

DEPARTMENT OF STATE
UNDER SECRETARY FOR POLITICAL AFFAIRS

December 4, 1968

I enclose the latest, and I hope the final final revision of the Report, and of the Draft Transmittal letter. Subject to minor editorial revision, this is the document I hope to transmit to the President on Friday, December 6, 1968, with whatever notations of dissent are filed by two members who have expressed the intention of dissenting with respect to certain aspects of the Report.

Eugene V. Rostow
Eugene V. Rostow

UNDER SECRETARY OF STATE
FOR POLITICAL AFFAIRS
WASHINGTON

December , 1968

The President,
The White House.

Dear Mr. President,

We have the honor to present herewith the Report required by your Message on Communications Policy of August 14, 1967.*

That message called for a review of past activities in the field, and the formulation of a national communications policy.

To that end, you announced the appointment of this Task Force "to make a comprehensive study of communications policy."

Your Message of August 14, 1967, requested our study to be submitted within a year. Later, you extended that date to December 31, 1968.

Fifteen Departments and agencies** of the Federal Government have cooperated directly in the Task Force effort.

* Reprinted as an Appendix.

** Department of State, Department of Defense, Department of Justice, Department of Commerce, Department of Labor, Department of Health, Education and Welfare, Department of Housing and Urban Development, Department of Transportation, United States Information Agency, National Aeronautics and Space Administration, Bureau of the Budget, Council of Economic Advisers, Office of Science and Technology, National Aeronautics and Space Council, Office of Telecommunications Management.

The participation of the Federal Communications Commission (FCC) had a special character. In the nature of the Commission's statutory responsibilities, Chairman Hyde's service on the Task Force was necessarily ex-officio, and nothing in this Report should be construed as reflecting the views of the FCC. Within the limits of that principle, however, Chairman Hyde, his colleagues, and the staff of the Commission have cooperated fully and constructively in the studies and consultations on which this Report is based. Their contribution is gratefully acknowledged.

In addition to the direct participants and the FCC, valuable assistance was also received from other government agencies, from private industry and from the academic community.

A small staff supplemented these resources with its own independent research and the documents produced under eight special research contracts. A comprehensive series of staff papers, research reports and appendices were prepared. The Task Force has not passed upon or approved these documents, but they proved useful in our deliberations, and in the preparation of this Report.

A particular debt of gratitude is owed to Mr. Alan Novak, Staff Director, and to the able group of associates, consultants, and advisers he assembled. Their work was distinguished both in intellectual quality and in its acute sense of policy. And they understood and wholeheartedly accepted the spirit of compromise without which it would have been impossible to accomplish the task you set us.

Communications policy is a complex subject on which reasonable men can and do differ, and differ strongly. No member of the Task Force would have written the Report in the form in which we submit it. Most would have preferred the Report to say more, or less, on almost every topic discussed. But all understood the importance of achieving a

Report which included the ideas and recommendations on which we could agree. We are gratified that taken together our statement outlines what we consider to be a suitable framework for a national communications policy -- a policy which could further the great goal of using communications technology to advance understanding and conciliation, at home and abroad.

With respect and regard,

Yours sincerely,

Eugene V. Rostow

PRESIDENT'S TASK FORCE ON COMMUNICATIONS POLICY

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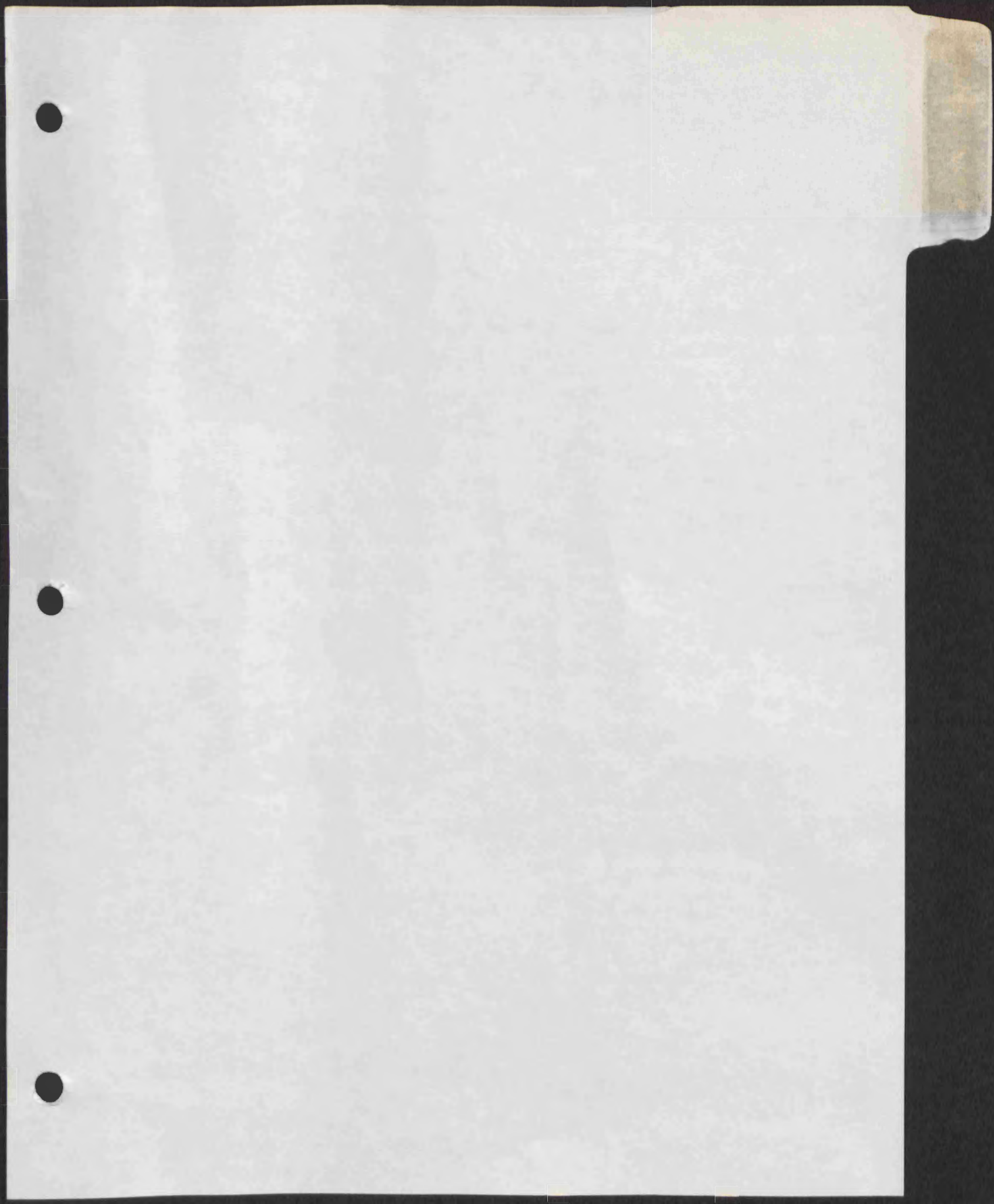
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CHAPTER ONE

INTRODUCTION

Few technological changes have had so profound an effect on the human condition as the development of telecommunications. Man today lives in a maze of electronic signals; it is certain that their influence on the quality of his environment will be even more important in the future than is the case today.

The potentialities of telecommunications are both inspiring and frightening. Modern methods of communications can be instruments of enlightenment, or tools of tyranny. They can make the best and the worst in man instantly available to everyone: great plays, knowledge, and the conversation of philosophers; cruelty, distortion and propaganda as well. They enrich the fabric of society, and at the same time they strain it. An effective strategy for meeting the worldwide yearning for education -- and first of all, for literacy -- is inconceivable without the use of television and other electronic communication tools to supplement the efforts of teachers. But television can also propagate and perhaps multiply themes of chaos. A truly global communications system could help knit the family of nations into a

living community, based on mutual understanding, and the universal diffusion of knowledge and skills. But if men will otherwise, it could also perpetuate mistrust, and deepen the divisions among nations and peoples.

Improved communications are essential to a growing world economy. They are vital to the progress of advanced and developing nations alike. New services promise to revolutionize customary patterns of business and finance, learning, entertainment and leisure, and the processing, storage and retrieval of information. Above all, they offer the citizen everywhere the opportunity to acquire the knowledge and the insight essential to the mature exercise of his responsibilities.

Within each nation, and among nations, the wise use of telecommunications is a key to success in building and reinforcing the sense of community which is the foundation of social peace: a sense of community based on freedom, and on tolerance of diversity; a community which encourages and appreciates the unpredictable richness of human imagination; but a community nonetheless, faithful to its own rules of civility and order.

In the United States, our faith is committed to the principle of freedom of speech. Telecommunications have afforded new dimensions, and presented new problems, in the

exercise of freedom of speech, the most fundamental of all freedoms for a democracy. On the one hand, telecommunications provide a vehicle for vastly enlarging the reach and impact of individual expression. On the other, however, access to the medium is not unlimited. Recognizing this dilemma, national policy has carefully sought, at least since the passage of the Communications Act of 1934, to develop a legal and economic framework for communications policy which allows many voices to compete in the market place of ideas and of taste. We have taken pains to protect society against the risks of concentrated power, in the hands either of government or of the communication companies. In this connection, we note with high hope the passage of the Public Broadcasting Act of 1967, and welcome the contribution it should make to the quality and variety of the broadcasting available to our people.

We have not interpreted our mandate to require a study on our part of the content of communications, or of the challenges we face in establishing rules of the game for the exercise of the power and the privilege of mass communication. But an awareness of these problems is the context of our study.

We do believe that the social and psychological effects of mass communication define one of the most important of all fields of research, both for public and for private groups, in the years before us, and we recommend that they become an active focus for sustained effort. This is an area where we cannot afford to have public policy based on ignorance. What is at stake is too precious, and too fundamental, to be lost through neglect.

II

Our study then is addressed primarily to the legal and economic structure of our communications system, and to the policy considerations which in our view should guide its evolution, both at home and abroad. New technology is transforming the realm of communications. One of the most basic aspects of our mandate is to make recommendations for the integration of new and old communications facilities into a balanced communications system which could meet the needs of a dynamic and expanding world society.

Four axioms have guided our work.

First, we deem it to be an accepted goal of national policy that the United States remain a leader among the

nations in communications science and technology, and in communications service. This target for policy is not a matter simply of pride. Communications technology is an increasingly fundamental aspect of national security. Telecommunications can play an equally fundamental role in achieving understanding and harmonizing conflict within and among modern societies dominated by diversity, mobility, and the claims of social justice. Telecommunications are an essential support for world commerce and finance. And communications equipment and know-how, like other products of advanced technology, should represent a rising share of our exports. For the foreseeable future, moreover, our communications technology will be a principal factor in efforts to develop and perfect a global system of communications through which knowledge and information could be made universally available.

Our present lead in communications technology is not a gift of nature, but the consequence of history and organization, and the stimulating impact of wartime and postwar government and private programs of research. Other industrial

nations are making rapid progress. For many reasons, we cannot and should not tolerate the waste of missed opportunities.

Second, we take it as self-evident that telecommunications policy should seek to maintain and develop an environment always sensitive to consumer needs. It should be an environment hospitable to productive innovation in facilities, services and management. Advancing technology promises a host of new opportunities. Among them are: the realization of the full potential of satellite communication and teleprocessing; the production of terminal equipment offering small business users a far wider range of telecommunications services; and the expansion of the range and diversity of television. The challenge is to transform the fruits of technological knowledge into tangible benefits for the public, through cost-reducing innovation and well-conceived public policy.

Third, the realm of telecommunications should be viewed as a system, extending from public and private research, at one end of the spectrum, to the provision of private and

common carrier communications services, at home and abroad, at the other. Our study has taught us the necessity to keep the whole of this system, and its interconnections, steadily in view. We have found that none of its problems can be examined in isolation, and therefore that piecemeal or segmented treatment of any one of them can be misleading.

Fourth, we have assumed that special consideration should be given to the needs of the developing nations. Modern telecommunications systems can be a valuable -- indeed, nearly indispensable -- catalyst of their economic, social and political progress.

III

The role of government is of unusual importance in telecommunications. How well government meets its responsibilities is and will continue to be a major factor in the development of the communications system as a whole.

One cannot carry on the telephone, telegraph or broadcasting business, either domestically or internationally, without government approval and regulation. Access to the

radio frequency spectrum is necessarily managed by government. Government is a major consumer of telecommunications services and equipment, and supports extensive research and development. It is deeply involved in international cooperative ventures like the International Telecommunication Union and the International Telecommunication Satellite Consortium (INTELSAT). We also note that if widespread applications of telecommunications to the problems of disadvantaged minority groups at home and of poor nations abroad are set in motion, such programs will be realized only with the initiative or support of government.

Government cannot and should not take over the functions of private business. Indeed, in certain areas, we recommend that policy rely more on market forces, and less on regulation, than in the past. But the wisdom of government policy in telecommunications will have a great deal to do with the capacity of the private sector to realize its full potential.

The essential goal of national policy, in our view, is an optimal rate of improvement in our telecommunications capability, based on progress in science, technology and the

arts of management and addressed to the growing needs of its users. To achieve this goal, policy should continue to rely largely on the spontaneous initiatives of private business and non-governmental research, supplemented where necessary by government-supported or sponsored research and development.

The main concern of policy in this field should be to improve the effectiveness of regulation where regulation is necessary, to remove unnecessary restraints on private initiative, and to provide as free a field as possible for the imagination and enterprise of innovators.

Among the most pervasive of our findings, therefore, is the need to strengthen governmental capabilities, both in the FCC and in the Executive Branch, to develop and implement policies which will enable the private sector to reach its full potential. This recommendation is discussed in Chapter Nine. In recent years, most markedly in the common carrier area, the FCC has confronted a host of policy problems engendered by the rapid advance of technology and services. More loom ahead. It currently lacks resources

to deal adequately with the burdensome day-to-day business of administering the regulatory statutes and to develop long-run policies. It needs increased resources and the assistance of a strengthened Executive Branch organization embodying a variety of missions and personnel. Unencumbered by day-to-day regulatory chores, that organization should be charged with coordinating executive roles and should be capable of taking the long view of policy problems.

The most notable feature of the telecommunications system viewed in perspective is its extraordinary rate of technological change. In recent years, communications have gone through a revolution in technique, and others are in prospect. It follows that one of the most important qualities to be stressed in guiding the evolution of the system is adaptability to change. We should seek to establish policies and institutions which maintain and if possible increase its capacity to respond constructively to new opportunities, both by removing impediments, and by improving incentives.

Important as it is to answer the specific policy questions put to us in the President's Message of August 14, 1967, it

is even more important to strengthen existing capacity and to create a new policy entity in the Executive Branch capable of answering comparable questions in the future as they arise. No ad hoc group like this Task Force can hope to clear the desk for long. In this field, we can be certain, problems of public policy will continue to develop, in view of the pace of change, and the government's deep and continuous involvement.

IV

The Report is organized around certain topics: the organization of our international telecommunications industry; policies to support and strengthen INTELSAT; telecommunications needs of less developed countries; uses of domestic satellites; structure and regulation of the domestic carrier industry; future opportunities for television; spectrum use and management; and Federal Government roles in telecommunications.

