and complications. The sovereign rights and needs of allied and friendly governments cannot be preempted in times of war. These requirements for essential communication-electronic services must be protected. Some civilian requirements must yield but basic requirements for coordination do not change materially from peace to war. Authorized direct military liaison channels are used among several governments on a world wide basis to coordinate spectrum management problems. This is particularly effective between the United States, the United Kingdom and Canada. These countries have established the Joint Communication-Electronics Coordinated Section (JCECS). Representatives of the JCECS are permanently attached to the Canadian and British embassies in Washington, D.C. There are also several other special arrangements for international spectrum management including those existing in NATO, CENTO and SEATO. Coordination among these countries is effected in preparation for Administrative Radio Conferences.

United States Procedures

The above outlines briefly the complex procedures required for the conduct of an Administrative Radio Conference. The procedures within the United States are equally complex as shown on Figure 4. The United States, consistent with its election of separation of powers among three

equal branches of government and free enterprise, divides the responsibility for spectrum resource management. *The Communications Act of 1934*, as amended, vests in the Federal Communications Commission (FCC) responsibility for the regulation of non-government interstate and foreign telecommunications, including the assignment of space in the radio frequency spectrum among private users and regulation of the use of that space. Further, the Act, recognizing the constitutional powers of the Presidency exempts "Radio stations belonging to and operated by the United States" from general powers of the Commission and provides that such stations shall use those frequencies as assigned by the President. Although the Executive Office of the President is currently undergoing reorganization, presently the President uses several government agencies to assist him in discharging his telecommunication duties. The principal technical supporting organization is the Office of Telecommunications Policy (OTP); an organizational chart is shown at Figure 5. The OTP coordinates those interdepartmental and national activities which are conducted in preparation for U.S. participation in international telecommunication conferences and provides to the Secretary of State advice and assistance with respect to telecommunications in support of the Secretary's responsibilities for the conduct of foreign affairs. The procedures for preparing for Radio Conferences are complex, time consuming and costly. Generally, the U.S. position is developed by the OTP after effecting intra-U.S. coordination. When com-

