Chapter 5

Alternative Structures, Procedures, and Strategies

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Chapter 5

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Introduction

Countries planning for the extension and growth of their telecommunications networks and improvements in communications generally have to set out a reasonably long-term strategy since a number of very important factors (resources, investments, socio-political needs and trends, international relations, technological possibilities and threats) must be considered concurrently.

Communications and information systems technology has reached the stage where concepts such as the "information-based society" are the subject of intense national and international discussion. High technology systems of advanced computer-communications including digital/switched facsimile, computer polling systems, packet switching data networks, distributed processor-controlled switching, and multiple-access satellite systems are appropriate to the needs of both developed and less developed countries. The use of such technology can greatly reduce costs for important services; they can extend service to rural or remote points; they can give these countries fast and convenient access to the best and most advanced information banks in the world. Many nations are beginning to grasp these implications. As a result, telecommunications is increasingly viewed as a "tool for development" and as a key to greater information capacity and power. This suggests that national communication and telecommunication planning must take account of broader considerations than were once considered necessary.

The telecommunication planner faces a new and potentially explosive situation. The facilities and services now being considered create a new infrastructure—an electronic infrastructure that makes possible and promotes electronic information transfer that will have significant, often radical, effects on the structures of cities, transportation, economics, education, banking, postal services, the nature and control of information media, the privacy and security of citizens, as well as general lifestyles. Changing political, sociological, and economic needs or constraints will, in turn, strongly influence the range, tariffs, and structure of the telecommunications facilities and services. The future environment is considerably more uncertain than the present volatile scene. It is also more political and characterized by a growth in the "communications consciousness" of people.

There is growing recognition that electronic and telecommunication technologies and their application to new integrated systems are an important source of economic stimulus. The importance of these technologies in social and economic development, national security, cultural diffusion, and influence over popular thinking combine to create a strong bias and argument for promoting and protecting national information industries and U.S. electronics manufacturing capability.

Information power is being increasingly recognized and used by the nations of the world to increase and enhance their economic and political power. Telecommunications is a key resource in the creation and exploitation of information capacity and power. As nations realize and appreciate the pivotal role and importance of information and information power, telecommunication policies will be viewed as strategic means for increasing national sovereignties and reordering world affairs.

A More Restrictive Global Information Environment

Information exchange between and among nations is essential if nations of the world are to function as viable societies in a multipolar, information interdependent world. The global flow of information is essential to the sustenance of the current level and pattern of the world's collective intelligence and economic production, development, and growth. The underlying principles of freedom of information and freedom of expression have given rise, in some countries, to the doctrine of free flow of information. For 30 years, the idea, given legitimacy at the United Nations, was that no barriers should prevent or distort the flow of information among nations. This doctrine is presently under serious attack.

The absence of, or loss of confidence in freedom of information rights or privileges in many of the Third World nations, as well as the Communist countries, is a fundamental threat to the global flow of information. In conjunction with the indirect barriers imposed by other international information issues and concerns, namely transborder data flow, the potential regulation of information imports and exports (contained in national policies for patents, advertising technology transfers, direct investment, appropriate technology, etc.), the protection of domestic electronics and information industries, and the global patterns of information power, the future suggests a much more restrictive global information environment.

On the way to this new global information infrastructure, the United States and other nations will face a broad range of major problems and issues including:

- international technical operating standards and procedures;
- privacy and other considerations affecting transborder data flows;
- international marketing rules;
- reconciliation of national differences concerning service availability and accessibility, information availability and accessibility, sociocultural variations, frequency assignments and management, national telecommunications and information policies;
- impacts on national sovereignty;
- influence and control of information on world events, attitudes, and outcomes; and
- the benefits of information imports v. the cost of information dependency.

Many of the developing countries are already evidencing an awareness of the linkages among these issues and of the interplay and interdependency that exists with radio spectrum matters.

Renewed Focus on Regional Telecommunications

The 20 years ranging from about the mid-1950's to the mid-1970's can be considered the global expansion phase in the development of international telecommunications. This was dominated by the initial laying of undersea telephone cables and the establishment of international satellite communication facilities and institutions (e.g., INTELSAT). The thrust was towards intercontinental connections and national access to the global satellite network. Dramatic decreases in international satellite communica-

tion costs and a corresponding increase in demand reflected and characterized this global expansion period.

We are presently in a phase in which regional needs and policies will predominate. Nations will become more interested in specific connectivity of external communication routes in support of national and regional political and economic goals and information policies as contrasted with the more general nature of global facilities expansion. The thrust will be on intraregional communications along with focused development or enhancement of specific interregional communication routes.

Corresponding to this shift in needs and opportunities will be a change in institutional influence. Regional bodies such as the European Conference of Postal and Telecommunications Administration (CEPT), the Arab satellite consortium (ARABSAT), and entities that support regional policies of political and economic integration (such as the Association of Southeast Asian Nations (ASEAN) will grow in influence relative to such bodies as the International Telecommunication Union (ITU), which will be compelled to accommodate these pressures and make strategic changes.

A More Active and Stronger Government Presence

Without doubt, governments around the world will become increasingly involved in the development, management, and control of communications technologies, products, and applications. They will seek to utilize and manipulate telecommunications, including frequency matters, in furtherance of national and international goals.

In most of the world, telecommunication services are provided by a state-sanctioned monopoly, that whether state owned or not, is likely to be a government or quasi-government institution. This is not the case in the United States and it is a factor that assumes added importance as computer and communications services continue to converge, eroding the boundaries between the private and public sector in communication and information goods and services.

U.S. Government Communications Policy and Structures

How is the United States likely to fare in this new environment? While it can be argued that the present structure of the U.S. Government and its policymaking processes in the telecommunication areas have protected and sustained our vital national interests to date, the question is whether it will be adequate for tomorrow. Since spectrum is the common denominator in all uses of radio, coordination is essential for the various services to function in a compatible manner. It is this coordination, which has over the years become a very specialized and sophisticated art, that frequently bears directly on policy decisions. Much of the ITU-sponsored negotiations relate to spectrum use. Because of this, spectrum management in the United States has been scrutinized many times, sometimes criticized, and sometimes praised, down through the years.

Starting at least 30 years ago there has been concern over the effectiveness of the government structure to cope with the international aspects of telecommunications—particularly the negotiation of agreements within ITU and other United Nations (U. N.) organizations. Most of the international negotiations have been motivated by technical considerations, primarily radio spectrum issues, without the advantage of a clearly stated overall national telecommunication policy.