In this Introduction we do not undertake a separate summary of each chapter. Rather, we review the main policy recommendations of the separate chapters in a functional

perspective which identifies six principal themes. Those themes, which shape many of our recommendations, are:

1. promoting experiment and technological advance;
2. determining the proper roles of monopoly and competition in the provision of telecommunications services;
3. enhancing the potentialities for progress through the removal of unneeded or obsolete restrictions on private initiative;
4. improving the capacity of government to meet its continuing responsibilities in telecommunications;
5. expanding study and research, both public and private, in the field of telecommunications policy and;
6. promoting international cooperation.

(1) Promoting experiment and technological advance.

We stand at the threshold of an immensely promising era in applying new technology. To achieve the full potential benefits of the new technology, however, operational experiments will often be needed to explore the feasibility and flexibility of full-scale systems. In some instances

government support for such efforts will be necessary and desirable. Three specific areas for such experiment and innovation are recommended in the Report.

The first is the domestic application of communications satellite technology which is treated in Chapter Five.

Satellites already seem a promising transmission mode for domestic wideband communications services. There are still more attractive potentialities for the future. A number of proposals for action in this area are now before the FCC. But the issues are complex. Existing investment and prospective innovation in the domestic terrestrial telecommunications system constitute one dimension of the problem. Different institutional and functional approaches to the exploitation of satellites constitute another. Other factors, including spectrum considerations and the nature of our international commitments, caution against irrevocable decisions or closed minds about the future use of satellites in providing domestic telecommunications services.

We must contemplate the possibility that permanent approval of any fully operational system at this time might

well fix the institutional and operational framework of domestic satellite communications services prematurely and foreclose valuable options for the future. Before we reach any final decision about the ownership and operational design of domestic satellites we think it is desirable to benefit from some exploratory operational experience.

In Chapter Five, we recommend a prompt start upon a pilot program designed to provide useful technical, operational and economic data as a basis for more permanent policy decisions. On the basis of its operational experience in the satellite field, ownership of the space segment and the overall management responsibility for the program should be entrusted to Comsat. But, to the extent consistent with the economic and operational viability of the venture, common carriers, broadcasters, and other users should be eligible to participate in ownership of ground stations. However, they, and Comsat alike, should be authorized to participate in the pilot program as interim owners without any assurance of more permanent rights upon the expiration of the project.

Direct access to the satellite by various classes of users should be assured; such flexibility will increase the yield of vital information and afford an opportunity to explore design and operational alternatives for subsequent full-scale systems.

Second, as recommended in Chapter Four, our studies indicate that improved telecommunications generally promise important contributions to the less developed world. Educational television and satellite communications are particular examples. Administrative and other problems involved in introducing modern technology into the fabric of a less developed country are considerable, and their cost and difficulty are generally underrated. Careful preliminary testing and training will be required before we can reach firm conclusions about the possible contribution of full-scale applications of telecommunications technology to major development problems in some of the less developed countries. Thus, we propose the exploration of realistic programs of regional and international cooperation in this area, with international support, where appropriate, for such efforts. The immediate need, again, is for feasibility studies and modest pilot projects.

Finally, in Chapter Seven, we recommend serious exploration of experimental domestic programs designed to test the utility of television in support of activities to assist disadvantaged groups within our population. Our studies suggest constructive possibilities for the use of television to help overcome some of the problems of urban ghetto dwellers. Isolated rural people such as the inhabitants of Indian reservations could benefit from similar undertakings. But government or foundation support and leadership would almost surely be needed to launch pilot programs of this type.

(2) Determining the proper roles of monopoly and competition in the provision of telecommunications services. The premise of our law with respect to industrial organization is that competition should be the rule, and monopoly the exception. Monopoly must be resorted to where a single seller is desirable as a consequence of conditions that permit him to offer most economically the full supply required by the market. Under such circumstances the monopolist is usually regulated by public authority to protect the public interest.

In the field of domestic telecommunications our public message telephone service is such an example. We find in Chapter Six that, under existing technology, the integrated provision of that service by common carriers is satisfactory and should be preserved. This conclusion is based on considerations of system optimization, system integrity, and service reliability. It is based as well on considerations of national security policy. But an integrated public message telephone service is not a static configuration. The telephone network is constantly evolving, for it exists in an environment being continuously transformed by change: technological developments; new services, and the demand for even newer ones; and changes, too, in the ideas governing public regulation.

The goal of public policy in this area should be an environment for the provision of services which will assure the maximum freedom of opportunity for such developments while preserving the integrity and economic viability of the basic integrated network.

Obviously parts of the communications industry viewed as a system do not and cannot significantly affect the basic telephone network. Their potential can and should be used

in the improvement of that network, and allowed to provide services which supplement those of the telephone network.

In the international field, cable and high frequency radio facilities are maintained by the U.S. international voice and record carriers, and satellite services are provided by Comsat through INTELSAT. The present industry structure largely divides international communications by type of traffic and mode of transmission. But the old distinction between voice and record services has lost its technical significance; both voice and record transmission are now carried by identical facilities. And the growing capacity and resultant economies of scale of new modes of transmission challenge the structure of the industry.

Two technological factors underlie the structural problems of the international industry: the rapid deployment of communication satellites, and the development of transistorized undersea cables -- each with vastly greater and continually growing capacity than earlier modes of transmission and at lower cost per circuit. It is estimated, for example, that in the early 1970's a single satellite

will have sufficient capacity to handle all Atlantic basin requirements for communications traffic originating in or destined for the U.S.

This fact threatens the possibility of rational economic decision making for future investments in this sector of the industry, under its present structure of divided ownership. No single firm is now in a position to decide between alternative techniques for meeting requirements on operational and economic grounds. And, under present regulation, traffic may well be divided, and investment decisions made, on the basis of compromises deemed fair and equitable to industry claimants, rather than on the basis of minimum social cost.

On balance, cable-satellite rivalry under the conditions prevailing today does not promise that social benefits will be sufficient to outweigh the cost of uneconomic investment decisions. Nor does it appear likely that conditions of more effective competition can be established by modifications of existing rules and practices.

For this, and other reasons, we favor a single international transmission entity, and recommend a consolidation of facilities designed to bring about such an entity, subject to certain safeguards and conditions.

However the industry structure may evolve, a strengthened regulatory capability is needed to deal with major investment decisions in the future. And in the absence of a restructuring such as we propose, we conclude that a reconsideration of certain past regulatory rulings would be desirable. In this context, we would favor elimination of carrier participation in Comsat.

(3) The removal of unnecessary restrictions on private initiative. Some areas of the telecommunications system do not or need not affect the integrity of the switched public message telephone network. Here the goal of policy should be the removal of unnecessary restraints to promote innovation and to encourage greater responsiveness to consumer needs.

One such area, discussed in Chapter Six, includes services which supplement those of the basic public message telephone network. In recent years, we have seen a growing

demand for private line communication services by government and business users, both large and small. Subject to regulations designed to protect the integrity, reliability and viability of the integrated system, we recommend that greater opportunities should be opened for suppliers of supplementary services, both for-hire and not for-hire, to enter the market. More flexible opportunities for entry should be matched, moreover, by pricing policies which allow the established carriers to compete fairly with the new suppliers. Under such conditions, rivals would be on an equitable footing, cost reductions could be expected in certain areas, and the communications system could be fortified by the development of new equipment and new services of value to many parts of the economy.

Teleprocessing, as the combination of computer and communication services is known, represents another kind of supplemental service which has become increasingly popular. In this field, the removal of tariff restrictions on the sharing of communications lines, on splitting or resale of channels, and on message switching, seems compatible with maintaining the integrity of the basic communications network.

And in light of our finding that the field of teleprocessing currently lacks natural monopoly features, we believe that computer service companies should be permitted to compete generally on an unregulated basis, offering computer services including message switching and line sharing as well as data processing.

A third area where relaxation of some restrictions may be desirable is in broadcasting. Recent years have witnessed the growth of cable as a mode of television distribution to the home. Cable television has high promise as a technology for improving and diversifying television services. In our view, its development should be governed by regulatory policies which allow freedom for fair competitive market forces, while safeguarding the public interest in over-the-air broadcasting. In Chapter Seven, we recommend an approach to such regulatory policies, which could permit a flexible accommodation between the development of cable services and the existing broadcasting industry.

Finally, in Chapter Eight, we conclude that policies and institutional arrangements relating to the electromagnetic spectrum require modification, to assure fuller and more economic use of this invaluable and scarce resource.

The privilege to use spectrum is obtainable only from the Federal Government. The thrust of our findings is that greater flexibility is needed in spectrum management. The present system of established administrative priorities is excessively rigid, and retards flexible adjustment to variations in needs and benefits. This is further aggravated by a single nationwide division of resources and management authority between Federal Government and non-government spectrum uses. Additional inflexibility results -- particularly in non-government spectrum use -- from the practice of allocating blocks of spectrum to specific user groups on a nationwide basis.

We have not discovered any simple solution to these problems. Our studies have encompassed the most frequently proposed alternatives to the existing pattern of administrative allocation: creating freely transferable property rights in spectrum, or creating an even more complex allocation system through the extensive use of the techniques of spectrum engineering. We are persuaded that the most promising solution at this stage involves an eclectic approach. That solution would preserve the essential

character of the present system while introducing important -- if incremental -- modifications of existing administrative, economic and engineering practices.

Among our principal recommendations, we urge the consolidation of the spectrum management function in a single Executive agency. We think it can more effectively achieve optimum utilization of this unique and valuable resource. Further, we urge the relaxation of the block allocation system and, in some areas, a movement away from administrative allocation toward market methods which could help shift some lower-valued uses of spectrum to higher-valued uses. We also recommend greater use of modern engineering techniques in the assignment of spectrum and coordination of spectrum uses.

(4) Improving the effectiveness of government's role. A strengthened telecommunications capability in the Federal Government is important to many of our recommendations. In this connection, we recommend changes in the Communications Act of 1934, to bring the statute up to date, and to give the FCC adequate authority and opportunity to review the major

investments which constitute the rate base of regulated entities. We also recommend that regulatory capabilities be adequate to provide incentives for cost reduction, and to determine the interplay of competitive and monopoly factors in the industry.

Our studies show that neither the FCC nor the Director of Telecommunications Management (DTM) has the resources required to discharge their present regulatory and Executive Branch responsibilities satisfactorily. Our recommendations for improved regulation would increase the burden on the FCC. Therefore, greater staff capability is essential.

Pursuant to the President's instructions, the Bureau of the Budget will report separately on its review of the administrative and managerial aspects of government organization in this field. In our report, we recommend that the Executive Branch should have a strengthened capability to address the broad range of policy questions of concern to the Executive. It should have adequate technical and financial resources to make appropriate long range studies; to give useful advice on specific issues to the FCC, to

State governments, to various Executive Branch agencies, and to private groups and industries; to explore new applications of telecommunications; and above all to coordinate Executive roles in telecommunications leading to development of coherent and forward looking policies guiding Executive action. It should also have the responsibility for unified spectrum management proposed in Chapter Eight.

Among its other roles, the Executive should have the capability to determine (with the Department of Labor) the nature and extent of any employment effects which might result from the organization and technological changes flowing from this report, and develop appropriate employment and adjustment assistance measures to meet any potential problems. */

These tasks should supplement and reinforce, not duplicate the work of the FCC, and the strengthening of Executive capability should not detract from or delay the augmentation we recommend for the FCC.

*/ Beyond this, the government should develop measures for protection against possible adverse effects due to technological change.

(5) More research and study. In our study we were repeatedly struck by the paucity of data relating to the economic characteristics and performance of the telecommunications industry. The field of telecommunications has thus far not generated anything like the amount of serious policy research that its importance justifies. Effective policy making, both by business and by government, could profit from the sustained study and critical analysis of well-informed scholarship. We therefore urge governmental, foundation, and business support for increased inter-disciplinary research and training in telecommunications policy.

To ensure that the government is exposed to a steady flow of independent, critical and creative ideas, we believe that an institute and preferably more than one institute, for communication policy training and research should be developed outside the government. Such institutes should undertake the advanced interdisciplinary training of communications experts -- economists, lawyers, engineers, management experts, social scientists and others -- to deal with problems of communications policy which transcend the confines of any single discipline.

(6) International cooperation. INTELSAT -- the global communications satellite consortium in which 63 nations, including the United States, are now represented -- had led to a wholly new pattern of cooperation in the communications field. It provides a striking demonstration of successful international cooperation in a complex undertaking -- planning and operating a global satellite communications system. We should continue to support the goal of developing and perfecting the global system, taking into account developments since 1964 as well as those now in prospect.

Definitive arrangements for INTELSAT are to be negotiated in 1969. We suggest in Chapter Three that these arrangements should be sufficiently flexible to adapt to the changing needs of INTELSAT members, and to accommodate specialized satellite facilities, without weakening the foundations of the global system. INTELSAT's institutional structure and decision-making process should be modified where necessary to reflect changed circumstances since its creation. In Chapter Four, we emphasize the importance of international cooperative arrangements for satellite applications in less

developed countries. INTELSAT should play a key role in those cooperative ventures.

V. CONCLUSION

In his Message of August 14, 1967, President Johnson said:

"This message does not create a new communications policy for our nation. Rather it proposes the foundation for that policy.

- It reaffirms our intentions as a partner in INTELSAT.
- It considers the need for modifications in our international communications posture.
- It sets in motion the necessary studies for a better understanding of policy needs in domestic and international communications."

The issues of policy we have isolated for examination in response to the President's charge are those we deem now to be most relevant. Many of our conclusions are necessarily tentative. They define what we regard as the directions that policy ought to follow, rather than definitive solutions for complex and closely balanced controversies now before our government. We conceive this Report as a compass for policy, not a blueprint.

We submit it with renewed appreciation for the critical importance of national telecommunications policy to many of our most vital national goals, at home and abroad.

CHAPTER TWO

ORGANIZATION OF THE UNITED STATES INTERNATIONAL COMMUNICATIONS INDUSTRY

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CHAPTER TWO

ORGANIZATION OF THE UNITED STATES INTERNATIONAL COMMUNICATIONS INDUSTRY

INTRODUCTION

The impact of satellites on communications was a central theme of President Johnson's Message to Congress of August 14, 1967. The development of satellite communications by INTELSAT since 1964, and the promising future of satellites are transforming the environment for international communications. The posture of our nation's international communications industry was another central theme. The President noted that unlike most other nations, the U.S. has no "chosen instrument" to handle its international communications, and that while our "normal instinct is to favor the existence of multiple companies in each commercial field ... there is a legitimate question as to whether the present division of ownership in our international communications industry continues to be in the public interest."

The nation needs efficient, low cost, reliable communications with other countries. This is important not only to private individuals and businessmen, but to

the government as well, since it is by far the largest single user of international commercial communications.

International communications are vital to our national security, and serve as an important vehicle for furthering the foreign policy objectives of the United States, including promotion of international cooperation and cordial relations with other countries.

For the less developed nations, cheaper, more reliable and more direct methods of communication are indispensable. Progress in all fields of endeavor -- both in the advanced and less developed countries -- requires modern communications to facilitate the rapid diffusion of information and ideas and to promote international trade and commerce -- a catalyst for worldwide progress.