FIGURE 4

NATIONAL FREQUENCY COORDINATION AND ASSIGNMENT

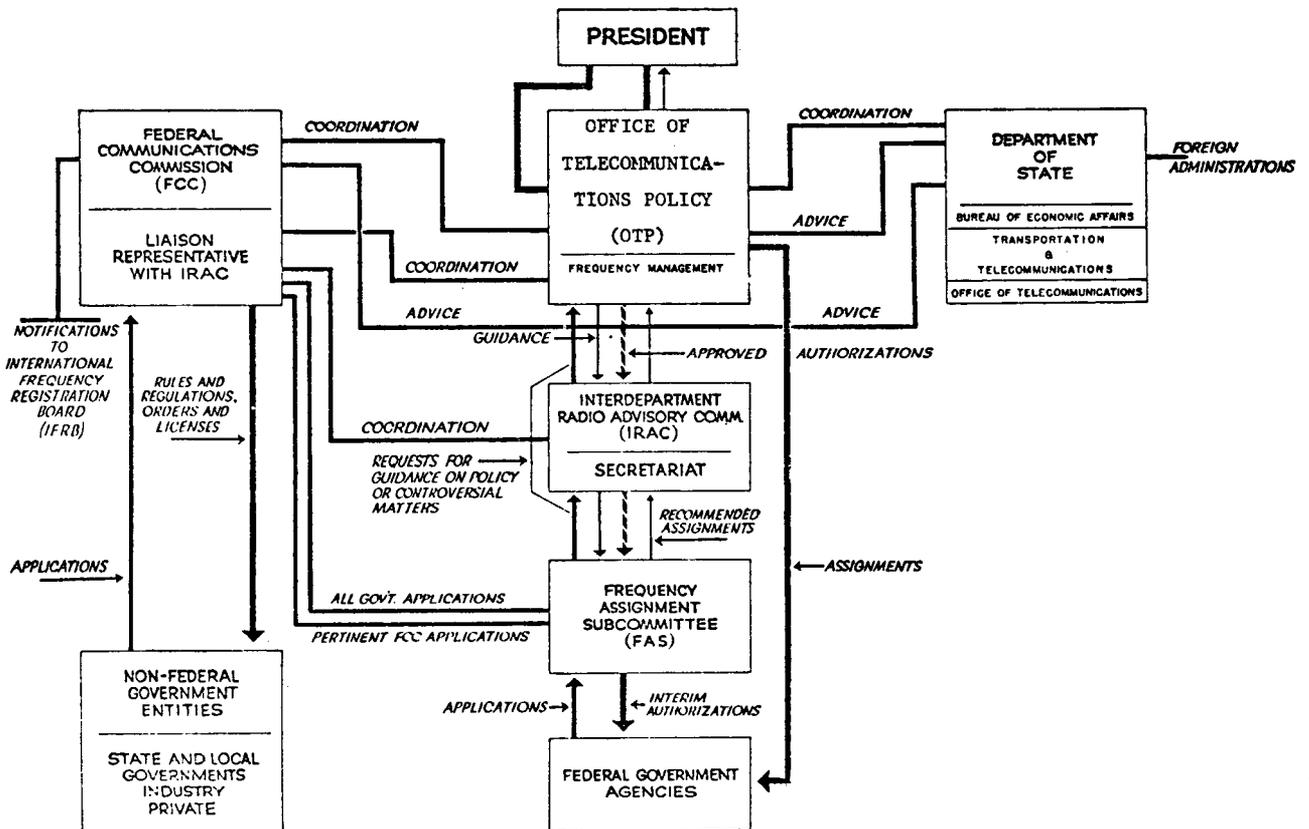
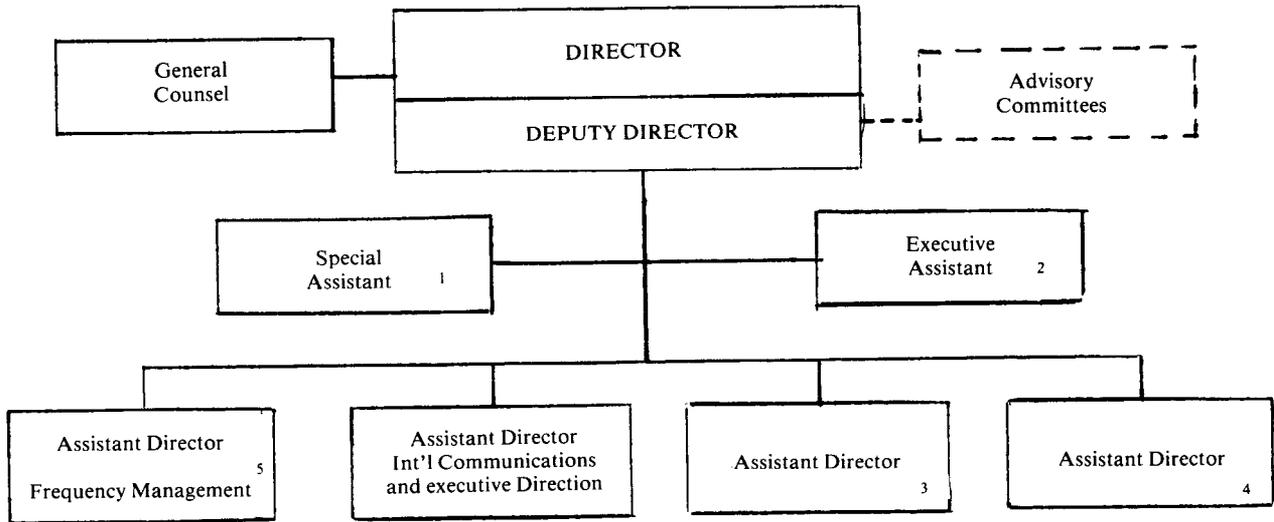


FIGURE 5

OFFICE OF TELECOMMUNICATIONS POLICY

Organizational Chart



1. Primarily Congressional Liaison and public relations.
2. Primarily personnel and budgetary matters.
3. Primarily Government communications and emergency communications.
4. Primarily domestic non-Government communication issues.
5. Primarily satellite and mobile communications.

pleted, proposals, positions and instructions for the US delegation are forwarded to the Department of State. "Preliminary Views" have been prepared in the past and coordinated with friendly interests. In some instances a Government-Industry Group is convened to assist in final preparation of US proposals. A principal supporting organization to OTP is the Interdepartment Radio Advisory Committee (IRAC). This committee, formed in 1922, consists of representatives of interested Government departments. It assists OTP in formulating and recommending to the OTP objectives, plans and actions in connection with the management and usage of the spectrum by the US Government. It further recommends the assignment (and withdrawal or modification) of frequencies to Government stations. The Electromagnetic Compatibility Analysis Center (ECAC) assists in determining whether there is a possibility of adverse impact upon existing operations when new types of communication-electronic equipments are proposed. The following chart indicates an approximate list of U.S. Government investment in communications-electronic equipment totalling more than 50 billion dollars:

In addition Fig. 6 indicates the division of the spectrum between government and non-government services.