The United States has done well in most of these negotiations but with each international conference the maneuvering room has decreased and thus the preparation and actual negotiating have become more difficult.

As we go into the decade of the 1980's, the international aspects of telecommunications are becoming more preeminent than ever. No longer can fundamental telecommunication policy issues be avoided by relying on technical agreements, motivated by technical considerations, and negotiated on the presumption that only technical issues need resolution. Unfortunately, the present Federal Government structure, while responding to the technical aspects of international communications negotiations, has not developed a mechanism or procedure for developing comprehensive policy.

There are three fundamental weaknesses in the present structure:

1. The lack of appreciation at the top decision levels of the Federal Government and industry as to the vital role of telecommunications in the international and domestic political, economic, and private affairs of the United States, and the need for policy coordination.
2. There is a lack of centralized policy coordination and guidance for international telecommunication negotiations at a high enough level in the Federal Government to be effective.
3 The State Department's Office of International Communications Policy is neither staffed nor institutionally organized to carry out effectively all of the functions involved in international telecommunications negotiations.

These structural weaknesses are a direct reflection of the lack of clear U.S. policy for telecommunication matters including spectrum management issues. Moreover, the U.S. permanent spectrum management mechanisms are not adequate to review all stated requirements of Government and nongovernment spectrum users objectively or to verify and adjust needs consistent with national policy objectives. The United States also lacks an effective means of collecting data and developing guidelines to judge the merits of one spectrum use over any other.

U.S. Structure and Processes for Spectrum Management

The planning and management of the spectrum in the United States is handled by-the Federal Communications Commission (FCC) (as manager for nongovernment users) and by the National Telecommunications and Information Administration (NTIA) (as manager for Federal Government agencies requiring spectrum for their radio-communication systems). Each executive branch agency develops its requirements for spectrum and orbit use and-these are discussed and coordinated through the mechanisms of the Interdepartment Radio Advisory Committee (IRAC) and its several subcommittees. The nongovernment requirements of commercial public and private users are developed through the FCC notice of inquiry (NOI) process often with the aid of advisory

committees. NTIA and FCC coordinate to resolve differences and together with the State Department develop a single set of U.S. proposals for ITU administrative radio conferences such as WARC-79.

NTIA and FCC must agree on the bands that are proposed for individual services and this requires agreement on the eventual domestic allocation of each band: whether for Government use, nongovernment use, or shared use. The State Department serves as ombudsman in resolving disagreements, if any, over U.S. proposals to international radio conferences and the President acts as final artiber if the State Department cannot resolve the problem. Depending on the portion of the spectrum involved, shared use ranges from about 20 percent for the region between 100 and 1000 MHz to 100 percent for the band 10 to 100 kHz. The working level forum for the generation of Government proposals and coordination between them and the nongovernment proposals is usually a special ad hoc committee of IRAC. Such ad hoc committees include participation by FCC liaison representatives who present the nongovernment view.

Consensus between NTIA and FCC on the division of spectrum between Government and nongovernment users does not necessarily ensure the most efficient use of spectrum. Moreover, IRAC is an advisory committee to NTIA and it can recommend but cannot compel spectrum-efficient design or technology on large, powerful agencies like the Department of Defense (DOD). The power and resources of NTIA to successfully challenge spectrum decisions of such agencies are limited.

Possible Procedural and Structural Improvements

Procedural Improvements

Improvements needed in the present procedures for managing and planning Government and nongovernment use of the spectrum include better means to provide adequately for:

- validation of requirements, giving particular attention to current spectrum usage, technology and development trends, and sharing opportunities between competing users of the spectrum;
- inclusion of spectrum and orbit efficient techniques and technology in system design of both Government and nongovernment systems;
- apportionment of frequency spectrum between Government and nongovernment services based on national priorities;
- effective planning for future spectrum and orbit needs;
- efficient and timely preparation for and participation in ITU conferences; and
- effective management of existing services and users on a continuing basis.

Some of these shortcomings could be corrected without any fundamental change in the structure of FCC or NTIA. Assigning spectrum management a higher priority and using resources more efficiently would help improve the present situation. For example, FCC should be able to improve its data base for spectrum management with the help of its own computer and spectrum experts. The establishment of deadlines for inclusion of licensing information in FCC master files can be accomplished by FCC action. A more fundamental procedural change would be to place all incoming applications for licenses, construction permits, authorizations, etc., in FCC computer on receipt. In other words, FCC could institute an information and data processing system approach to aid its spectrum management activities.

The validation of spectrum requirements, and the apportioning of spectrum between Government and nongovernment users, should receive closer scrutiny. A mechanism using analytical tools to evaluate needs and assess priorities among competing users of the spectrum would provide decisionmakers with basic information and data for use in establishing policies and reviewing requirements. Federal spectrum requirements are reviewed by IRAC and its Spectrum Planning Subcommittee, but this function needs to be strengthened and broadened to effectively consider longer range impacts. FCC needs to be better equipped to assess future spectrum requirements of the private sector, including the use of new technology.

Economic techniques (e.g., auctions, lotteries, spectrum fees, resale of frequency spectrum assignments, etc.) should be considered, at least on an experimental basis, to provide guidance on the consequences of different spectrum allocation decisions and the introduction of newer technology. These should include techniques for evaluating the relative economic viability of alternative spectrum uses, as well as radio v. nonradio communication systems. The use of economic techniques in spectrum management might require legislative action. FCC, perhaps with the aid of a task force, other Government agencies that have studied the question, industry groups, and private experts, could select a few services for detailed analysis of the prospects of using one or more economic techniques. FCC could then present its recommendations for the experimental application of a selected technique, or techniques, to one or a limited number of services and frequency bands to Congress for its information and action, if necessary.

Problems relating to forming a U.S. delegation for WARC-79 could be addressed and the effectiveness of U.S. participation in international meetings could be improved by several steps: 1) industry and other nongovernment delegates could again be permitted to participate fully as U.S. representatives at international telecommunication conferences and take any assignments on the delegation for which their skills and experience qualify them. Legislation to accomplish this passed both Houses of the 96th Congress. However, the legislation to which it was added was vetoed by the President for reasons unrelated to the exemption. The measure was again passed by the Senate and reported by the responsible House committee, but the House of Representatives did not consider it before adjournment; 2) consideration could be given to finding means to comply with due process requirements under the Administrative Procedures Act and still name industry and other nongovernment representatives to delegations on a timely basis; and 3) establish guidelines with an implementing mechanism to name the chairman and individual delegates to the U.S. delegation. Qualifications required, distribution of various skills needed, and type of representation desired would be selected from the best candidates available, especially those who participated in the preparatory effort. If special Government support is necessary to assure certain representation, then that support should be available early in the preparatory stages.