The structure of our international communications industry has been debated intensively for many years. Congress has given the FCC authority to confer antitrust immunity to a merger of the domestic telephone and telegraph carriers, but such authority presently does not extend to restructuring the international communications industry. In 1966, the Intragovernmental Committee on

International Telecommunications, composed of officials of the Departments of State, Justice and Defense, the Chairman of the FCC, and the Director of Telecommunications Management, submitted a report to the Senate and House Commerce Committees recommending legislation to amend the Communications Act of 1934 to permit the FCC under its proceedings to authorize restructuring of the industry under certain conditions if the FCC decided that such a step would be in the public interest.

This Task Force believes that a basic reorganization of the industry to form a single international transmission entity is desirable, subject to certain safeguards and conditions, in order to assure the achievement of our nation's goals in international communications.

I. THE PRESENT ORGANIZATION OF THE U.S. INTERNATIONAL COMMUNICATIONS INDUSTRY IS THE PRODUCT OF LONG TECHNOLOGICAL EVOLUTION AND NUMEROUS GOVERNMENT DECISIONS

Telegraph cables and high frequency radio were the principal modes of U.S. international communication until the introduction of voice-grade submarine cables in the 1950's, which provided transoceanic telephone service of much better quality than previously, and also provided facilities for telegraph circuits at much lower cost than through telegraph cables.

The early 1960's saw the development of satellite communications. The existing common carriers urged that communication satellites, like voice-grade submarine cables, be entrusted to them. Others, citing the immense governmental investment in space technology, called for public ownership. In the Communications Satellite Act of 1962, Congress followed a middle course. It provided for the creation of a new entity, Comsat, to exploit communication satellite technology and serve as the U.S. participant in a global satellite system. Under the Act, Comsat is subject to more extensive government regulation and supervision than the other common carriers, who are subject to FCC regulation only under the 1934 Communications Act. Furthermore, the 1962 Act reserved 50% of the corporation's common stock to authorized common carriers, who elect six of the 15 members of Comsat's board of directors;*/ the non-carrier, or public stockholders also elect six directors; and three are appointed by the President, by and with the advice of the Senate.

*/ As of Nov. 1, 1968, the carriers held only about 42% of the outstanding common stock of the corporation, and legislation has been proposed to revise the formula specified in the Act for carrier representation on its board of directors.

The global satellite system envisioned by Congress in 1962 began to take shape in 1964, when the INTELSAT Interim Arrangements created an international joint venture of operating communications entities to own and operate the space segment -- the satellites and related facilities -- of the global system. Consat participates in INTELSAT on behalf of the United States. INTELSAT now has four satellites in operation providing about 960 circuits in the Atlantic and Pacific Ocean basins, and plans service in the Indian Ocean in the near future. The two Atlantic basin satellites have a capacity about equal to the presently operating transatlantic voice-grade cables. Extensive further development of the global satellite system is planned.

Our international communications are now handled in several ways. Message telephone traffic travels over the domestic telephone network to cable heads, satellite earth stations, or high frequency radio stations. This traffic is then carried to distant points on voice-grade submarine cables (mainly by AT&T), on INTELSAT satellite circuits, or -- to a decreasing extent -- by high frequency radio.

Record and mixed voice-record (alternate voice/data or AVD) traffic is carried by domestic telephone or

Western Union lines to the office of the international record carriers in gateway cities (principally New York, and San Francisco), thence to cableheads, earth stations, and radio stations for long haul transmission as before. The principal record carriers are ITT World Communications (a subsidiary of ITT), RCA Global Communications (a subsidiary of RCA), and Western Union International (separated from the domestic Western Union Company in 1963).

The international voice and record carriers (together with their foreign counterparts) own the voice-grade cables used in international service. They obtain INTELSAT satellite circuits by lease through Comsat and share ownership of the U.S. earth stations with Comsat. The voice and record carriers each own high-frequency radio facilities.

Comsat is already showing an operating profit; the record carriers are operating in the black; and the entire industry is growing rapidly. But this current growth should not hide the fact that the advent of commercial satellite communications, the changing environment of international operations, and recent regulatory decisions have had a serious impact on the industry.

II. A FUNDAMENTAL RE-EXAMINATION OF THE INDUSTRY IS
NEEDED

A. A Fragmented Ownership Structure Poses a
Principal Problem

Present U.S. industry structure largely divides international communications by type of traffic and mode of transmission. But the old distinction between voice and record services has lost its technical significance; both voice and record transmission are now largely carried by identical means. And the growing capacity and resultant economies of scale of new modes of transmission set a major challenge to our compartmentalized industry structure.

In its simplest form, the policy question posed, to paraphrase Judge Learned Hand's famous phrase, is whether technology has now thrust monopoly upon the international communications industry. More specifically, we must examine in the context of the present and prospective technology and organization, whether rational economic investment choices are most likely to be made among alternative modes of international transmission, now or in the future, without reorganizing the industry to form a single operating entity for international transmission.

Two technological factors underscore the structural problems of the international industry: the rapid deployment of communications satellites, and the development of transistorized undersea cables -- each with vastly greater and continually growing capacity than earlier modes of transmission and at lower cost per circuit. It is estimated that in the early 1970's a single satellite will have the capacity to handle all Atlantic basin requirements for traffic originating in or destined for the United States -- and these requirements are substantially greater than in any other region in the world. Economies of scale in submarine-cable technology are also rising rapidly. The largest transatlantic cable operating today has a capacity of only 138 circuits. TAT-5, which the FCC has recently authorized, will have 720 circuits, and it is expected that by the middle 1970's cables with a 2500 circuit capacity will be available -- and at much lower cost per circuit than today's undersea cables.

In the present environment, investment decisions involve considerations which will make it difficult to achieve that combination of satellite and cable facilities

which best serves the nation's needs and particularly, avoids overbuilding. A major concern of telecommunications policy should be to protect users from having to bear the burden of unwarranted investments in communications facilities.

Recent industry and government decisions illustrate the nature of the issue. In 1966, the FCC approved separate applications to build an earth station in Puerto Rico and a transistorized 720 voice circuit cable from Florida to the Virgin Islands. Although the cable was defended on grounds it would provide interim capacity for service between North and South America and the Caribbean area, even if the highest responsible estimate of demand for 1970 should materialize, either the cable or earth station will turn out to have been a redundant facility. Yet cable and satellite interests supported the parallel developments. In granting both applications, the Commission stipulated that new traffic was to be allocated 50/50 between satellite and cable circuits. The social costs of policies designed to maintain a rough parity between cable and satellite communications

are not trivial. TAT-5, a new transatlantic cable recently authorized by the FCC with the concurrence of the State Department, will involve an initial investment of \$70 million and require revenues of some \$250 million over its useful life. Should satellite capacity alone be adequate in the near future to accommodate all transatlantic traffic at comparable or lower costs -- a prospect which appears quite likely, given INTELSAT IV development and projections of traffic demand -- these cable revenue requirements may be quite burdensome to users.

The goal of policy in international communications should be a system which permits such investment choices to be made on sound economic grounds, once the claims of defense and other national interest and foreign policy requirements are met. An efficient international communications system will increasingly require a careful meshing over time of the various methods of transmission -- submarine cables, high-frequency radio, satellites and their attendant earth stations, and doubtless other future techniques as well. Each method has advantages and disadvantages; different patterns of costs and benefits;

different capacities, service characteristics, vulnerabilities to accidental or hostile disruption, useful lifetimes, and building times. To achieve the best blend of facilities in international transmission will involve complex investment decisions among alternative transmission technologies for meeting new demands. Today, no single firm is in a good position to make such overall decisions. The FCC normally acts as a reviewer, not an initiator, of investment decisions, and in any event, it is very difficult to make comprehensive long-range and systematic judgments regarding alternative technologies based on sporadic filings by interested parties. Nor has the Executive Branch performed this latter function.

The voice and record carriers now have a number of reasons for preferring investment in new cables to the leasing of additional satellite circuits from Comsat. Some may not be congruent with overall system optimization. These reasons include considerations of law with respect to their rate-base; the business policy of providing customers a complete communications service entirely under their control; reluctance to become dependent on Comsat,

a potential competitor; actual or imputed differences between self costs (for cables) and lease costs (for satellites); greater confidence in their own ability to establish and maintain facilities; and, on the part of the record carriers, concern over being relegated to a minor role in the industry. These considerations reflect the fact that, when Comsat was given a monopoly position in the global system, the carriers were thereby precluded from direct participation in satellite ownership for international communications. They do, however, under interim FCC policy, share ownership of satellite earth stations. Comsat is in the converse position of having an exclusive commitment to satellites, and thus a natural interest in pressing the development of this mode of transmission. It has no interest in cables and is not authorized by law to make cable investments.

Some doubt has been expressed whether this problem is serious. Conceivably, the practices of AT&T and the record carriers up to now may have reflected the fact that satellite circuits were not significantly cheaper because of satellite pricing policy. Were decisive cost advantages soon to appear in satellites, as many anticipate,

the preference of carriers in favor of cable technology might prove to be merely transitional. Arguably, moreover, such preference might be countered by appropriate regulatory action. The present structure has been said to have some advantages since it pressures carriers to expose for government decision competing choices and considerations, and to pass to the public economies in the form of lower rates and diversity of service. Giving due weight to such considerations, we are nevertheless persuaded that the central problems in the industry cannot be adequately dealt with in the absence of a fundamental restructuring of the industry.

No firm is now well situated to decide between alternative techniques of meeting a particular requirement on operational and economic grounds. And, under present regulation, traffic may well be divided arbitrarily, and decisions made, on the basis of compromises deemed fair and equitable to industry claimants, rather than on basis of least social cost. On balance, cable-satellite rivalry under prevailing conditions does not promise sufficient social benefits to outweigh the dangers of uneconomic investment decisions.

B. Other Pressing Problems Concern the Future Roles of Comsat and the Record Carriers, and Government Regulation and National Policy

1. The future of Comsat. Controversy over the role and future of Comsat has not abated since its creation in 1962. Instead of finding a fully-accepted place in the industry, Comsat has found itself locked in controversy with the established voice and record carriers on a number of occasions. Some of these differences have resulted in FCC decisions that have had a major impact on the corporation.

In its "authorized-user" decisions the FCC ruled that Comsat was a "carrier's carrier" precluded from serving users directly except in unique or exceptional circumstances. Under these rulings, which raised serious questions concerning the interpretation of the 1962 Communications Satellite Act, Comsat was forbidden to serve the government directly except when required by the national interest. In its "earth station" decision last year, the FCC reconsidered an earlier ruling and authorized the international carriers to own a 50% share of each U.S. earth station built or then planned, with Comsat owning the other 50% and acting as manager. To

finance its share of the global system, Comsat raised some \$200 million by an initial issuance of stock. Today more than two-thirds of Comsat's original capital remains in cash or securities rather than in productive communications assets.

Comsat's interlocking directorate with the carriers has been a source of continued controversy. Experience has shown that in many areas, Comsat has interests conflicting with those of the terrestrial carriers. Despite the authorized-user decisions, which insulate them from direct competition, the terrestrial carriers and Comsat are rivals in a very real sense.

Finally, Comsat's domestic role is uncertain. Comsat has a monopoly position as the U.S. entity in the global satellite system, and concern has been expressed about permitting it also to enter the domestic satellite field -- particularly if it should be given a monopoly of all commercial satellite communications, domestic and international.

The role of the government in Comsat's creation and the corporation's significant role in international communications make these problems of public concern.

2. The future of the record carriers. The international record carriers offer three basic kinds of services: telegram (equivalent to domestic Western Union public message service); teletypewriter (equivalent to domestic TWX and Telex), and switched narrowband and broadband data (computer-to-computer); and leased line services, either pure record or mixed voice record (AVD). They also often provide their customers with terminal equipment. Persistent controversy has surrounded the status of the international record carriers.

In the U.S., these carriers are largely dependent upon the facilities of the domestic telephone and telegraph carriers. Thus, in the case of public message service (outside certain gateway cities), an individual desiring to send a telegram overseas contacts the local Western Union office which transmits the message over its lines to an international record carrier switching center in the appropriate gateway city for transmission overseas. If the individual does not specify a particular international record carrier to handle his message, Western Union will transfer it to a carrier in accordance with current quotas under a formula established by the Communications Act of 1934. In the case of the teletypewriter exchange and switched data services

non-gateway city customers are with few exceptions subscribers to Western Union's Telex or AT&T's TWX service who also use their instruments for international service. Automatic Telex service (customer dialing) is possible with an increasing number of overseas points. For leased services which are not switched, the international record carriers have no real switching or interfacing functions, although the transmission is run through a loop from a domestic carrier's lines to a record carrier's office where it is monitored and tested. In most instances, a record carrier derives as many usable communications channels as possible from the transmission capacity available through the undersea cable or satellite and also supplies the equipment to maintain signal quality. The record carrier also furnishes terminal equipment used by leased line customers.

AT&T's offer of alternate voice-record service (AVD), and to some extent, the availability of high-quality telephone service in AT&T's submarine cables, made deep inroads into the record carrier's business and profits. But an FCC decision in 1964 provided a regulatory framework in which they could expect to maintain profitable operations. The Commission ruled that they were entitled to a share of the ownership in the fourth (TAT-4) and later transatlantic cables, and

that they would have an exclusive right to offer any additional AVD service (AT&T was permitted to retain only AVD service already provided by it). This decision has, in the view of some, created an artificial support for the record carrier industry, not warranted on economic grounds. On the other hand, others feel that this decision was fundamental to the maintenance of the record carriers as viable entities, providing basic international message telegraph services without major rate increases over the past decade.

In the "30 circuits case" Comsat proposed rates for Pacific satellite service far below those of the record carriers. Had Comsat been permitted to deal directly with ultimate users (in this case the Defense Department), thus by-passing the other carriers, the international record carriers would have been put in a much weaker economic position. While international record carrier rates for leased circuits were reduced because of the "30 circuits" case and subsequently thereto, it is clear that the FCC's authorized-user rulings have insulated the record carriers from direct competition by Comsat. The future implications of these rulings remain unsettled.

Some question the magnitude of the record carriers' role in the international communications process. Our research indicates that there has been some service competition among the record carriers. Areas of competition include proper maintenance of facilities, quality of proposals outlining new services for customers, terminal equipment alternatives, and dealings with foreign correspondents as a representative of the customer for the establishment of communications services. In addition, there is at least some rate competition among the record carriers. These competitive benefits must be weighed against the detriments of a fragmented industry structure. These would include some duplication of facilities and manpower adding extra costs, and the inability of large users to deal directly for transmission capacity as a result of the authorized-user rulings.

3. Government regulation and national policy.

Doubts have been expressed about the FCC's rulings in resolving the frequent disputes that have marked the history of the international industry. In addition, it is alleged that the ability of the Executive Branch to secure adequate international communications for military and other governmental services, and to advance U.S. foreign policy

objectives, has been impaired by the plurality of firms in the industry -- a plurality that has no parallel abroad. It is argued that the divided organization of U.S. international telecommunications services does not enhance the contribution that these activities can make to the foreign policy objectives of the U.S., and that a single U.S. entity presenting a consolidated U.S. position on transmission matters would be in a strong negotiating position to deal with foreign entities.

III. OF THE VARIOUS ALTERNATIVES THAT HAVE BEEN SUGGESTED, FORMATION OF A SINGLE ENTITY FOR UNITED STATES INTERNATIONAL TRANSMISSION SEEMS THE MOST EFFECTIVE ORGANIZING PRINCIPLE OF THE INDUSTRY FOR THE FUTURE

This study has reached conclusions that the industry problems noted above are serious, and that a new single entity should be created for the basic international transmission functions now performed by Comsat and the international voice and record carriers. ^{*/} First, let us examine other alternatives for dealing with the industry's problems.