ARMY	.5 million transmitters and similar number of receivers
NAVY	.3 million transmitters and greater number of receivers

AIR FORCE	0.17 million transmitters and similar number of receivers
Coast Guard	0.35 billion
Dept. of Interior	80 million
Dept. of Agriculture	18 million
Dept. of Commerce	90 million
Treasury Dept.	9 million
NSA	1 billion (terrestrial radio facilities)
Atomic Energy Commission	0.24 billion
US Information Agency	134 million

In addition, the following have sizeable communication systems:

- Dept. of Health, Education and Welfare
- US Postal Service
- Veterans Administration
- Federal Communications Commission
- Tennessee Valley Authority
- Dept. of State
- General Services Administration
- Federal Aviation Administration
- Dept. of Justice

Federal Communications Commission

The Federal Communications Commission (FCC), perhaps better known than those organizations described above, is responsible for the private sector and was established by the Communications Act of 1934 which has been amended several times. It is responsible for all non-Federal Government interstate and foreign telecommunications including those operated by State and local governments. It has regulatory jurisdiction over the Communications Satellite Act of 1962 and the responsibility for emergency preparedness for telecommunication services and facilities. Its complete responsibilities, functions and operations are too long to describe here. However, the Frequency Allocation and Treaty Division of the Office of the Chief Engineer is of interest. That Division is the FCC liaison Representative to the IRAC and works with the OTP, IRAC and Executive Branch agencies on matters of mutual concern concerning frequency allocation/assignment problems. The statistics involved in US private sector communications for promoting safety of life and property, entertainment, public convenience and interest is overwhelming—millions of transmitters and billions of dollars involved in TV and radio revenues, all of which must be carefully controlled and protected against any drastic change resulting from frequency allocation changes.

Department of State

The Secretary of State is the chief advisor to the President in the determination and execution of foreign policy including the international projection of telecommunication policies and positions and the conduct of negotiations. His role in telecommunication matters is readily understood as radio waves do not recognize the artificial barriers man has created between the countries of the world. Thus, it is, the Department of State is responsible for all negotiations at the Radio Conference. He is ably assisted by others but it is this Department that must assure that the results of the

meeting which will result in a formal treaty to be approved by Congress and the President reflects the needs of the U.S. telecommunication systems.

Summary

The above serves only as a bare outline of the great complexity in the allocation of the limited resource; the radio frequency spectrum. Disruption of the status quo could have untold effect upon our communications. Based on previous 'minor' conferences it is expected that the developing and economically troubled states (see Figure 1) will, in some instances, vote as a block. As each nation, regardless of size, has one vote, difficulties beyond comprehension could occur. However, the U.S. has been preparing for the forthcoming meeting for a considerable length of time and will be well prepared and represented in Geneva in 1979.

Information for the above was obtained from various documents including "The Radio Frequency Spectrum" prepared by Office of Telecommunications Policy; "Frequency Management Within the Executive Branch of the Government" prepared by Office of Telecommunications Management and "The Electromagnetic Spectrum and Its Management" issued by the Assistant Chief of Staff for Communications-Electronics, Department of Army.

EDITOR'S NOTE: Since the preparation of this paper, it has been announced that the functions performed by the Office of Telecommunications Policy (OTP) will be assigned to the Department of Commerce to be headed by a newly created assistant secretary for communications and information. At the same time, the Office of Management and Budget (OMB) will assume responsibility for Federal telecommunications procurement and management and arbitration of interagency disputes concerning frequency allocations. The Department of Commerce has long been involved in such matters; it will be interesting to participate or observe in the workings of the OMB.

FIGURE 6
DIVISION OF THE RADIO SPECTRUM BETWEEN
GOVERNMENT AND NON-GOVERNMENT
(Cumulative—25 Mc/s to any Frequency)