Structural Improvements

Chapter 3 discussed the present structure within the Federal Government to perform spectrum management and participate in international telecommunication conferences. Consistent with the findings of past commissions and task forces going back to 1950, this study also finds that structural improvements are necessary. Primarily, the problems stem from the absence of high-level Government attention to effective policy coordination. Accountability for spectrum management issues and international negotiations is difficult to assign under the present structure.

Congress could consider ways to improve the present structure or examine possible changes in the structure. A detailed analysis of alternatives is beyond the scope of this study that concentrates on the results of

WARC-79. However, at least four options are available to Congress:

1. maintain the status quo and make no changes;
2. maintain the present structure, but raise the level of attention and accountability within the responsible agencies;
3. establish a mechanism—such as a task force of high-level Government officials—to develop, examine, and make recommendations on structural and procedural improvements; or
4. establish a permanent board, council, or interagency committee of high-level Government officials to be responsible and accountable for international telecommunication policy coordination and the preparations for international conferences.

Option 1: Status Quo.

The relatively low priority given to spectrum management issues within the Government will likely continue under the status quo as discussed in this report. This reflects the relative lack of appreciation and attention at a high level of Government to telecommunications generally. Even with the unprecedented number of upcoming conferences of ITU and the direct importance of these conference decisions to the United States, the State Department, particularly, will find it difficult to raise the priority of radio spectrum issues vis-a-vis other nontelecommunication foreign policy issues. Moreover, FCC is unlikely to assign a higher priority to spectrum management in light of other pressing regulatory policy issues.

Option 2: Raise the Level of Attention Within the Present Structure.

Congress could take steps through its oversight activities to focus attention on ways to improve coordination and develop coherent policies and strategies for international telecommunication matters generally and spectrum issues in particular. Congress could require special reports from responsible agencies on steps taken to improve the status quo spectrum management throughout the Government. Several possible procedural measures were discussed earlier. In addition to those, it may be beneficial to establish a more formal and continuing conference preparatory mechanism within the existing structure of divided responsibilities among several Government agencies. This would replace the more "ad hoc" approach followed in the past. If such a mechanism was not justified when ITU conferences were held at infrequent intervals, it appears necessary now when over a dozen conferences are scheduled over the next 7 or 8 years. Complex issues of vital concern to the U.S. with direct consequences for both international and domestic telecommunications are on the agendas of these meetings. Developing and recommending skilled delegates for U.S. delegations could be made a part of this process. Formal training in negotiating, language, and diplomatic skills could also be included.

Option 3: Create a Task Force To Examine and Make Recommendations on Structural Changes.

Congress could mandate that an interagency task force of high-level officials from responsible Government agencies be established. This task force would examine alternative structural changes, assess the pros and cons of each, and report to the President with recommendations. The President, in turn, could make a report to Congress with specific proposals where legislation is required. Because of the divided responsibilities and direct influences of several Government agencies, the task force might include representatives from the following agencies: Department of Commerce—including NTIA, Department of State, FCC, DOD, Department of Justice, Office of Management and Budget, and possible representation from the Office of the U.S. Trade Representative.

Option 4: Establish a Permanent Board or Other Mechanism.

Congress could consider the establishment of a permanent board, council, or inter-

agency committee to coordinate international telecommunication policy. Spectrum management issues and international negotiations would be key elements of the work of this body. Such a board could be charged with the continuing responsibility to: coordinate international telecommunication policy; plan and direct strategies to achieve policy objectives; assess the need for personnel and other resources within the Government to conduct an effective international program including ways to use resources more effectively; - and prepare for international conferences and meetings.

Depending on the specific mandate for such a board, the present structure for spectrum management within the Government would be altered to a greater or lesser extent. For example, the present structure could be left intact with the board providing the centralized point of coordination. However, the board could be made accountable for seeing that policies and actions are coordinated and that a coherent and effective program for U.S. international telecommunication matters is maintained. As a part of its functions, the board would assure that the necessary linkages are made among the various elements within Government agencies, between agencies, between Government and industry, and among the international forums concerned with telecommunication matters.

Bills have been introduced in the Senate and House recently to establish a mechanism aimed at improving the U.S. posture for international telecommunication matters. Also, in recent years, other legislation has been introduced that would alter the present Government structure for telecommunication matters. These and other approaches could be considered under options 2 and 3 above.

U.S. Strategies for Dealing With International Spectrum Issues and ITU

The United States may have reached a crossroads in its relationship with ITU. Having started in 1865 as a relatively noncontroversial organization of 20 nations concerned mainly with the interconnection of their telegraph systems, ITU has evolved into a contentious assembly of 155 nations that look to the Union to solve fundamental issues of allocation and regulation of radio spectrum resources.

The ITU structure, which was well suited to the analysis of interference between radio communications systems, and to achieving a consensus on noncontroversial matters among a small number of broader issues, is sorely tested by the demands of numerous countries exhibiting the widest possible range of technical, economic, cultural, and political backgrounds. Many of these issues did not originate at ITU, but have ended up there, often argued by delegates unschooled in the technical language that has been the sine qua non of ITU. Thus, the mechanism that brought together highly trained engineers to consider abstruse issues of interference between sophisticated communications systems is becoming a focal point for broader policy issues with political posturings by delegates to further national and political objectives. ITU structure, procedures, and mechanisms have not changed, but the problems have changed enormously. The ITU must now develop greater flexibility if it is to function effectively in a new and dynamic environment.

The radio spectrum is essential to the communications infrastructure of the United States, and it is not an easy matter for the United States to concede its vital national interests to satisfy the demands of many nations that repeatedly assert their “equal right” to the radio spectrum even though

they have no immediate need or capability to use additional allotments for the foreseeable future. U.S. officials must ask themselves whether this nation can continue to accept these same structures, procedures, and mechanisms in an important, essentially allocative forum as are routinely tolerated in other situations that are more abstract or political in nature, and less concerned with vital U.S. interests. Will U.S. negotiating skills and technological proficiency enable us to achieve our essential goals and objectives in a forum that employs *a* "one-nation, one-vote" decisionmaking formula and in which the United States and the other developed countries are greatly outnumbered by the less developed member countries?