^{*/} Dr. Welsh does not concur in this view. He believes that some competition between technologies will benefit consumers. He favors a consolidation of international cables into one company and ownership and management of satellite communications, both domestic and international, in the Comsat Corporation. Such a result, in his view, would lessen the chances of conflict of interest on the part of the Comsat Corporation as manager of INTELSAT, should result in healthy competition and make it easier for an efficient regulatory agency to get the facts and keep down rates, and would reflect clearly the fact that satellite communications do not stop at the water's edge as does cable transmission.

A. Establishing Conditions of Effective Competition
Between Cable and Satellite Entities Would Be
Very Difficult

Direct and open competition between cable and satellite entities might theoretically produce optimal development of rival technologies, but establishing such an environment in practice in a regulated industry of so few firms would be very difficult, if not highly unlikely. Indeed, even if the authorized-user rulings should be overturned, effective competition might not be forthcoming. It is highly improbable that the balanced transmission plant needed to achieve national security and foreign policy objectives would result from direct and open competition between competing technologies premised mainly on cost considerations.

A single satellite will soon have the capacity to handle all traffic on several international routes (perhaps even whole ocean basins), probably at lower cost than alternative techniques. The pendulum might at some future date swing the other way, and an advanced cable or other technique achieve a decisive cost advantage. Competition in such circumstances would be so unstable that the regulatory authority, in our opinion, would naturally be disposed to shield regulated

firms from its consequences, thus postponing the displacement of old technology by new.

Aware of the uncertainties of open competition and fearful of the mutually destructive force it would have, firms in the industry are likely to renounce such competition, preferring instead a policy of "live and let live." Rather than the life and death choices that the market makes in truly competitive situations, the pattern would likely be one of parallel development of the separate technologies, to some degree independent of economic justification.

In the view of some observers, the rivalry of the cable companies and Comsat has produced more rapid innovation and rate reduction than might otherwise have obtained. It is probably true, for example, that Comsat's low bid in the "30 circuits" case stimulated the record carriers to reduce their rates. However, the effectiveness of even this competitive spur has now been somewhat blunted by the FCC's authorized user rulings. Whatever the benefits of separate ownership, they will probably be more than offset by the increased costs imposed on the system, and borne ultimately by the users, if both technologies are permitted

to develop on some basis of accommodation rather than strictly on need and cost.

If the protection against satellite competition afforded by the authorized-user rulings were removed, it would expose the record carriers to jeopardy. Comsat might surpass the record carriers in open competition. However, it would be difficult to imagine effective competition between Comsat and AT&T while AT&T controlled the routing of most originating traffic, unless compulsory interconnection were required. And, in any event, a question of equity would be presented: On what ground should public policy continue to prevent the carriers from using satellite technology to compete with Comsat?

Moreover, cable-satellite competition could not fairly be premised on cost considerations alone. Other factors, such as improved reliability through diversity of transmission modes and foreign policy objectives, are also entitled to weight in ultimate decisions about our international transmission plant. Such factors would strengthen the prevailing tendency to find an agreed compromise and would complicate the task of fostering genuine competition between cables and satellites.

Some argue that maintaining a distinction between satellite and cable entities has particular value because of the unique characteristics of the satellite mode. They point to the implications in the domestic satellite field and for our INTELSAT policies of a fusion of cable and satellite ownership. We deal with these aspects of the question elsewhere in this chapter. They do not alter our conclusion that establishing conditions of effective competition between cable and satellite entities would be very difficult.

B. Economies of Scale Preclude Competing Bimodal Entities

Another organizing principle of the international communications industry might be to create effective competitive entities that are not limited to a particular technology. One way to establish such a competitive environment would be to permit the carriers to build and operate satellites and earth stations if they desired -- or to participate in INTELSAT ownership -- and Comsat to lay cables if it desired. The authorized-user doctrine would be repealed, permitting direct competition among the various communications companies. Additional steps required under

this approach would include divestiture of the carriers' interests in Comsat, so that they could not influence its policies, and perhaps separation of AT&T's international and domestic operations lest it use its control of most originating traffic to channel the lion's share of the international market to its own facilities.

This hypothetical solution would raise a number of difficult questions. One very serious problem would be its adverse impact on INTELSAT. Allowing separate U.S. entities to compete with one another by satellite for international traffic would be difficult if not impossible to reconcile with our commitment to the INTELSAT concept of a global satellite system. We also doubt the practicality of competing bimodal entities, because the capacity of existing and projected transmission facilities will be large in relation to demand. In the face of such a relationship between capacity and demand, it is unrealistic to expect effective competition in international transmission -- whether between satellite and cable companies, or between bimodal entities. In short, experience and analysis since 1962 strongly point to the evolution of a truly "natural monopoly." A natural monopoly is rarely encountered in the real world, but the transmission

segment of international communications appears to be an area where the necessary conditions will be fulfilled.

C. Even Substantial Changes in Today's Regulatory Framework Would Provide Only Limited Benefits Under the Existing Ownership Structure in the Industry

The existing structure of the industry differs from the two models discussed above. Although the international voice and record carriers may not invest directly in the space segment of the global satellite system, they can and do use INTELSAT facilities obtained by lease through Comsat. This structure nonetheless raises problems about the prospects for reaching optimal investment decisions for new transmission facilities which achieve available scale economies. Particular attention has been focused on the preference for cables shown by AT&T and the record carriers. Conceivably, steps short of industry restructuring could go far to cope with the problems arising under the present structure. For example, the rates of AT&T and the record carriers could be set on the basis of the most efficient and lowest cost transmission medium regardless of ownership; government review could be strengthened to enable rigorous scrutiny and evaluation of adversary proposals for new facilities and choices which avoid overbuilding; and the international carriers could be subjected more rigorously

to the test of the market by giving others direct access to international circuits by modifying the authorized-user rulings.

Apart from questions concerning the practicality of such steps, experience under the present structure demonstrates the limited benefits resulting from the diversity of ownership in international transmission facilities. As noted, the carriers increasingly use joint transmission facilities. The benefits of competition are largely, therefore, in rates, terminal equipment and in arrangements for special communications services, not in transmission facilities. And even with consolidated transmission facilities such competition in rates, service and terminal arrangements can be maintained and fostered by providing users, carriers, and prospectively, perhaps specialized service companies, with flexible access to the international transmission facilities.

D. A Single Entity for International Transmission
Would Help Rationalize the Industry

1. It would promote system optimization and enable realization of the available economies of scale. The reorganization we recommend involves consolidating the transmission plant of the international voice and record carriers, Comsat's satellite investments, the U.S. earth stations now operating or planned for operation in international service, and such switching

and other equipment as may be justified to realize economies of scale.*/

A single entity for transmission would not have a vested interest in or natural preference for any particular technology or class of service. It would, therefore, be in a better position than any of the existing firms to make impartial system choices, and to exploit fully the available economies of scale as well as of specialization.

System optimization should be more susceptible to effective government review under the single entity approach. The regulatory body could examine investment plans in a comprehensive and consistent manner, free from claims by participants dependent to some degree on the furtherance of a particular technology. The regulator could insist on an explanation of the full range of possibilities open to the single entity. It would no longer be under pressure on equity grounds to authorize a facility the need for which was not clear, nor to program the introduction of new facilities on the basis of an accommodation -- by approving 50/50 sharing arrangements between entities tied to different transmission modes.

The danger would remain that a single entity might be slow to grasp opportunities for efficient and economical operation. However, if appropriate conditions are attached

*/ Such a restructuring could involve transfer of all of the assets and franchises of the international record carriers.

to the creation of a single entity -- an issue to which we return -- this danger can be minimized. At this point, it is sufficient to note some of the factors that should motivate the single transmission entity to good performance: expanding and price-elastic demand for international communications; influence on rates and service which AT&T and other domestic users could be expected to exert as buyers of service from the new entity; and pressures for rapid application of advanced technology that equipment sellers should exert -- if the equipment market is kept open and competitive.

2. It would further U. S. foreign policy objectives. It is alleged that the plurality of U.S. international communications entities has been a source of difficulty in achieving an economically balanced international industry and one that supports our foreign policy objectives. On occasion, U.S. entities have been forced to bargain on terms less favorable than would have been possible were there only one U.S. entity authorized to build communications links to other nations. If there were a single U.S. transmission entity, it could present a more solid position in bargaining with foreign entities.

As the INTELSAT system moves into an era of advanced development -- one in which global coverage has already been achieved -- a single entity would be in a better position than Comsat is today to reflect an overall and consistent U.S. view in the consortium. Today, Comsat's mandate is to promote only satellites. A single entity that had both cable and satellite interests would reflect a more balanced interest in efficient communications.

Some have noted that a single entity acting also as manager of INTELSAT could encounter conflict of interest problems. In this connection, we would call attention to the evolutionary trend toward a greater internationalization of the INTELSAT managership, and our endorsement in Chapter Three of greater international cooperation in the managerial function.

More generally, our international communications industry represents an important point of contact between the United States and foreign nations. A single international transmission entity could help minimize friction with foreign states, facilitate broad efforts at international cooperation, and assist and improve our relations with the developing world in communications matters.

3. It would resolve the anomalies of Comsat's role and function. The single entity solution appears to be a feasible and effective way to resolve a number of problems affecting Comsat's future. With the trend in satellite investment costs downward on a per-circuit basis, it is not clear when Comsat under present circumstances will be able to achieve a balanced capital structure. Investment in the domestic pilot satellite program and in advanced INTELSAT satellite programs will provide some improvement for the Corporation. However, a fair plan of consolidation involving the international transmission plant of Comsat and other international carriers should establish a balanced capital structure for the consolidated entity.

Creation of a single entity would also provide an occasion for resolving the potential conflict-of-interest problems created by the carriers' participation in Comsat. In the circumstances prevailing in 1962, there may have been no practical alternative to carrier participation in Comsat and to an interlocking directorate. The formation of a single entity would be an appropriate occasion to end such arrangements, for it would remove a principal justification for their presence.

Since the single entity would own the U.S. earth stations associated with INTELSAT satellites, such problems as arise from divided ownership of these stations would also disappear. Finally, Comsat's isolation from large ultimate users of communications, as a consequence of the FCC's authorized-user rulings, would also be ended since, for reasons explained below, the special circumstances in the record business that gave rise to those decisions would be changed.

4. Formation of a single entity would help resolve the problems of the international record industry. Two key issues that have engaged attention in prior studies are: First, should the record carriers be merged to promote more efficient operations, or would possible gains in efficiency be outweighed by the loss of competitive benefits? Second, does the existence of record carriers largely insulated from competition except among themselves, impose unnecessary costs on the public because the record carriers no longer provide an essential function? We believe that both of these questions can be satisfactorily resolved by a single-entity solution.

To be sure, it is theoretically possible to remove the protection now afforded the record carriers without forming a single entity. But it is far easier to contemplate such a change as part of a complete restructuring of the international industry in which the record carriers are offered the option to dispose of their assets and franchises at a fair price. We do not foreclose the possibility that the record carriers would prefer arrangements retaining some role in international communications. But if they choose to dispose of their assets and franchises, the non-transmission, non-switching properties and personnel might then devolve upon such domestic companies as would succeed them in performing functions at the service end.

The governing principle for the structure of a single international transmission entity would be that applicable generally to all situations where public policy has found the need for a public utility monopoly -- to confine the monopoly to the functions which in their nature require unity of operations.

A single transmission entity would eliminate inefficient or duplicative transmission and switching operations without necessarily foreclosing competition in other areas.

Principal areas where competitive offerings exist today in the international record business are in leased line service, switched teletypewriter and public message service and the provision of terminal equipment. */

The public message service is not, in any event, an attractive candidate for competitive offering and, if the international record carriers choose to dispose of their assets and franchises, the public message service might well devolve upon domestic Western Union. With respect to leased line service and switched teletypewriter service, competition need not be foreclosed. AT&T and domestic Western Union might well provide competitive services. And to the extent the existing international record carriers wish to maintain terminal and service offerings, using circuits obtained from the single entity, they would, of course, be free to do so. Moreover, competitive elements will be added by permitting the single entity to deal directly with large users where no

*/ In the absence of restructuring the entire industry to form a single entity, the question as to the desirability of consolidating all or part of the record carriers' operations arises. Our review of the available evidence does not lead us to recommend such a consolidation at the present time, apart from the single-entity solution. It would not be objectionable, however, to give the Commission the authority to approve such consolidations when found to be in the public interest.

"customizing" of the transmission service is involved or where the user can do it himself. Finally, where feasible, other firms might in time be permitted to enter the customer-service international market and provide remote accessing of computers, message switching, subdividing or channelizing of leased circuits, and terminal gear to users as needs for such specialized services develop, and provided that appropriate procedures can be concluded where necessary for dealing with foreign entities.

5. Formation of a single entity could improve the prospects of effective government regulation. For several reasons, we could anticipate improvement in the effectiveness of government regulation. First, with the number of firms providing international transmission reduced to one, there would be no occasion to adopt regulatory policies designed to protect the weaker firms. Moreover, the single entity would constitute a relatively manageable operation from the regulatory standpoint. Lacking (as we propose below) domestic connections, manufacturing affiliation, and terminal service functions as now performed by the international record carriers, a single entity would be, in effect, no more than a transmission highway or pipeline with few major facilities and assets.

It would have easily identifiable costs and a simple rate structure. This radical simplification of the industry could materially improve the prospects for effective regulatory supervision.

The international telecommunications system is, and will remain for some time to come, quite small by domestic communications standards -- annual revenues are less than 5% of the domestic carriers' annual revenues. The problems of regulation would thus be presented on a far smaller scale. The major responsibilities of the regulator would be rate review and authorizing new transmission facilities. While such decisions would involve complex considerations, they would be required only infrequently and in a time frame permitting full examination and consideration by the government.

It is true that with a single entity owning both cables and satellites, the regulatory agency might lack the benefits of an adversary presentation on applications to build new facilities. However, one may question the amenability of investment decisions in this industry to thorough review in such adversary proceedings if the present structure is continued. In some cases, cable and satellite firms may not contest each other's applications vigorously. And in any event,

review of the long term system planning required does not lend itself easily to examination in contests over specific investments. Moreover, AT&T and other major customers of a single transmission entity should be fully capable of vigorously representing their interest in efficient low-cost international communications before the Commission, even if adverse to the single entity's interest; and if competition is preserved at the manufacturing level, cable and satellite manufacturers can be expected to promote new cost saving technology with equal vigor. Since the investment decisions which must be made mainly involve infrequent, long life, large investment programs dependent on long-term demand projections and a variety of economic and non-economic factors, intensive government scrutiny of one system planner should produce better results than at present.

We are mindful of the risks inherent in the single entity being entrusted with monopoly power, even in a well-defined sector of the communications industry. But we have concluded that such risks are worth taking. Appropriate safeguards should of course be built both to maintain every incentive for cost-reducing innovation, and to assure the public reasonable rates, and high quality service.

IV. CREATION OF THE SINGLE ENTITY SHOULD BE SUBJECT TO CERTAIN CONDITIONS

- A. It Should be Limited to that Function -- The Provision of Transmission and Other Facilities -- Where the Economies of Scale Are Clearly so Great That Effective Competition is Unlikely

It is unnecessary for present purposes to define the precise interface between the domestic and international communications carriers, and premature to decide now the exact structure which would emerge in the user service (as contrasted with the transmission) function in international communications. The retail service function should not in any event be provided by the single entity. The entity should sell only transmission capacity.

Under the 1962 Communications Satellite Act, only Comsat and authorized carriers may be permitted to construct and operate earth stations. Although we have recommended that the single entity assume responsibility for the U.S. earth stations in operation or planned for operation with INTELSAT satellites, this should not foreclose eventual authorization by the FCC of user-owned and operated stations, should they prove justified. We would recommend legislation to ensure that this possibility remains open.

It has been argued that a carrier that had a monopoly of transmission but was not responsible for the entire communication service would be insensitive to customer complaints and demands. However, most users of international communications (save those, like the U.S. Government, large enough to purchase transmission capacity directly from the transmission entity to do their own conditioning) would not deal directly with the transmission entity. That entity would deal mainly with carriers, selling to entities such as AT&T and domestic Western Union, to certain final users, and prospectively, where feasible, to specialized service entities discussed earlier. And we suspect that the entity's principal carrier customer -- AT&T, representing most users of international communications -- would be quite able to ensure adequate performance from it. At all events, end-to-end control has never been a possibility in the international communications business. One end is always under foreign control whatever the transmission mode or U.S. ownership structure.

It has also been suggested that a split between domestic and international telephone service could endanger the quality of overseas calling from the U.S., which now benefits from the developments of the Bell Laboratories and Western Electric. To be sure, overseas calling has become an extension of domestic service (the message network is used commonly for both domestic and international traffic), and by the early 1970's, customers in the U.S. will begin dialing overseas calls just as they now dial directly distant points in this country. This will bring almost complete integration of domestic and international telephone service over a single, integrated message network.

Again, the creation of a single transmission entity should not significantly alter present relationships between domestic and international telephone service. It deserves emphasis that the transmission links of our international telephone communications are already subject to divided responsibility -- between Comsat, as a carrier's carrier, on the one hand, and AT&T on the other. Given the projected future growth of satellites as a means of international transmission, the vast bulk of our international circuits are likely soon to be carried by satellites, and even under

existing arrangements would not be the responsibility of the cable carriers. Nor need a restructuring to form a single entity for international transmission otherwise affect the existing pattern of responsibility for international message telephone service. The message network commonly used for domestic and international calls would continue to be the responsibility of the domestic carrier. */

B. It Should Not Engage In Manufacturing That Can Be Provided By the Competitive Marketplace or Have Any Manufacturing Affiliations

We have already stressed that a public utility monopoly should be confined to the functions which in their nature require unity of operation. Diversity of approach is an important factor in successful innovation. Accordingly, the creation of a monopoly of international transmission makes all the more vital the preservation of competition at other levels, such as manufacturing. The satellite systems manufacturing industry is highly competitive, and if it remains so, one can expect that satellite manufacturers, competing for INTELSAT contracts, will add impetus to vigorous and rapid technological development and application by the single entity. Several companies here and abroad also engage in cable research, development, and manufacturing and in research and development of other techniques for international transmission which have promise for the future.

*/ The appropriate arrangements for dealing with foreign entities on operating matters remain an open question.

In a rapidly developing area of advanced technology, every encouragement should be given to rivalry among firms and technologies, all with equal access to the purchaser of communications facilities. The technical staff of the entity should be capable of organizing and maintaining close and continuous relations among research, manufacturing, and operating personnel in the field, so that the lessons of operating experience would be fully available to those who design equipment and study the more fundamental aspects of international communications. For these reasons, in those areas where the development and production capability is available in the competitive marketplace, we deem it essential that the single entity be forbidden to engage in manufacturing, although we assume it would wish to undertake serious programs of research.

C. It Should Not Provide Domestic Service, Save As May Be Necessary to Permit Completion of the Pilot Domestic Satellite Program, and Should Have No Domestic Carrier Affiliation

It would be undesirable to accentuate an arbitrary distinction between domestic and international communications. To be sure, the development of

satellite communications tends to blur the technical distinction between domestic and international communications and in time this may well compel a re-examination of the matter. But for the present and foreseeable future, there is greater value in continuing to distinguish between our domestic and international communications, particularly in light of our INTELSAT policies. One benefit will be to ensure diverse sources of commercial satellite communication development. Hence, we would favor confining the single entity to the international arena. We do not, however, rule out the possibility of the international entity applying to the FCC for additional earth stations at inland points for more economical origination and receipt of international traffic.

Our judgment that the domestic and international sectors can and should remain separate is supported, therefore, by the objective of maintaining the maximum diversity in communications common carriage as is consistent with efficient systems planning and operation. We thus reject a solution whereby AT&T would become the single U.S. transmission entity. Given AT&T's size and complexity,

such a solution would, in any case, be the antithesis of creating a simple international operation that would facilitate effective government regulation.

There is concern -- discussed more fully in Chapter Five -- that in the pilot domestic satellite program, no industry claimant for a permanent role be given a preliminary advantage over competing claimants -- an advantage that could easily become a vested interest. This concern has given rise to objections to allowing Comsat to play a major role in the pilot domestic satellite program, even though realistically it may be the best for the job at this time. An appropriate condition to adopting the single entity approach is that the entity should have only the domestic ties necessary to complete the pilot domestic satellite program. Thus, if Comsat were to help form the single entity under the conditions we have suggested, its participation in the domestic satellite pilot program as a trustee or steward would indeed preserve complete flexibility as to the eventual ownership of domestic services provided by satellite.

It would not follow from Comsat's later vacating the domestic field that AT&T should obtain a monopoly of

domestic satellite communications. We recommend against such a course. There are attractive possibilities for specialized domestic satellite applications outside the common carrier public message telephone network as well as in the network. We think it premature now to define the future role of AT&T in domestic satellite communications, although it is clear that it will necessarily have a major involvement in satellite uses in the public message telephone network.

As noted earlier, the justification advanced in 1962 for allowing the carriers to own stock in Comsat and to sit on its board of directors would disappear with the formation of a single international transmission entity. Such interlocking ownership and control should be eliminated to avoid conflicts of interest, and a blurring of the relationship between customer and supplier of telecommunication service.

D. It Should be Subject to Strengthened Government Regulation

Some believe that if the government is to be intensively involved in the operations of the industry, it should form a public corporation to provide international communications, rather than continuing to entrust this responsibility to private enterprise. We are not convinced, however,

that the public would benefit by substituting a public for a regulated private entity. Some of the problems associated with regulated monopoly -- such as the adequacy of incentives to be efficient -- might even be aggravated.

Mindful of the dangers of ineffectively regulated monopoly, we urge improved regulation for the international industry through a strengthened regulatory capability in the FCC as outlined in later chapters. It is our assumption that the duties imposed on the Executive Branch by the Satellite Act of 1962 with regard to Comsat would continue, or would be strengthened, if Congress should authorize a single international transmission entity. Furthermore, as discussed in greater detail in Chapter Nine, the capability of the Executive Branch to engage in economic and engineering analysis in the field of communications policy should be substantially augmented so that it can engage in those activities essential to informed and effective long-term planning, surveillance of investment decisions, and policy guidance in the international field. The Federal Government's role as a dominant user of our international communications facilities, and the importance of international communications to our foreign policy and national security,

justify such extensive oversight.

V. RESTRUCTURING THE INDUSTRY WILL REQUIRE ACTION BY CONGRESS

If the formation of a single entity for U.S. international transmission subject to the conditions outlined in this chapter is accepted as a goal of U.S. policy, the question arises as to how best to achieve it. We have not attempted to lay out a detailed plan for carrying out such a program.

Whatever the precise content of the legislation which might be adopted by Congress, we recommend for consideration the following general principles:

- that an opportunity be afforded for full hearing and for the submission of views by interested parties on the plan of consolidation;

- that there be appropriate protection of labor;

- that the single entity be subject to a requirement, similar to that contained in the Communications Satellite Act, that effective competition be maintained to the extent feasible in its procurement of apparatus, equipment, and services;

- that the single entity not engage in manufacturing that can be provided by the competitive marketplace, and

that it have no manufacturing affiliation, direct or indirect;

-- that the single entity should not provide domestic service, save as necessary to permit completion of the pilot domestic satellite program, and should have no domestic carrier affiliations;

-- that the single entity be forbidden to provide terminal or service functions now offered by the international record carriers, but be permitted to deal directly with users;

-- that users or carriers obtaining leased circuits from the single entity be entitled to appropriate interconnection and other arrangements with domestic carriers enabling them to make use of such international facilities;

-- that the provision of the 1962 Communications Satellite Act prescribing Executive Branch responsibilities to protect the national interest and further U.S. foreign policy apply with equal force to the single entity;

-- that the terms of all agreements among the interested parties bearing on the consolidation, as well as the capitalization and financing of the single entity, be subject to government approval;

We believe a single transmission entity approach is in the national interest and we recommend it to the Congress.

We should therefore expect those responsible for our international communications to cooperate with the Congress, the FCC, and the Executive Branch in exploring its many complexities and ramifications so as to move expeditiously toward enactment and implementation of legislation leading to a better rationalization of the industry's structure on equitable terms. But the government should be prepared to take whatever action is necessary to ensure against undue delay in this process.

VI. IF THE SINGLE ENTITY APPROACH IS NOT IMPLEMENTED,
CERTAIN AMELIORATIVE STEPS WOULD STILL BE DESIRABLE

Substantial modifications in the present international communications industry structure and regulatory scheme may not be feasible except in the context of a consolidation that created a single transmission entity.

However, if a single transmission entity solution is not adopted, steps should be taken to improve the performance of the existing international communications industry. Augmenting the regulatory agency's capabilities should improve its appraisal of carrier proposals and better enable it to make the difficult choices between competing applications for transmission systems and to resist undue redundancy. Other steps to be considered by the regulatory agency are the

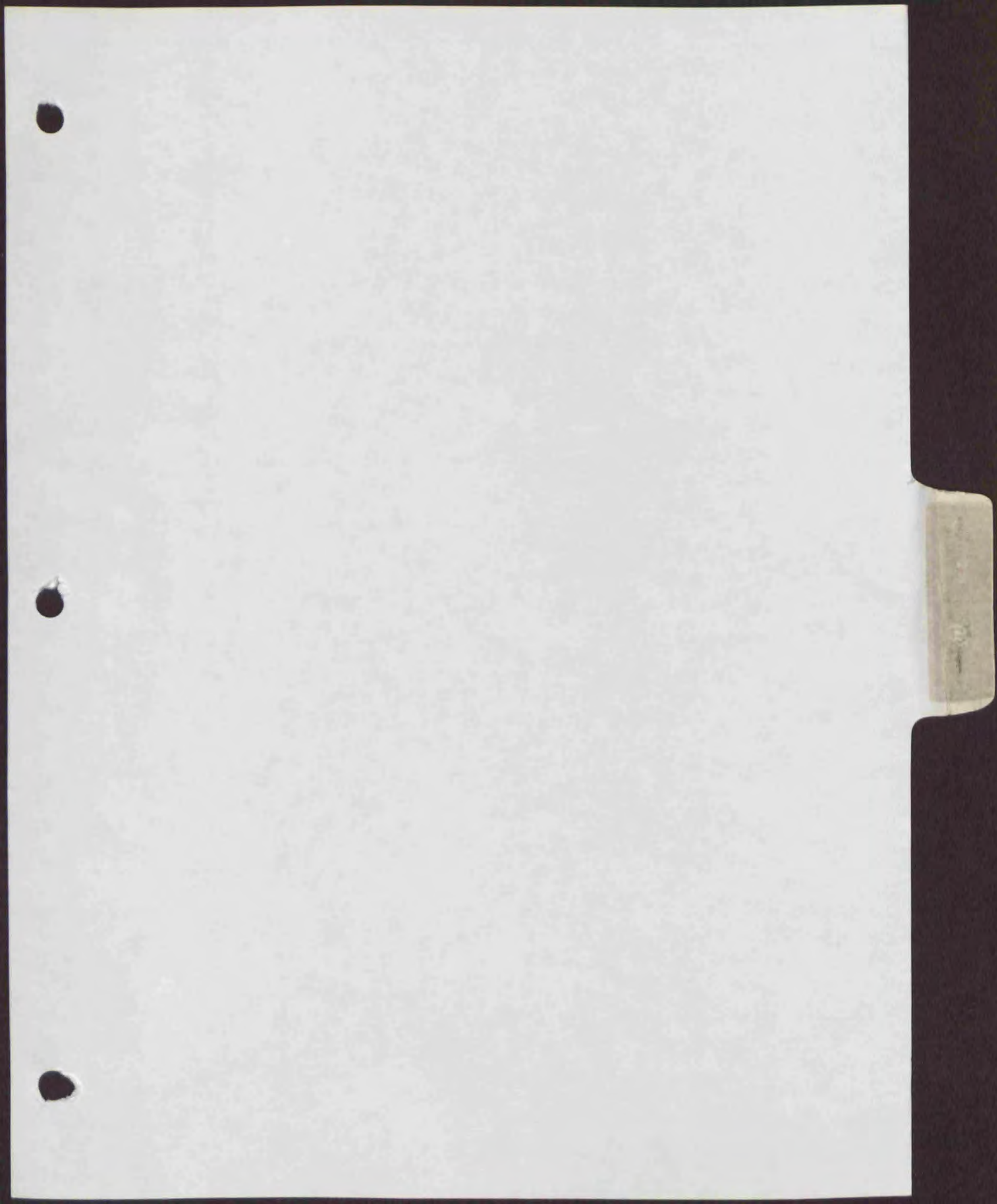
development of ratemaking criteria related to optimal plant and modification of the authorized user policy to allow broader direct access to the satellite entity.

We recognize that modifying aspects of the FCC's TAT-4 decision with respect to mixed voice-record traffic and its authorized user decision would have a serious impact on the record carriers. However, if our recommendation for a single entity is not implemented, these decisions should be reconsidered in the interest of ensuring the nation efficient and economical international communications service in the future. In such a context, we would favor Congressional action to divest the international voice and record carriers of their ownership of Comsat's stock and representation on its board of directors.

CONCLUSION

The critical role the international communications industry plays in achieving our national goals justifies prompt remedial action to correct deficiencies in its structure that our study has revealed. The problems of divided ownership have not reached crisis proportions. But

effective policy should anticipate problems, treat them before they become severe, and seize opportunities which could benefit the nation. Technological advance in the communications industry is rapid. The time to further reform its structure is now, when the profile of both the problems and opportunities is clear. That it will undoubtedly require several years to realize such reforms only lends added urgency to the case for prompt action.



CHAPTER THREE

THE FUTURE OF INTELSAT

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CHAPTER THREE

THE FUTURE OF INTELSAT

A basic mandate of the Task Force is to make recommendations for future policy with respect to communication satellites, and to propose ways in which this promising new technology should be integrated "into a balanced communications system which will meet the needs of a dynamic and expanding world society." Recommendations that bear on this objective appear in other chapters. Here our central concern is the International Telecommunications Satellite Consortium (INTELSAT), which was created in 1964 to establish and develop a global commercial communication satellite system. With a current membership of sixty-three, INTELSAT owns and operates the space segment of the global system. The United States is represented by Comsat, in accordance with the 1962 Satellite Act.