The answer is not readily apparent. What is apparent is that our technically oriented approach that has served so well in negotiating the technical issues of the past two or three decades, is simply not sufficient for the broader issues of today. The United States must make some policy decisions, reflecting changes in U.S. strategy or in the structure or procedures of ITU, and then augment the scope and training of the responsible U.S. personnel consistent with those decisions.

The United States has essentially two alternatives: it can seek various improvements in the present means for solving spectrum allocation problems within ITU as it is now constituted, or it can seek to alter the existing structure, procedures, or mechanisms of ITU itself. The policy options considered here may be divided into two broad categories, strategic and structural.

From the strategic standpoint, assuming no significant changes in ITU, the United States has a wide range of options. At one extreme, the United States may conclude that the drawbacks of continued participation in ITU outweigh the benefits, and withdraw from the organization or decline to participate in its deliberations. At the other extreme, the United States could decide to yield to other nations on controversial matters and play a passive role within ITU. Between these extremes there are a number of alternatives. One that requires no structural or procedural changes in ITU would be a serious attempt at better coordination of our views and objectives with other nations in advance of ITU meetings, and better U.S. planning based on improved understanding of other nations' views.

Another strategic option that might help to achieve U.S. objectives even if ITU remained essentially unchanged would be for the United States to seek to remove controversial issues from the ITU forum and attempt to solve them in other ways. A current example would be to respond to the demands of developing countries for "guaranteed access" to radio spectrum and satellite locations by developing the institutional arrangements to ensure domestic communication services to these nations. This could be a common-user system either building upon the present INTELSAT structure or creating a separate system for domestic services. Such a solution would offer each nation all of the satellite services or capability it could realistically use, without allocating to small nations significant amounts of satellite spectrum and orbit locations that might then remain unused for the foreseeable future.

From the structural standpoint, assuming that ITU can be changed, a number of options are available. One relatively extreme example would be to seek revision in the voting formula of ITU to one that was more advantageous to the United States, perhaps by giving added voting weight to those countries that contribute most heavily to the U.N. budget. A more modest option would be to increase the number of ITU regions beyond the present three so that regional issues could be dealt with by a smaller number of countries most directly concerned.

Policy Option No. 1: Withdrawal From ITU

Would withdrawing from ITU guarantee the United States unhindered use of the spectrum allocation or frequency assignments we need? Probably not. Member nations of ITU rely on the organization to avoid interference from the radio signals of others and to achieve interoperability of certain mutually used systems. Avoidance of interference is the essence of spectrum allocation or frequency assignment processes. The assignment of a particular frequency is of little value if others feel free to use it for purposes that cause interference. There are no effective sanctions to force compliance with ITU decisions. Therefore, the United States, as do all nations, relies on the voluntary agreement and cooperation of other nations to refrain from interfering with its use of the spectrum.

Abrupt withdrawal from an ITU in which the United States was unable to have its own way could well intensify the risk of interference. For applications that are vulnerable to interference, it seems clear that preemption of spectrum would be ineffective. Any nation that chose to interfere, whether due to a valid need for the particular frequency band or by intentional jamming, could greatly reduce the value to the United States of the preempted spectrum.

There are some important spectrum uses that are relatively invulnerable to interference (e.g., high-power radar systems with electronic countermeasures capability), but any preemption of spectrum by the United States would likely result in retaliation by other nations in areas where it was vulnerable. There might also be spill-over into nonspectrum relationships with other nations, such as transborder data flow or telecommunication equipment trade matters. Extreme forms of retaliation, such as refusal to interconnect telephone or telex systems with the United States, would be unlikely since these services are probably as much in the interest of many other nations as in our own.

What would happen to the generally friendly process of coordination to avoid harmful interference? The bulk of our coordination takes place with the developed countries that are fewer in number and with whom the United States has fewer fundamental differences than with the Third World nations that have recently begun challenging and, in some cases, outvoting the United States. It is conceivable that the United States could abandon ITU and establish a more congenial grouping of developed countries as a forum for coordination to avoid interference, and simply ignore other countries. Coordination and information exchange would become less certain by the omission of the majority of nations, even if their spectrum use is relatively limited, but would still be fairly effective. We could also continue to coordinate with many of them informally, since that would also continue to be in their interest. Eventually they might even seek to join the coordinating forum of the developed countries, although the terms of reference and voting basis might be much different from ITU.

It seems likely that ITU–or that part that deals with radio matters, as opposed to telephone and telegraph-would disintegrate if the principal developed countries abandoned it. A major mechanism for technical assistance to developing countries would disintegrate with it, leading perhaps to negotiations for a new mechanism. Probably these negotiations would be conducted on a basis that would more nearly reflect the relative technical and economic strengths of the various nations involved, rather than the ITU's "one-nation, one-vote" formula.

In the resulting "free-for-all" atmosphere, large nations and organizations would probably get whatever spectrum they needed, subject only to coordination among themselves. In the short run, smaller nations could take whatever spectrum they wanted.

But in the long term, if the larger nations developed technology and systems for their own purposes, rather than for common usage, the smaller nations could find spectrum unavailable, or perhaps limited to those frequencies that are complicated and expensive to use.

Overall, the lack of a central spectrum allocation and coordination authority would probably lead to a more fragmented use of the spectrum, with fewer common worldwide channels, less standardization, and possible difficulties with interoperability of certain common systems, and a general increase in interference problems between services. In short, the result of spectrum preemption and withdrawal from ITU would lead to a relatively less organized mechanism for spectrum management having significant disadvantages for both developed and developing countries. Whether these disadvantages would at some time be outweighed by the benefits of increased access to frequency bands vitally needed by the United States would depend on the specifics of those needs and the degree of conflict present in ITU at that time.

The results of the OTA-sponsored survey show that a clear majority of the survey respondents would strongly oppose, or even consider U.S. withdrawal from ITU. Nearly two-thirds of the respondents strongly disagree with the suggestion that the United States view withdrawal from ITU as an option even under hypothetical "worst case" conditions. And 18 percent of the respondents agreed or agreed strongly with the suggestion that the United States consider withdrawal from ITU.

Policy Option No. 2: Revised ITU Voting Formula

As an option less drastic than withdrawal from ITU, the United States might join with other developed nations to force a revision of the ITU's "one-nation, one-vote" decision-making formula toward one that would reflect the dominance of the developed nations in the actual use of the spectrum. If successful, this option would greatly reduce the ability of the Third World nations to block or force changes in U.S. positions.

One possible formula for revised voting is a combined weighting factor based on land area and population. Another possibility is the proportion of present use of telecommunications, or investment in telecommunications, which would clearly favor the developed countries in the short run. A third formula might be based on the relative proportion of overall contributions to the United Nations and its various specialized agencies.

There are numerous precedents for unequal voting arrangements in international organizations. In the INTELSAT board of governors, voting is in proportion to investment in the system (which is in turn proportional to utilization of the system), and voting in the World Bank is in proportion to contributions. There are, of course, a number of agencies and conferences which adhere to the "one-nation, one-vote" principle. Examples are the United Nations Educational Scientific and Cultural Organization, the International Labor Organization, and the Law of the Sea Conference. None of these is an operational organization, and none is especially well known for reaching accommodations efficiently and expeditiously.

A revised voting formula might reduce the contention over spectrum allocation matters at ITU; make ITU more efficient; help to make the use of the spectrum more efficient by precluding the adoption of unworkable allocation schemes; and be no less fair than the voting practices used in a number of other international bodies that benefit Third World nations without being controlled by them. The stimulus for concurrence of Third World nations with such a proposal would be the possibility that, were it rejected, the developed countries might withdraw from ITU and render it essentially irrelevant.

The reaction of Third World nations is difficult to predict but it seems most likely that they would bitterly resist any reversal of

their recent successful trend toward assertiveness and refuse to make any concession on ITU voting formulae. From a general foreign policy standpoint, it is important to consider how much support the United States might obtain from other developed countries, many of which do not feel the spectrum problems as acutely as the United States. The United States must also consider whether it wishes to take an assertive policy toward ITU apart from a generally more assertive stance toward Third World nations. Should spectrum and communications policy be the "leading edge" of a new U.S. posture of asserting our interests vigorously? This issue needs to be faced early, in the broadest possible forum, since the answer will be one of the key factors in the selection of any policy option.

It can also be asked whether the proposed change in voting arrangements should apply to all ITU spectrum decisions, or just to those allocations that might qualify as major matters. The latter case is equivalent to establishing a new, separate forum with revised voting arrangements and routing the major matters to that forum rather than to ITU.

Objectively, it would seem that the interests of the developing countries lie with the continued existence of ITU and with continued technical and economic aid from the developed countries. If this choice were clearly and convincingly drawn, the Third World nations would probably come to realize that these benefits outweigh such hypothetical advantages as satellite orbital slots that they may never use. Whether they would ultimately decide the matter on objective grounds is difficult to predict. In any event, it seems unlikely that a change in the voting formula within ITU will occur given the present structure of ITU.

Policy Option No. 3: Increased Regionalization of ITU

At present, ITU divides the world into three geographic regions and many issues that can be treated separately and effectively in a single region are considered in this way. Regional administrative radio conferences are scheduled on a variety of specific issues, allowing the World Administrative Radio Conferences to "spinoff" certain controversial matters. One option would be to extend this process of regionalization on a geographic basis to smaller subregions, and/or on an issue basis to include only those nations directly affected by the particular issue. The purpose would be to reduce the number of nations debating or voting on issues that do not affect them directly, thus reducing unnecessary contention.

WARC-79 was attended by 142 nations. Approximately 1,670 delegates and advisors met for 11 weeks (one week more than scheduled), considered nearly 17,000 individual proposals (more than 900 from the United States), and held more than 900 meetings. Surely any approach that might help limit further WARCs to more modest proportions would be worthy of study. More importantly, when nations vote on issues that do not directly affect them, opportunities for trading votes arise at no cost to themselves, but which help others to sustain confrontations. Large meetings also tend to encourage bloc voting, which has already begun to emerge at ITU. Thus, subdividing the ITU into smaller units, either on the basis of geographic subregions or on the basis of particular issues, would divide the Third World bloc into smaller, less dominant groups.

There are numerous precedents for this. In addition to the three ITU spectrum regions, there are five International Telegraph and Telephone Consultative Committee regions, three ocean basin groups within INTELSAT, and a North American Regional Broadcasting Agreement, which coordinates broadcasting in the United States, Canada, and Mexico.

While a potentially useful approach, and one ITU has tried to some extent (e.g., the forthcoming WARCs on Mobile Services, high frequency planning, and the geostationary satellite orbit), decentralization is

not applicable to all problems. Some services cannot be considered separately from others with which they interfere. Frequency bands in which signals propagate for many thousands of miles cannot be considered on a regional basis, and some issues (e.g., interoperability of aircraft communications systems) are fundamentally global in character. The key is to define a spectrum problem in a way which leaves significant numbers of nations unaffected. For example, the ultra-high frequency TV and microwave fixed (radio relay) service, which use signals of limited propagation range, might be treated on a subregional basis.

Decentralized decisionmaking does not, of course, guarantee that the U.S. position will prevail. Being outvoted by 10 to 1 is no more satisfying than being outvoted by 153 to 1. However, it is easier to bargain in detail with 10 nations than 153; and if a quid pro quo must be offered, the total cost is likely to be lower.

The mechanics and economics of increasing substantially the number of conferences is also important to consider. The limited U.S. professional staff available to prepare for and attend spectrum conferences is already stretched thin, and if the United States does not wish simply to skip many of the meetings (a very risky proposition) this staff would need to be augmented. The developing countries would find it even more difficult to prepare for a heavy schedule of meetings.

Developing countries tend to have very few professionals available to consider spectrum matters; a few key people might decide spectrum policy for an entire country. Also, in some cases even the key individuals lack sufficient expertise to comprehend the needs and technical requirements of their own country, let alone understand and appreciate the complex spectrum problems of the United States. Assuming that this effect overbalances any possible advantage to the United States from keeping them in ignorance, it may be in our interest to assist these nations in their planning and conference preparation.

One way to assist the Third World nations would be on a regional basis. This could take the form of providing special regional rapporteurs; of educating and assisting key countries, which would in turn assist others or act on their behalf; or of establishing and supporting a joint planning capability for a group of nations in a region. Apart from the regional approach, we could assist certain country blocs in their planning and preparation.

Increased decentralization of ITU could, in principle, lead to greater fragmentation in the use of the spectrum, with the same band being used for different purposes in different regions to a much greater extent than is now the case. Advanced technologies may increase the opportunity for regions and subregions to operate reasonably independent of one another. While this may be acceptable in the short run, the long-term implications are worthy of study. If, for example, a new service were proposed that would be global in character, obtaining the necessary global spectrum allocation might require changes in the allocations to many different services in many different locales. At the least, it might be necessary to create an institutionalized system for coordinating decentralized decisions.