INTRODUCTION

Communication through space satellites is one of the new vistas opened by modern science, and developed as an offshoot of government-sponsored research and development. When the potentiality for commercial communications through

satellites clearly emerged in the early 1960's, the United States, as the leader in the field, was presented with a number of policy choices. We could, for example, have pressed our advantage in this field, and sought to develop the technology based on a narrow view of our national interest.

But we chose another and, in retrospect, a wiser course.

The new technology of satellite communications offered the promise of worldwide availability of high quality and reliable communications at reduced cost, and of enabling all countries to have more direct access to each other -- thus binding the peoples of the world into a closer community, based on better understanding and a deeper diffusion of knowledge and ideas than would otherwise be possible.

Furthermore, it was recognized that the use of satellites for commercial communications is a legitimate subject of international concern. Synchronous satellites in particular occupy orbital locations (or "parking slots") which can accommodate only a finite number of satellites without interference problems in the use of the frequency spectrum. Moreover, satellites radiate and receive electromagnetic energy

potentially capable of causing interference to or receiving interference from other communication systems, both within and beyond the national boundaries of the user nation.

Recognizing such considerations, the United States in a number of national policy pronouncements and later the General Assembly of the United Nations^{*/} set forth the principle that communications by satellite should be made available to the nations of the world as soon as practicable on a global and non-discriminatory basis.

The future development of this technology of peace, the United States concluded, should draw on the minds and industries of many nations, which should be encouraged to share in its growth.

We therefore chose to proceed through methods of international cooperation, rather than by unilateral action, and, acting under the mandate of the 1962 Satellite Act, strongly supported the creation of INTELSAT. Our own policy in this regard corresponded to the natural and legitimate desire of other nations to participate in the development of this important new frontier of knowledge.

^{*/} Resolution 1721 (XVI) of December 1961.

INTELSAT was established by two international agreements in 1964. The first is an agreement among governments declaring the basic principles on which an international cooperative program was to be built. The second, open to signature by governments or their designated operating entities, is a special agreement containing the details for the operation of the satellite system. The United States Government is a party to the intergovernmental agreement, and Comsat is the United States designated signatory to the special agreement.

Reexamination of United States policies regarding INTELSAT is timely because definitive arrangements, to replace the interim arrangements under which the consortium now operates, are to be negotiated in 1969.

The 1964 intergovernmental agreement establishing INTELSAT provides in Article IX that the governing body -- the Interim Communications Satellite Committee (ICSC) -- shall render a report not later than January 1, 1969 containing the Committee's recommendations concerning the definitive arrangements for an international global system which shall supersede the interim arrangements. This report is to follow the principles found in the Preamble of the 1964 agreement, which set as a principal objective that communications by satellite should

be available to the nations of the world as soon as practicable on a global and non-discriminatory basis.

In October 1967, the United States tabled a proposal in INTELSAT for the definitive arrangements. While the proposal follows the general pattern for INTELSAT developed under the interim arrangements, it contemplates a number of changes based on experience and on the desires of other nations. The final United States position on the definitive arrangements will have to take account of continuing discussions with other nations represented in INTELSAT. It would be unwise to establish rigid positions now on the various issues that will arise in the negotiations.

Our treatment of the subject here will deal therefore, not with immediate negotiating problems, but with more general concerns. One is how INTELSAT can be made sufficiently flexible to adapt to the changing needs of members without weakening the foundations of the global system; another is the evolution of the institutional structure and decision-making process in INTELSAT needed to reflect the changed circumstances since its creation.

I. THE INSTITUTIONAL FRAMEWORK

Under the present arrangements, each INTELSAT member contributes to the cost of developing and establishing the space segment of the global system on the basis of quotas related to expected use. The United States investment share in INTELSAT is now about 53%. The space segment, consisting principally of the satellites, is owned in undivided shares by all members in proportion to their respective contributions to the costs. In contrast, the earth stations that transmit to and receive from the satellites are separately owned and controlled by national operating entities in the countries where they are located.

Decision-making responsibility for INTELSAT rests with the Interim Communications Satellite Committee (ICSC). Voting power in the ICSC is in proportion to each member's space segment investment quota based on use. The ICSC now consists of eighteen representatives who speak for forty-eight of the sixty-three parties presently in INTELSAT. These forty-eight members represent about 97% of the total space segment investment. Voting in the ICSC on specified important matters requires the concurrence of 12.5% of the votes, in addition to that of the United States.

The intergovernmental agreement provides that Comsat be the Manager for INTELSAT, pursuant to the ICSC's general policies and in accordance with its specific determinations. Comsat, as Manager, recommends the type of space segment to be established, operates and maintains the space segment, and places contracts relating to the design, development and procurement of equipment for the space segment. However, ICSC approval must be sought on all major aspects of these activities.

INTELSAT provides satellite service at rates based on units of space segment utilization and intended to cover amortization of capital, return on investment, and operating, maintenance and administrative costs. The level of charges for units of space segment utilization is based on the revenue requirements of the entire space segment, and the unit rate is, accordingly, the same in all satellites. INTELSAT does not determine the rates that its members establish for satellite service to their customers.

II. THE SUCCESS OF INTELSAT HAS DEMONSTRATED THE WISDOM OF OUR COMMITMENT TO A GLOBAL COMMUNICATION SATELLITE SYSTEM

INTELSAT has demonstrated the value of communication satellites in actual operation. There are four satellites

of the INTELSAT I and II series in operation in the Atlantic and Pacific areas. With the launch of an Indian Ocean satellite, expected in a matter of months, INTELSAT will have established worldwide coverage by satellites. The three INTELSAT II satellites launched during 1967 each have capacity of 240 two-way voice circuits.

INTELSAT III series satellites shortly to be launched will have a design lifetime of five years and capacity of 1200 voice circuits. Contracts have been awarded for even more advanced satellites, of the INTELSAT IV series, each of which will have at least 5000 voice circuits and far greater operational flexibility. INTELSAT satellites serve a variety of communication needs, including voice, record, data and television traffic, and studies are being undertaken to examine the feasibility of providing via satellites other communication services such as for aeronautical and maritime customers.

When INTELSAT began with only a handful of members in 1964, the full promise of this mode of communication was still unproven. Today, almost two dozen earth stations throughout the world are linked up with its satellites, including four in the United States. By 1972 an additional

forty to fifty earth stations are expected to be operational.

Under procurement policies established by INTELSAT, the industries of the world are being steadily drawn into its activity. At first, United States industry was virtually the only supplier of equipment for INTELSAT. A measure of the progress made since then in diversifying procurement sources is that about 30% of the INTELSAT IV satellite program -- over \$19 million -- will be carried out in other countries. And in the earth station field there is particularly healthy competition among firms representing many nations.

There has been a steady growth in the use of INTELSAT satellite facilities. Already, some 306 circuits are being provided among Atlantic Basin nations via these facilities, and by 1972 this number is expected to reach 2230.

It is clear, then, that the foundation laid by INTELSAT is a solid one, and its future bright. The United States, in our view, should firmly continue to support the goal of developing and perfecting the global system.

But in considering the future of INTELSAT under definitive arrangement, we should carefully take into account

both developments since its formation and those now in prospect.

Early planning for a global satellite communication system envisioned the use of random-orbiting satellites. At that time, the promise of commercial communications satellites seemed greatest in spanning very long distances, primarily across ocean areas. With the successful launch of Syncom II in 1963, INTELSAT decided to use synchronous satellites for the initial global system, and has subsequently followed through with 4 generations of synchronous satellite technology, which has evolved rapidly over the past 6 years. Declining costs and new developments, such as more powerful satellites and highly directive, multiple-beam satellite antennas enabling limited coverage, may permit more widespread and varied uses, including economic satellite programs servicing small areas of the globe.

Recognizing that the new technology could have useful domestic applications, we propose in other chapters of this report that the United States establish a pilot domestic satellite program, and that the use of satellites for domestic and regional services in less developed countries be thoroughly explored.

The only other country that has developed a system for providing domestic satellite services is the Soviet Union. Canada recently announced that it plans to establish a domestic satellite system, and interest in specialized satellite applications has been expressed in other areas of the world as well. These developments underscore the importance of assuring harmonious development of the new technology in ways which best serve the needs of members. It will be especially important to fashion procedures in the definitive arrangements for relating the emergence of specialized satellite services to INTELSAT, and to ensure that INTELSAT can best serve the needs of its members in the rapidly changing technological environment.

III. THE DEFINITIVE ARRANGEMENTS FOR INTELSAT SHOULD BE SUFFICIENTLY FLEXIBLE TO ADAPT TO THE CHANGING NEEDS OF MEMBERS AND TO ACCOMMODATE SPECIALIZED SATELLITE FACILITIES WITHOUT WEAKENING THE INDISPENSABLE FOUNDATIONS OF THE GLOBAL SYSTEM

One of the basic principles of this report is that we be guided by the goal of achieving a legal and economic environment which encourages and stimulates cost-reducing progress, both in technology and in management. This principle is of universal value in examining problems of economic

organization. It is particularly apposite for an area of rapid technological change, such as communication satellites.

With this principle in mind, we have carefully examined the underlying premises of the global system. The global system enables substantial economies of scale to be realized. This is true because large satellites are capable of flexibility in use and provide high communications capacity and lower costs per channel. They also permit economies in the use of earth stations. This fact is of special importance to the developing countries, whose communications systems are often still limited, costly and indirect. There are other important advantages to a global system in integrated system planning, financing, procurement, management, and control. We also look to INTELSAT to demonstrate the value of broad international cooperation, while recognizing that INTELSAT's success is best assured if it rests on a firm economic foundation.

Looking ahead to the future needs of members of INTELSAT, we would be wise to avoid any approach that stifles technological innovation, or relies upon a particular theory regarding the future evolution of satellite technology.

Proposals for specialized satellite facilities should be viewed in terms of their compatibility with the objectives of the global system to which all members of INTELSAT are committed.

The concept of compatibility should include the economic integrity of the global system. Plans for specialized satellite facilities should be developed through consultations between INTELSAT and the member or members concerned. In the development of such plans, differing patterns of cooperation between INTELSAT and the members could be arranged, as might be appropriate.

Nations might wish to obtain specialized satellite services for a variety of reasons, not necessarily inconsistent with their commitment to the global system. It would, however, be of concern if this were to lead to a proliferation of competing systems -- small, often suffering from high unit costs, and together denying to the world much of the potential benefit from technological progress in satellite communications.

There are powerful forces at work for continued development of a strong global system, stemming from the inherent advantages of a global system for international communications --

global access is assured with far fewer satellite and earth station facilities and, consequently, at substantial savings.

Whatever their specialized requirements may be, members of INTELSAT should be most reluctant to participate in a system actually designed to compete with the global system, because of the unnecessary expense this would entail in terms of duplication of facilities.

A satellite facility designed for purposes other than the provision of common carrier communications which INTELSAT is prepared to provide would present special considerations. Where no particular advantage accrues to the global system or is to be derived from using it, there could be no objection to an outside project. However, this is not to say that INTELSAT should be limited in its scope; it should be able to offer all sorts of services as may be appropriate to meet its broad aims.

Any specialized satellite facility should be compatible with INTELSAT's use of the frequency spectrum and orbital space; the proposed mechanism and technique for its control would have to be adequate; and radiation emitted from the satellites should cause no harmful interference to INTELSAT satellites or associated earth stations.

If a specialized satellite facility were thus compatible with the global system, the member or members concerned still should consider with INTELSAT the mutual benefits that might flow from relating it to the global system. Areas of potential mutual benefit could include sharing of joint research and development costs, common procurement, shared use of telemetry and control facilities, joint arrangements for satellite launching, and sharing of in-orbit satellite spares or on-ground backup facilities.

As we are on the verge of a new era in the use of communication satellites, INTELSAT will have a key role by providing a reservoir of expertise in satellite system planning. It should continue to be the focal point for coordinated planning for the most effective global utilization of satellites, and should likewise serve as a forum for coordinating plans for specialized satellite uses.

IV. INTELSAT'S INSTITUTIONAL STRUCTURE AND DECISION- MAKING PROCESS SHOULD BE MODIFIED WHERE NECESSARY TO REFLECT CHANGED CIRCUMSTANCES SINCE ITS CREATION

The continued development of INTELSAT requires a firm foundation. The negotiations in 1969 should facilitate resolution of a number of questions affecting governments. On

the other hand, if INTELSAT is to continue as an efficient operational organization, its day-to-day work should continue to be carried on by the operating entities which now participate in the consortium.

In approaching the future organization of INTELSAT, the United States should be willing to consider adjustments of structure which could lead to a new pattern of cooperation within the consortium. The major role of the U.S. in INTELSAT today reflects, quite naturally, our leadership in the field of space technology, as well as our position as dominant user of INTELSAT satellites. It is not surprising that the present arrangements mirror these facts.

As the INTELSAT system matures both in membership and in scope, the U.S. role will naturally alter. Broad participation by other members will remain an important objective, and nations that have not yet sought membership can and should be encouraged to consider it.

The present decision-making process in the Interim Committee is effective. On the whole, decisions have been made in timely fashion, and without undue controversy. There are many advantages in centering decision-making in a relatively small, cohesive body such as the ICSC. A

governing body designed along the lines of the ICSC, and with similar powers, should be the principal decision-making body of INTELSAT under the definitive arrangements.

Any standard selected for calculating voting power on the governing body should be on as rational a basis as possible. The standard selected for the interim arrangements -- space segment investment quota -- has been a workable one. The United States proposals presented in the ICSC have suggested that under the definitive arrangements the voting power of a representative be directly proportional to the investment share of the member or group of members he represents, and that investment, in turn, would be proportionate to the member's use of INTELSAT-financed space facilities. There might be other acceptable voting formulas; but any formula should adequately reflect the fact of widely varying contributions to the organization, and the objective of operating an efficient and effective communications enterprise on a businesslike -- rather than a political -- basis.

An adequate opportunity must also be provided for even the smallest member to be heard. This is particularly

important since decisions regarding the design of the system -- taking into account the interrelationship between space and ground segments -- will have a direct bearing on the attractiveness of the system. Members will view the overall design of the system from different perspectives. We are concerned that the developing countries be fairly represented, since well over 60 percent of the ground stations -- representing a major part of the total system investment -- now planned for operation with INTELSAT satellites by 1972 will be established in developing countries.

To ensure increasing participation by developing countries, the conditions required for access to the governing body might well be eased, within limits necessary to ensure that the governing body does not grow unwieldy. The United States has already proposed that, under the definitive arrangements, any five members of INTELSAT would be entitled to representation on the governing body even if their combined investment share were less than the minimum otherwise required for representation. Other approaches to the question should also be examined.

To ensure that all members of INTELSAT have an opportunity to participate in its affairs, we have also proposed that an assembly of members, meeting annually, would be desirable. There have been various suggestions regarding the role of such an assembly and the mechanism by which it would reach decisions. The United States should remain receptive to all such suggestions.

The role of the Manager will also be considered in the forthcoming negotiations. We have proposed that Comsat serve as Manager under the definitive arrangements pursuant to a management contract concluded with the Governing Body --- with the main features of the Manager's functions to be spelled out in the definitive arrangements.