Policy Option No. 4: Better **Coordination and Planning**

As a relatively conciliatory approach, the United States could mount a major effort to develop long-term plans for spectrum use that would take into account the spectrum requirements of developing nations, to aid them in understanding the realistic options available to meet their short- and long-term needs, to offer them such technical and economic assistance as might be needed to enable them to participate actively in the planning process, and to seek their concurrence with fair, objective, and realistic proposals.

The acceptance at WARC-79 of U.S. proposals for new spectrum allocations devoted to remote-sensing activities offers support for the view that advance coordination and a concerted effort to explain and justify requirements can have a significant impact on countries that might otherwise be skeptical or indifferent. The delegation of Senegal came to WARC-79 with specific instructions to support U.S. remote-sensing proposals, thanks to a special effort by the National Aeronautics and Space Administration (NASA), backed by the State Department, to enlist the help of U.S. embassies overseas in lobbying appropriate authorities in their host countries. A NASA slide presentation, with tape-recorded commentary in English, French, and Spanish drew appreciative audiences from delegations at the conference itself. Of the some 50 remote-sensing proposals made by NASA for both passive- and active-sensing programs, all were accepted by the conference to a greater or lesser degree and, contrary to expectations, there was no opposition to U.S. proposals that could be traced to political motivations.

To a significant extent, the confrontations initiated by Third World nations in ITU are based on suspicion and mistrust of developed countries, perhaps based on a lack of understanding of the true potential of technology to create the spectrum resources they will need in the future. But many Third World nations also question whether they will be able to take advantage of that technology and they question the good faith of the developed countries to share the benefits of advanced technology.

The fact remains that there is adequate spectrum for all nations at the present and that technology will very likely expand the effective utility of the available spectrum to satisfy future needs of all nations. The problem for the United States is to convince other nations, particularly the developing countries that spectrum and orbit capacity will be available and that their needs for service can be satisfied. Technical assistance can be very useful in this regard, and economic assistance can help make the benefits of technology a reality. Creating a role for the developing countries in cooperative planning efforts is likely to make them more receptive to the positions and plans that are forthcoming, even though they benefit both the developed nations and themselves.

Long-range planning of spectrum utilization is presently inadequate and not easily accomplished in an area where technological rate-of-change is rapid and in an open competitive system like that in the United States where policy makers are more likely to be responding to problems than to be developing long-range plans. However, better long-range planning for telecommunication service and spectrum needs is clearly necessary in order to cope effectively with the ITU allocation process. Developing and sharing planning techniques and data with other countries would not make a new planning process vastly more difficult or costly, and might make it more reliable in the long run.

It is also necessary to know the extent to which developing countries' positions at ITU are based on their own vital interests rather than on misunderstandings and politics; it is unlikely that they would compromise vital interests for the sake of comity. A cooperative planning process would tend to expose true interests and clarify the negotiations.

As a practical matter, the majority of the developing countries cannot now make use of advanced communications technology without technical and economic assistance from technologically advanced countries. If the majority of nations were to vote to adopt rules that limit or preclude the use of advanced technology to which they do *not* have independent access, communications capability suffer and costs increase in the long term for all users. Thus, the cost of assisting other countries in using advanced technology must be balanced against the cost to the United States of *not* being able to take full advantage of such technology ourselves. This equation deserves close analysis.

It can also be argued that giving technical and economic assistance to the Third World nations will simply provide them with the sophistication they need to challenge our own positions more effectively in the future. While not invalid on its face, this argument ignores our ability to live in relative harmony with dozens of highly developed nations, and to avoid excessive contention in spectrum allocation matters with some of these nations that are sworn enemies. We have more to lose from ignorance than from true disagreement.

It is useful to recall what can happen in the absence of cooperative planning. As preparation for the 1977 Broadcast Satellite WARC, the United States developed comprehensive data and explanations to show that a technologically based "first-come, first-served", or evolutionary approach, would assure adequate access to the geostationary satellite orbit for all nations. However, other nations were intent on adopting a rigid a priori plan and simply were not interested in the U.S. arguments. Most of the U.S. preparatory work was of little value and the U.S. delegation was thus forced to develop alternative positions on an ad hoc basis, during the conference.

This experience serves as a reminder that it is no longer feasible to go to an ITU conference with a well-documented technical solution to a problem and expect other nations to embrace the U.S. position. A certain degree of advance coordination is necessary, as a minimum, and probably was one of the reasons that the United States achieved certain objectives at WARC-79. The prior coordination undertaken by NASA on U.S. remote-sensing proposals is a case in point.

Cooperative planning has worked in the past; the United States was a leader in cooperative planning for INTELSAT and INMARSAT. The exact mechanism for cooperative planning is an important and complex matter, compounded by divided responsibility in the United States for communications policy in general and spectrum planning in particular. It should be possible, however, to graft onto the existing structure a sufficiently comprehensive mechanism with high-level Government responsibility to assure effective long-range planning and to foster cooperation with other nations.

As an alternative, ITU could be invested with a planning staff to undertake long-range coordination, analysis, and planning. Such a neutral planning expertise might be less likely to be mistrusted by Third World nations, and perhaps more capable of defusing potential disagreements. Naturally, the United States would participate in the process and perhaps could more easily influence a planning process, in which the measure of power is technical expertise, rather than an ITU conference, in which the measure of power is votes. The United States has consistently opposed any increase in the power of the ITU, particularly efforts to expand the planning role of the International Frequency Registration Board (IFRB).

A broader, more extensive, and more conciliatory approach to international spectrum planning would be required under this option and could have a real chance of working, given some major changes in the U.S. approach. In the long run it could be the least expensive and most effective option available to this country.

Policy Option No. 5: Common-User System

As an alternative to contention for geostationary satellite orbit slots, the United States and other developed countries could enter into a joint venture with developing countries to construct, launch, and operate a common satellite system to meet domestic needs for telecommunication and/or broadcast services. The developed nations would provide the private capital and technological resources necessary to construct and launch the system, and would operate and manage it in conjunction with other using nations. All nations in the joint venture would have the option of purchasing a share of the com-

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mon enterprise, up to their actual percentage of use of the system, and sharing proportionately in any profits. Such an arrangement would be similar to that governing the INTELSAT global satellite system used for international telecommunication. High-capacity satellite systems employing technology to make a common-user system economic and operationally attractive to developing countries for domestic services is needed to make a common-user system for domestic services viable. Such a system could be part of the existing INTELSAT structure or a separate structure established for this purpose.

Many developing nations are concerned that the satellite orbit locations are being occupied rapidly on a "first-come, first-served" basis, and that by the time they are in a position to use satellite systems there will be no desirable orbit locations left for them. It seems clear that the requirements of developing countries will be for satellite service and not for satellite orbit locations that they may not be able to use. This option would provide service without allocating dedicated orbit locations for individual users.

Moreover, the cost of developing and launching a dedicated satellite system is very high, well beyond the capability of most developing countries for the foreseeable future. This option could provide satellite service well in advance of the time these countries could afford their own systems, and much more cheaply. No large initial capital investment would be required from user nations, and there would be little risk. The technical expertise required to use such a system is far less than is needed to construct one.

This is not a new concept. The precedent for such an initiative is the global INTELSAT satellite system. Today 106 countries, the great majority of them developing, share in the management and operation of the satellites that have been optimized for international usage.

A further indication of INTELSAT's success, and of the developing countries' stake in the INTELSAT organization has been that organization's evolution towards playing a larger role in provision of domestic satellite services. In 1974, Algeria proposed to lease spare INTELSAT capacity for enhancement of its domestic telecommunication network. Since then a total of 20 countries have leased capacity from INTELSAT for domestic services and an additional 15 countries have expressed interest in leasing capacity in the next 2 years. By mid-decade, the total number of clients could easily grow to 50 countries.

INTELSAT has responded to this demand by committing itself to include planned domestic capacity, as opposed to relying solely on preemptible, spare capacity, in future generations of satellites and has also sought to develop higher powered satellites to be compatible with the small ground stations that have proven to be the most economical for domestic services.

While this policy option does not address the full range of problems before ITU, it does offer the prospect of relieving the pressure on a particularly important and contentious issue. If low cost and technically attractive domestic satellite capacity is made available through an international organization that accommodates the sovereignty interests of each country, many developing countries could come to see access to orbital slots and satellite frequencies as a side issue with availability of service being the main objective. Adoption of the common-user system alternative would free-up orbital slots for those major developing countries that continued to desire their own separate domestic systems whether for political reasons, or because requirements justified such a system economically.

A common-user system need not require any Government funding by the United States. Sufficient capital and technical resources exist in the private sector in the

United States, and within Europe and Japan to construct such *a* system as a commercial venture with expectations of future markets for follow-on equipment and services. Alternatively, such systems could conceivably be initiated with World Bank loan guarantees.

In summary, to the extent that developing countries can be persuaded to evaluate their needs for domestic satellite service apart from political considerations, they may come to believe that a common-user system can serve many of these needs at an early date and more cheaply than can dedicated systems, which could be many years away. Whether operated by INTELSAT or by a separate organization, whether financed with public or private funds, such a common-user system could relieve the pressures now creating the international tensions over use of the geostationary satellite orbit. And while not a precedent in any specific way for dealing with the broader range of ITU spectrum problems, a successful common-user system might at least show that difficult problems can in some cases be removed from ITU for separate treatment.

Policy Option No. 6: "A Priori" Allotment

The United States could agree to participate with other nations in the development of a long-range plan for the utilization of satellite orbit locations to serve participating nations' domestic communications requirements. This plan would assure that orbital slots would be available for the use of all nations when needed. In exchange for this agreement, the developed nations would likely insist that the plan be based upon sound operating principles and updated regularly to take account of the latest, most efficient technology available. Technical planning assistance would be provided.

A priori allotment of satellite orbit slots has been a cause celebre among developing countries and at WARC-79 a resolution was adopted to consider this issue at a two-part space WARC in the mid-1980's. The United States and others have opposed a priori allotment plans for satellite service as wasteful and inhibiting to technological advancement, Although this option goes a long way toward accommodating the position of the developing countries, need not be adverse to U.S. interests. It maintains a substantial degree of flexibility important to the United States including the key qualification of a requirement for regular technological updating that would help to avoid the worse consequences associated with rigid allotment schemes like the one adopted at WARC-77 for regions 2 and 3.

As far as the United States is concerned, certain types of a priori allotment plans would not be as objectionable as others. Plans based on sound engineering and operational parameters might be workable internationally, at least on a regional basis. Indeed, U.S. domestic satellite operations are based more or less on an a priori approach. In the long run, the United States may have enough satellite capacity made possible by advanced technology to meet domestic needs even if the orbit and spectrum available to U.S. satellites is reduced. In the short run, the United States already has substantial numbers of operational satellites with additional satellite systems planned for operations in the near future.

In addition to the possible advantages that may result from updates to presently unforeseen technology, there are two factors that may help reduce the impact of a priori allotments on the United States. One is advanced technology including cellular satellite technology, already on the drawing boards, which will permit the construction of large, wideband satellites that can provide very large capacity from a single orbit slot. The other factor is the particular geography of region 2 (North and South America). As far as the geostationary orbit is concerned, region 2 is naturally divided into two parts—those nations located in the Northern Hemisphere and those in the Southern Hemisphere. A second geographic factor that serves to separate the hemispheres is the dis-

placement in longitude of the nations in the two hemispheres (see figs. 4 and 5). Moreover, those nations situated close to the Equator enjoy the widest possible visibility of the geostationary satellite orbit from within their borders and have the greatest flexibility in positioning satellites in that orbit.

Limitations on the number of satellites that can be placed in the geostationary orbit is the fundamental factor that must be addressed to arrive at a solution to equitable access for all nations in region 2. The capability of the geostationary satellite orbit is primarily limited by the need to separate satellites operating in the same frequency band. When serving the same or adjacent coverage areas are not in close proximity, the required separation between satellites serving these areas may be significantly reduced. For example, current U.S. requirements for separation between satellites in the fixed-satellite service serving a common coverage area is 4 to 5 degrees. However, a satellite serving the United States and another one serving a South American country, if properly designed, could be essentially colocated without harmful interference.