While recognizing the important contribution that Comsat has made thus far as Manager of INTELSAT, some members have expressed the view that broader participation in the execution of this responsibility is desirable in the future. In this context, we note that Comsat is now in the process of implementing a recent decision to establish a distinct division within the corporation to carry out its duties as Manager of INTELSAT. Increasing numbers of

foreign personnel have served with Comsat since the inception of INTELSAT; they will now be able to work in the new division.

We endorse such steps in the direction of greater international cooperation in the managerial function.

V. INTELSAT SHOULD REMAIN FREE OF EXTRANEIOUS ISSUES

In considering the desirable shape of INTELSAT's institutional structure and decision-making process under the definitive arrangements, we are mindful that the organization is becoming increasingly attractive to many non-member nations because of the global coverage it provides, and the efficiency and economy of its services. If it is to continue its established record of growth, INTELSAT should, as in the past, continue to provide a forum in which communications matters, and not extraneous issues, are central. Political alignments and differences need not and should not have a place in such an organization.

It is hoped that those countries which have remained apart from INTELSAT will reconsider the advantage of participation in INTELSAT. It should be possible to find a way to accommodate their legitimate interests and requirements within the flexible framework of the global system.

CHAPTER FOUR

SATELLITE COMMUNICATIONS AND EDUCATIONAL TELEVISION IN LESS DEVELOPED COUNTRIES

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CHAPTER FOUR

SATELLITE COMMUNICATIONS AND EDUCATIONAL TELEVISION IN LESS DEVELOPED COUNTRIES

The President's message on communications policy gave stress to the communications problems and needs of the less developed countries. The Task Force has, therefore, appraised the prospects of telecommunications helping such countries overcome their problems and evaluated policies which this and other countries might adopt in order to assure that the prospects are realized. Accordingly, we have studied as illustrative examples the needs and possibilities of two representative, but quite different, areas of the less developed world: Latin America and India. Of course, this selection does not imply that these two areas are necessarily the most attractive for satellite or instructional television applications.

Our general conclusion is that the prospects are favorable for expanded and much more efficient use of telecommunications by the less developed countries. Satellites can make a significant contribution to this advance. However, for these prospects to be realized, new planning capabilities are required.

I. THE LESS DEVELOPED COUNTRIES VITALLY NEED BETTER COMMUNICATIONS, BOTH INTERNALLY AND WITH THE REST OF THE WORLD

The process of economic development requires the acquisition of a modern telecommunications capability, for telecommunications is part of the essential infrastructure of any developed industrial nation. Effective government, domestic and foreign trade, transportation, modern industry, and national unity all require good telecommunications. In the form of television, telecommunications offers substantial promise of helping to solve the serious educational and population problems of the less developed world.

At the outset, we would emphasize that sound development of a nation does not result when a few limited locations are provided sophisticated and advanced telecommunications systems while the substantial remainder of the nation goes undeveloped. It would be mistaken to consider the development of a few international earth stations or a few broadcast reception terminals within a nation without devoting attention to the development of communications facilities within and between countries. Balanced telecommunications progress requires the expansion of the domestic infrastructure, including modern local exchanges and adequate numbers

of telephones, as well as links among the various cities and towns.

As discussed more fully in Chapter Three, striking progress is being made through INTELSAT with respect to a global communications network including the less developed countries. At this writing 55 countries, including 40 of the less developed, have ground stations scheduled for completion by 1972 to work with INTELSAT satellites.

Both to serve the needs of domestic development, and to fully exploit the INTELSAT global system (which initially will link only the largest cities of the participating countries) it is important that domestic telecommunications networks be greatly expanded. Unfortunately, communications links within less developed countries are generally rudimentary and unreliable -- where they exist at all. High-frequency radio, subject to vagaries of the atmosphere, is still relied upon to connect many major cities. And nationwide electronic distribution of television programming, commonplace in the United States and Europe, is virtually unknown in less developed areas.

II. MULTI-PURPOSE SATELLITE FACILITIES HAVE SUBSTANTIAL PROMISE FOR LATIN AMERICA

A. There are Important Areas of Demand Which Satel- lites Might Meet

Much of Latin America's population is scattered over towns and cities separated by rough, uninhabited, sometimes forbidding terrain. It is quite natural to think of telecommunications development in these circumstances primarily in terms of the communications satellite. Satellite costs are largely independent of the distance between earth stations or the character of the intervening terrain, and satellites appear particularly economic as a method of linking up widely separated points having relatively low traffic requirements.

In order to judge the attractiveness of satellite services for Latin America, it is necessary to have some idea of the extent and character of the region's physical environment, stage of economic and telecommunications development, and the possible range of opportunities. This is not an easy task. In the case of telephone, the prevalence of "concealed" demand (i.e., potential users discouraged by the existing inadequate facilities), the unknown effect of rate changes, and other factors, make the forecasting of

communications demand in the less developed world especially difficult. However, a study conducted for the Task Force by Page Communications Engineers does clearly show that for these countries domestic demand is likely far to exceed international. While much of the domestic demand in Latin American countries may involve distances too short for satellites to be more economical than terrestrial alternatives, even a small percentage of the region's demand may provide a sufficient base for economically attractive satellite facilities.

In addition to telephone, telegraph and data service, the use of satellites for television has considerable potential. It would permit each capital city to distribute timely public affairs and news programs on an instantaneous basis to numerous points within its national boundaries.*/ In addition, programming from international sources (such as coverage of major news and cultural events) could be transmitted by INTELSAT satellites to the several large earth

*/ We emphasize the phrase "national boundaries" because special political and legal considerations would affect the extent to which countries would accept television programming beamed from other countries for consumption by their national audiences.

terminals already planned or under construction in the region. From these terminals satellites could be used to relay the program to outlying areas. The television distribution system would also be useful for classroom instructional purposes. Thus, one could visualize a channel being employed during the day for instructional purposes in the classroom, and during prime time evening hours for entertainment, public affairs and news programs. As the occasion arises, especially important international public affairs programming could be brought in to preempt regularly scheduled national programming.

However, one question which immediately arises with respect to instructional television is: "Why use a satellite?" Since instructional television is generally "canned," what benefit is connected with instantaneous transmission to individual receiving points? If local television stations are in any event needed, would it not be less costly to distribute video tape through the mail for local rebroadcast by these stations?

There are four considerations which make instantaneous transmission especially attractive:

-- While video tape distribution for local rebroadcast is likely to be much less expensive than a satellite system dedicated solely to instructional television, the additional cost of using the satellite for instruction may be low if the satellite is at the same time employed for other purposes such as telephone and public affairs television. Or, if it is desirable to beam timely public affairs programming to the home and to the village square, for which instantaneous electronic distribution is essential, then the additional cost of using the same channel during the day for classroom use would be small.

-- The low cost embodied in video tape distribution is very much dependent upon local use of particular tapes in accordance with prearranged schedules and then mailing them in sequence to other local users. However, unless mail and transportation systems are good, and the competence of local personnel is high, the snowballing of delays and missing tapes can lead to a crashing fiasco. Unfortunately, mail systems and transportation are typically not reliable in less-developed countries -- especially in the isolated areas one would be particularly interested in reaching by satellite.

-- It would sometimes be desirable to bring to the classroom programs of particularly timely interest, to make ad hoc revisions in televised lecture material to reflect recent events and experience, and more generally to retain the option of changing programming on short notice -- things which can be done satisfactorily only with instantaneous distribution.

-- A widely-voiced complaint concerning instructional television is that it is totally passive -- that it does not permit members of a large audience in a learning situation to interact with the teacher appearing on the screen. But here, since the satellite would provide telephone channels along with television, exciting possibilities emerge for designing an interactive feedback system to employ voice channels, particularly during off-peak periods of telephone use. For example, we could visualize a television channel, combined with telephone links to the originating studio in the capital city, employed for teacher training sessions; small groups of teachers scattered throughout the country could ask questions, get immediate answers, and enjoy a shared participation with those in the studio.

Against these considerations, it must be recognized that nationwide distribution via satellite may suffer handicaps in particular situations. A major educational constraint is that the less locally tailored the programming, the less likely it is to be effective. Thus, a trade-off exists between the scope of satellite coverage and its instructional effectiveness.

B. Estimated Costs of Satellite Facilities, Designed to Meet these Demands, Compare Favorably with those of Terrestrial Alternatives

Among the various satellite possibilities which we have studied with respect to Latin America's telecommunications needs, one of the most interesting involves a satellite with four beams covering South America, working with relatively low-cost earth stations in all the 125 cities with populations in excess of 50,000.—*/ Each city would have 50 to 250 voice channels, depending on its size, and one television receive channel; at least one city in each of the ten countries covered by the satellite beams would also

*/ The model was developed by the Central Staff from data provided by NASA, The Electronic Industries Association, Page Communications Engineers, General Electric, and Hughes Aircraft.

have a television transmission channel to cover its own national population.* / Thirty-five percent of the continent's population would be directly served by the system. While cost estimates are necessarily subject to great uncertainty at this early stage, this system might involve a total 10-year investment cost of perhaps \$80 million, and an annual operating cost of about \$3.5 million. At roughly twice the cost, the coverage of the system could be expanded to an additional 403 cities and towns accounting for an additional 12 percent of the continent's population.

Planning and construction are already under way on an Inter-American Telecommunications Network (ITN) designed to interconnect the continent's major cities, mainly by terrestrial microwave links. However, even if we presume that

* / It should be noted that the most significant school uses of educational television would surely require more than one channel. Perhaps the most useful combination would involve the satellite for programming a national curriculum, while local television production, using other channels, would provide supplementary locally-tailored programming. Of course, if more than one channel is required by satellite, a much larger system than is considered in our illustrative example could be built.

ITN is completed as planned, the additional cost of expanding it with microwave facilities to provide the same level of service contemplated in our satellite model would be significantly greater, according to our studies, than the cost of the satellite system. Moreover, ITN is far from complete. As it now exists, ITN represents a mixture of on-going construction, firm plans, attractive prospects, and hopes. If satellite facilities were substituted for some portion of ITN, they would enable substantial additional cost savings. Of course, we do not mean to imply that plans for ITN should be scrapped and satellite facilities substituted. What we do suggest is that the prospects for satellites merit careful appraisal as part of a mixed satellite-terrestrial network in Latin America.

Of course, the facilities described here are only illustrative. At this time we cannot say what the optimal level of coverage and capacity would be for either an initial or a more advanced system, nor do we have precise estimates of costs. What our study strongly suggests, however, is that potential applications are promising, and that satellite facilities could be tailored to meet the needs of the countries served. Major decisions would require much

more detailed analyses of the comparative costs, benefits and feasibility of satellite applications and other alternatives.

C. Regionally-Shared Satellites Would be Compatible with INTELSAT and with the Needs of Spectrum Conservation

It is notable that regionally-shared satellite facilities would complement and strengthen a global satellite system; by "collecting" domestic traffic it would expand the demand for intercontinental service supplied by currently programmed INTELSAT satellites. We have already mentioned that television programming originating on other continents could be transmitted by INTELSAT and re-transmitted via the regional satellite facilities to reach additional cities, numbering a hundred or more, depending on the factors noted above. In addition, regional satellite facilities would provide the "tail-end" extensions in the participating countries for telephone, data and record service involving overseas points. That is, traffic could be routed between the outlying towns and cities to major cities where the large INTELSAT ground stations are located. From there, the traffic would go by INTELSAT to Europe, to the United States, Africa, or anywhere else in the global system. To be sure,

this would require two hops, which would result in somewhat degraded telephone quality because of the time delay. Nevertheless, given the reliability and general quality of international service that would be provided to outlying points, in contrast to the exceedingly poor service existing today, a two-hop delay might well be tolerated by most users.

Some fears have been expressed that the proliferation of satellites would lead to a crowding of the orbital "parking slots" most suitable for satellite communications, as a result of spectrum limitations. For several reasons we doubt that this problem will become serious in anything like the foreseeable future: First, the orbital space that would be most useful for the South American continent would fall conveniently between the longitudes most useful for U.S. and Canadian systems on one side and longitudes most useful for an INTELSAT transatlantic system on the other. The best positions for U.S. and Canadian satellites would be over the Pacific Ocean to the west of Ecuador. The best position for transatlantic satellites with good coverage of Western Europe is near the bulge of Africa. The 45 degrees of longitude directly above the South American continent would not overlap these areas. Secondly, this 45 degrees of orbital space

would permit a number of satellites -- perhaps 5 or 10 -- with a total capacity for Latin America far greater than anything we can envision being needed by 1980 -- or indeed well beyond. Third, as traffic grows in the more distant future to require many satellites, orbital space might become increasingly crowded. But during the same time technology will also advance to afford more efficient use of spectrum. Narrower beams can be designed to cover selected portions of the earth and permit reuse of the same spectrum and orbital space by several regions simultaneously. For example, a satellite covering the southern regions of South America could use the same spectrum space in the same orbital slot as a satellite covering portions of the United States or Canada without mutual interference. Likewise, a narrow beam satellite covering East Africa would not interfere with a different satellite in the same orbital slot beamed to Western Europe.

D. The Most Difficult Problem is that of Regional Coordination; INTELSAT May Provide the Answer

Over the next few years the large economies of scale inherent in satellite technology will very probably be best exploited if facilities designed for Latin America are shared

among a number of countries. In most cases, it would be highly uneconomic for Latin American countries separately to orbit satellites to serve their own domestic telephone and television needs. As technology progresses and traffic demands grow in the more distant future, perhaps it may become economic for separate small countries to have their own systems. In the meantime, the economic appeal of satellites rests largely on the condition that the system be spread over a number of countries. But sharing a satellite system among a number of countries obviously requires a high level of cooperation with respect to such factors as satellite design, spares and replacements, launching arrangements, procurement, earth station design, traffic loading, and control and telemetry.

Of basic importance to satellite use is the need for a special degree of international cooperation differing substantially from the more traditional form of cooperative arrangements that govern terrestrial alternatives such as cable and microwave relay. Participating in a satellite system that provides domestic service, a country would become dependent for its domestic communications needs on facilities over which it does not have total control.

The reliability and capacity of communications links, the cost burden borne by the country, the time phasing of the services, and other matters would depend partly on the actions of other countries -- what kinds of services other countries desire; whether agreement is reached about common procurement of ground stations, etc. In contrast, a microwave system built for domestic use would be entirely under the control of the national government. Though, as suggested earlier, microwave might involve a total cost considerably greater than that of satellite, the country would be free to choose its own hardware, build microwave links whenever and wherever it pleases, and provide whatever services it desires.

This is not to say that it would be impossible to achieve levels of international cooperation required to develop and operate regionally-shared satellite facilities. The best solution might well involve INTELSAT establishing and maintaining the satellite portion of the system. In this case INTELSAT would procure and place in orbit the satellites (tailored to the needs of its users), provide backup satellites and other facilities, undertake the telemetry and control functions and, in general, perform all

the other tasks associated with implementing and maintaining the space segment. Each user might reimburse INTELSAT for its share of the space segment in proportion to use, while it would own and operate its own earth terminals.

Using INTELSAT has several advantages, not the least of which is simply the fact that it is an organization with many members. While each participating country would necessarily face the prospect of not being in complete control of its telecommunications facilities, it would at least have the assurance that the responsibility for the space segment would be shared by many members with no serious risk that the organization would become dominated by one or a few potentially unfriendly neighboring countries. One might imagine a small country being reluctant to join a four-nation group to put up a satellite, on grounds that such a grouping would likely be dominated by the largest one or two members. If, on the other hand, the forum for cooperation were more broadly based, as in INTELSAT, the attraction of participation could be markedly enhanced.