Figure 4.— Displacement in Longitude for Countries in the Northern and Southern Hemispheres

SOURCE Off Ice of Technology Assessment

A plan could be devised to take advantage of the geographic and technological factors discussed above, which would serve to isolate the capacity of the geostationary satellite orbit into subregional areas. Specifically, it is technically feasible and could be operationally practical for the geostationary orbit to be used by nations of North America essentially independent of the use of the orbit to be used by nations of South America. Moreover, the North American Continent consists of three countries with very large land areas that make the use of advanced technology using shaped-beam antennas attractive. Except for some possible coordination problems near the border areas, it may be possible to reuse the entire orbital arc separately for each of the three countries.

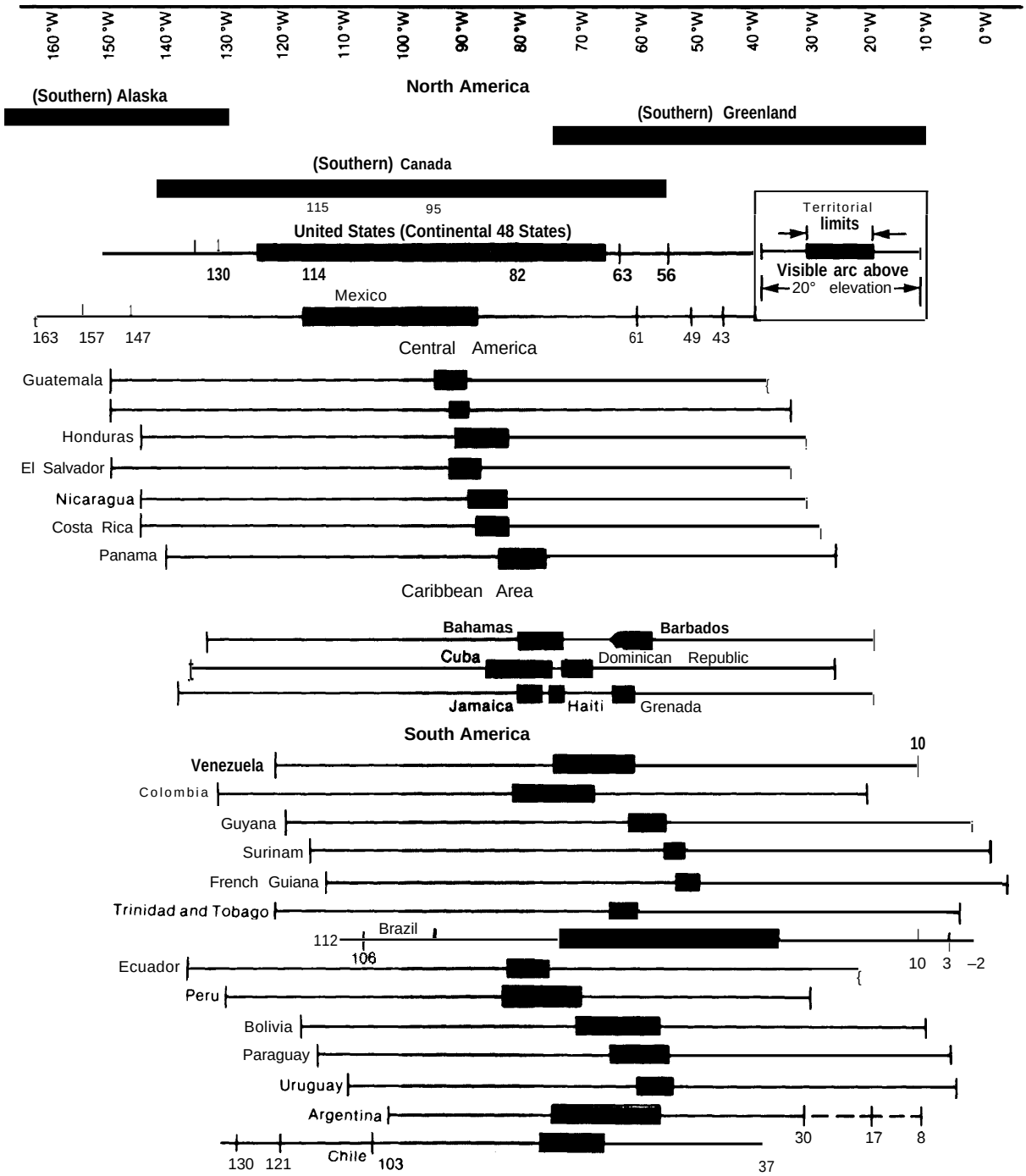
The implications of this approach and its linkage to the policy options discussed above are as follows:

1. This solution will require both coordination and planning by the member nations of region 2 (Policy Option No. 4).
2. This solution would essentially lead to a subdivision of region 2 into two parts (Policy Option No. 3).
3. The practical use of a common-user system would be enhanced by this approach (Policy Option No. 5).

Although an a priori plan is implied in the approach, it could be implemented without the adverse limitations of a rigid a priori plan such as adopted at WARC-77. If this approach is possible, then an a priori allotment to one country would not preclude using the same allotment for others if certain technical and operational guidelines were followed.

There may even be some benefits to the United States from adopting an a priori allotment plan. At present, there is considerable uncertainty about the outcome of the 1983 Region 2 Broadcasting Satellite Administrative Radio Conference and the Space Planning Conference in the mid-1980's. If a decision is postponed, the uncertainty would continue. A situation would then be perpetuated in which any existing

Figure 5.—Available Geostationary Arc



SOURCE J D. Barnia

domestic satellite orbit slot may potentially be withdrawn in the future. Moreover, no satellite system designer could plan the logical evolution of a proposed system with confidence that the required additional allotments would be available.

It is also important to examine the tactical aspects of agreeing to an a priori allotment policy. By participating in the development of a plan, the United States would be in a position to influence the type of plan adopted and possibly gain concessions on other issues of importance to the United States.

In short, the linkages and tradeoffs among these and other possible approaches to future use of the geostationary satellite orbit cast each U.S. policy option in a different light. Careful review in each case is needed for sound policy formulation. Rather than rejecting a priori allotments as inherently wasteful, it may be in the U.S. interest to examine the principle, to modify it to avoid its worst aspects, to examine the practical effects, to examine the possibility of a quid pro quo, and if the result looks acceptable, to work with the developing countries to implement the plan.

The results of the OTA-sponsored survey show that the majority (68 percent) of the respondents believe that a practical compromise is possible and desirable between the evolutionary approach and a rigid a priori plan for use of the geostationary orbit. Another 15 percent of the respondents think that a compromise is possible but undesirable from a U.S. standpoint. Only 8 percent of the respondents said that a practical compromise is impossible.