Another advantage of an INTELSAT arrangement is better exploitation of economies of scale. We have assumed that a separate satellite would be used to serve the domestic needs

of a continent the size of South America. With the kinds of technology available in the early 1970's, in the light of anticipated demand, this is probably a safe assumption. However, as technology advances in the more distant future, it could become technically feasible and economically attractive to serve a wide variety of domestic, regional and intercontinental needs throughout the Atlantic basin from a single satellite. Thus, a satellite over the Atlantic, with a large number of separate narrowly-focused beams, might simultaneously provide domestic and regional service both in Latin America and in Africa and at the same time provide intercontinental links among all major points, including the dense routes over the North Atlantic. If such an approach seeking to reduce unit costs to all users should eventually turn out to be attractive, working through INTEL-SAT from the outset would facilitate its adoption.

The prospects for regional cooperation in the use of satellites will be enhanced if the 1969 INTELSAT definitive arrangements establish a flexible framework within which the specialized satellite needs of groups of members -- as well as individual members -- can attractively be met by going to INTELSAT. Such a framework would facilitate regional

cooperation in the use of satellites by all countries, regardless of their stage of development.

III. A NATIONWIDE TELEVISION SYSTEM OFFERS PROMISE FOR INDIA

A. India's Staggering Problems in Regard to Telecommunications Require a Strict Set of Priorities

The less developed regions differ greatly from each other, and for that reason it is impossible to apply the same regional model everywhere. The contrast between Latin America and India is striking. Interconnection of all of the cities and towns of South America having a population of 10,000 or more would embrace 47% of the population of these countries. In contrast, only 20% of India's population lives in urban areas, the remaining 80% being scattered among some 568,000 villages. Since only 20% of these villages are expected to have electricity by 1974, the creation of an inclusive electronic communications network is out of the question in the near term. With only 5400 miles of microwave or coaxial cable links, and a telephone to population ratio of 2 to 1000, India's telephone and telegraph industry is in its infancy. Moreover, the country has only one television station, and 6000-7000 television receivers.

Of special significance is the fact that India is severely fragmented in terms of language and culture. Fifteen official languages exist, thirteen of them spoken by more than 10 million people. Sixteen unofficial Indian languages are spoken by more than half a million people each. Altogether, there are over 800 recognized languages in India.

With problems and obstacles to development so formidable, improvement of the subcontinent's telecommunications in the near term would be facilitated by a strict set of priorities modest in scope and aspiration. A relatively small scale television distribution system utilizing satellites might represent a realistic and promising first step.

B. Television Offers Hope of Ameliorating Some of India's Serious Problems

In the opinion of India's leaders and of outside observers, the subcontinent's salient need is to create a sense of national unity and integration among a culturally, religiously and especially a linguistically diverse people. Television could give Indians an opportunity to share common experiences, enable Indian leaders to communicate more effectively with the entire nation, and contribute to mass participation in the major events of national life. Television may also have an important application in assisting

India to overcome another fundamental problem: inadequate education. It is less the number of schools or teachers than it is the quality of education that is inhibiting national development. And it is precisely in improving quality that television could be expected to make its principal contribution. Television enables the exceptionally skillful and well-trained teacher to reach a vastly greater number of students than he could possibly reach in the classroom, thereby enabling the greater utilization of the nation's scarce educational resources.

From a more utilitarian perspective, television also offers substantial promise of helping to rid India of its age-old problem of famine, by communicating advanced agricultural productivity. Finally, television may have value in combating a variety of other grave national problems -- such as that of overpopulation, through dissemination of birth-control information.

To be sure, radio is also an important medium for such tasks, and has the advantage over television of already reaching the bulk of the population. Lacking the visual dimension, its impact is, however, inherently much more limited -- especially for educational uses that require pictures, diagrams and visual demonstrations.

Printed media also can contribute. But their circulation and penetration in India are very shallow and are severely handicapped by pervasive illiteracy.

C. An Initial Satellite System Covering the Major Cities and Surrounding Agricultural Areas Appears Attractive, Although Substantial Problems Will Have to be Overcome

In the long term, it is possible to envisage a satellite or terrestrial television distribution system which would reach most of the Indian population. But many years will be required to build up the electrical and transportation infrastructure to the point where television receivers can be operated and maintained at reasonable cost throughout the entire populated area of the subcontinent. For the near term, it would be unrealistic to consider a television system outside of the major cities and surrounding villages (e.g., the 79 cities that have populations of 100,000 or more), in which electricity, transportation and service facilities are adequate. A multi-purpose satellite, not unlike that discussed earlier in connection with Latin America, could provide perhaps 5000 telephone channels plus three television channels for the 79 cities (and surrounding agricultural areas) with populations in excess of

100,000. This capacity would be sufficient to broadcast 35 hours a week to each of 12 language groups. The system could be expanded later to serve additional population centers as the necessary infrastructure developed.

We must carefully note, however, that the greatest difficulties encountered in establishing and operating such a system would involve not hardware design, but rather a host of other factors: developing good and effective programming, getting support and cooperation from schools and teachers, organizing and training people to use television effectively, and many others. Like most less developed countries, India has an inadequate number of technically and professionally skilled personnel, especially in the areas most vitally involved in a satellite television system -- communications and educational technology, broadcasting, the design and administration of educational television curricula, the interface with the conventional educational system, and overall administration of novel and complex public institutions. Television systems require not only a system coordinating large numbers of people in many different specialities, many of whom will be dispersed over large and remote areas; they also require a degree of

efficiency and precision in operation rarely found in any less developed country: Programs must appear on time, program schedules must be known in advance throughout the country, supporting materials must be supplied on time, and technical interruptions of services must be minimized.

A promising step in moving forward is the planned experimental use of a NASA satellite for television in India.*/
The project was conceived nearly three years ago when NASA recognized that the ATS satellite series would, early in the 1970's, reach a stage which would permit experimentation with television broadcasting over a controlled area into augmented standard TV receivers for community reception. Studies have shown that such modification can be accomplished at costs ranging from \$150 to \$500 or \$600, depending upon the numbers produced, location for use and similar factors.

The experiment will offer India an important and useful domestic tool in the interests of national cohesion. It will provide a first and major test of educational television for the practical instruction of illiterate adults.

*/ A description of the experiment is continued in Appendix A of the Staff Paper on this subject.

The experiment has already stimulated a domestic TV manufacturing enterprise in India with important managerial, economic and technological implications. Above all, it should provide information and valuable experience for future applications elsewhere.

IV. IN GENERAL, INSTRUCTIONAL TELEVISION DESERVES
A HIGH PLACE IN THE EDUCATIONAL PRIORITIES OF
THE LESS DEVELOPED WORLD

On the basis of our case studies and other research, we are inclined to believe that educational television may prove highly beneficial to the less developed world in general, if the problems involved in its use are clearly recognized. It goes without saying that the extension and improvement of education are matters of the highest importance to a nation which desires to escape from poverty. Education in the less developed world is characterized by its heavy reliance on rote memorization instead of analysis, by curricula and subjects which are often antiquated or irrelevant, by a desperate shortage of teachers and especially of skilled and trained teachers, by lack of teacher training programs and facilities, and by student apathy.

As a complement to the many other valuable tools of education, television could make a tremendous difference.

Experiments in American Samoa, in Colombia, and elsewhere indicate that television is well adapted for teacher training, that it lends itself to uses which strengthen teacher-student responses, and that it excites students about the possibilities of education. In addition, of course, television multiplies the reach and effectiveness of the highly skilled teacher and is ideally suited to the presentation of a contemporary curriculum which includes scientific demonstrations and other visual aids vital to vocational and scientific education.

What is especially important to emphasize, however, is that successful exploitation of the medium's potential requires planning and personnel of a high order. A successful program of instructional television requires, as we stressed in our discussion of India, a rare combination of technical and educational expertise, administrative competence, and firsthand familiarity with the challenges and difficulties of adapting television to the educational needs of the less developed world. Without a proper appreciation of the magnitude of the task and an effective approach to the problems of program design and operation, instructional television is apt to prove an enormous disappointment in practice.

More specifically, from our studies of educational television we conclude the following:

1. Success requires a very serious commitment to educational change from those in top political and educational positions.

2. In order to achieve a major commitment, and to maintain it by demonstrating its success, television must be used -- or at least must be planned ultimately to be used -- for achieving fundamental solutions to priority educational problems. It must be thoroughly integrated into the educational system.

3. Planning must proceed from an analysis of the problems in local conditions, not from a blueprint for introducing a technology.

4. It is essential that programming be as relevant as possible to the individual student. Substantial parts must therefore be locally produced. The reach of any central system is determined by the homogeneity of the population.

5. The systems characteristics of the educational process, with all their interrelatedness, must be fully

recognized in planning the use of television. Many technical, organizational, and human elements must be given equal attention, for significant failure in any one of them will disrupt the entire system.

6. The systems which require complicated interaction between technical systems and human or organizational systems -- e.g., the training of repairmen and provision of an efficient repair service -- are more difficult to master than the merely technical elements in the operating environments most likely to be encountered.

7. The organizational and human elements demand most of the energy, imagination, and the application of resources. Organizational efficiency, teacher and student attitudes, coordinated teamwork, training, and like problems require complex planning, enlightened administration, and, most important, a very strong will to succeed.

V. WE RECOMMEND THAT A NUMBER OF INSTITUTIONAL AND PLANNING MEASURES BE UNDERTAKEN TO ENABLE CONSTRUCTIVE DEVELOPMENT OF TELECOMMUNICATIONS IN THE LESS DEVELOPED COUNTRIES

On the basis of our research and analysis, we are persuaded that telecommunications may be an important key to economic development in the less developed world. To turn

that key, however, will require careful, informed and sustained attention to the many problems of regional coordination, technical and educational design, and administration and operation, mentioned previously. Here we describe some mechanisms whose prompt establishment, we believe, would make this task more manageable.

A. Multi-national Educational Training Centers

We favor the creation of centers to promote the ability of individual countries to determine their own needs and objectives, determine what resources can best be applied to meeting these needs and objectives and initiate action toward their achievement. Among its missions, these centers would provide information to educational authorities and other public servants involved in the problems of educational development on the advantages of the use of technology for the solution of these problems. They would also offer, at the request of member states, training in the techniques of educational television for personnel in charge of the application of technology to education.

The absence of sufficient knowledge in any one country and the absence of sufficient trained manpower in virtually

all countries suggests that these entities cannot easily be created in each country. Establishment of regional multi-national centers, along the lines proposed by an OAS group of experts on educational technology, appears to be a very attractive approach to coping with these problems.*/

Accordingly, the multi-national training center recommended by the OAS group of experts should be given encouragement and support to implement a program for development of applied technology in education, with particular emphasis upon the use of educational technology including television as an effective instrument in helping to meet Latin America's educational needs.

Moreover, appropriate agencies should be alert to the possibility of encouraging the development of additional regional multi-national centers in those areas where the environment is favorable for success.

*/ Organization of American States, Final Report, Fifth Meeting, Inter-American Cultural Council, February 1968.

B. Assistance to Individual Country Programs

As an essential immediate step, the United States should take the lead in encouraging and supporting the use of television for educational purposes, on a scale large enough to demonstrate the technology's capacity to deal with problems of substantial scope and consequence. It is important to include a major experiment in its use for village development, in addition to formal education. These should be frankly recognized as research and development efforts, with their worldwide significance placing them in a category meriting long-term and substantial support. In this context we applaud the pilot program to be undertaken by NASA and the Government of India to explore the use of satellites through actual experiments for educational television in the early 1970's.

C. A U.S. Institute for Educational Planning and Technology

In support of both the regional centers, and the individual country efforts described above, the United States should further develop its own competence in the application of educational technology. To achieve this, strong consideration should be devoted to establishing a U.S. supported

institute or center capable of performing the following functions:

1. Performing basic research in the most effective ways to increase the educational efficiency of telecommunications media.
2. Performing multi-disciplinary applied research in the applications of educational technology to meet the needs of less developed countries under the prevailing social and environmental conditions.
3. Offering educational training for qualified persons who wish to develop competence in the field of telecommunications related to educational, cultural, and socio-economic development.
4. Offering training for individuals planning to work in a foreign country where a knowledge of the resources of telecommunications would enhance their effectiveness -- for example, training for those in agriculture, public health, job training, or other areas where the dissemination of information to large numbers is involved.
5. Offering training to foreign nationals in the techniques of planning and utilizing educational technology, especially those who do not have the resources of national or regional training centers.

6. Building and maintaining working associations with professional experts of other countries and international agencies.*/

D. Development of Low-Cost, Low-Maintenance Television Receivers

As mentioned earlier, one of the greatest problems of extending television into remote areas is the difficulty of maintaining and operating television receivers. Unfortunately, the receivers available to date were designed for ordinary household use by viewers accustomed to electronic gadgetry. Large-scale exploitation of the new technology in the environments of less developed countries will require that the technical support requirements for television receivers be drastically reduced. Accordingly, we recommend that the U.S. Government, in cooperation with private industry, explore the feasibility of developing a low-cost, low-maintenance receiver (perhaps with only a 1 or 2 channel tuning capability) suitable for use with batteries or other sources in remote regions that do not have electricity. Ideally, the receivers would be produced by the using countries themselves.

According to our studies, the total cost of any large system is likely to be dominated by the investment and

*/ In making these recommendations, we note that The Commission on Instructional Technology, under contract with the U.S. Office of Education, is currently exploring promising applications of new technology that may have great relevance to less developed nations as well as to the U.S.

operating cost of the receivers themselves. Therefore, any effort that substantially reduces the cost of the receivers will have a major impact on economic feasibility.

E. Cooperative Planning in Expanded Use of Satellites

Clearly, much of the planning and organization of educational television use can precede the use of satellites or other long distance electronics telecommunications media. The earliest programs will, in any event, probably operate with existing television broadcasting stations in large urban areas operating from video tape libraries. However, as the systems expand, long distance electronic transmission either by satellite or other means will become increasingly vital in providing both instantaneous (real-time) distribution and two-way communications links. Instantaneous distribution will be important:

-- As systems expand into the hinterlands alternate video tape distribution systems will become increasingly costly and unwieldy;

-- It will permit program schedules and content to be changed on short notice to take into account the myriad problems that will undoubtedly arise in day-in, day-out operation of the ETV system;

-- Major news and timely public affairs programming can be brought into the classroom on an ad hoc basis.

The two-way communications links are important:

-- In permitting use of feedback systems for television programs beamed to small scattered audiences, as for teacher training; and

-- In permitting service needs of schools to be met more promptly.

Quite apart from educational television, satellites are attractive for providing domestic and international telecommunications links as a major contribution to the infrastructure required for economic development. While we have discussed this role largely in the specific context of South America, it is no less important in other areas of the world.

Of course, it is up to the particular countries to determine their own needs and requirements in the areas both of educational television and of two-way communications links. The principal aim of this Chapter has been to delineate, in very general terms, some of the potentially attractive applications. We recommend that these countries be

encouraged to explore further and much more concretely the potential use of satellites. Given the importance of domestic services as a complement to global coverage, and given INTELSAT's expertise and experience in the field, we recommend that nations look to it for appropriate assistance in the development and maintenance of these services.

