Meeting - Tuesday, May 27, 1969

Fred W. Morris, Jr.
President
Tele-Sciences Corporation

Tele Sciences

August 19, 1969

Dear Fred:

Thank you for your kind letter of July 30th regarding our action on the domestic communications satellite issue. I have indeed met Walt Hinchman, and am finding him and his analyses very useful. I will indeed be in touch if our efforts involve any outside assistance.

Sincerely,

Clay T. Whitehead
Staff Assistant

Mr. Fred W. Morris, Jr.
President
Tele-Sciences Corporation
9315 Holly Oak Court
Washington, D. C. 20034

cc: Mr. Whitehead
Central Files

CTWhitehead:ed

Tonya

TELE-SCIENCES CORPORATION

TELECOMMUNICATIONS CONSULTANTS

9315 HOLLY OAK COURT
WASHINGTON, D. C. 20034
TELEPHONE (301) 469-6034

July 30, 1969

Dear Tom:

Congratulations on the positive step forward you are taking and the leadership exhibited in your convening a study group to consider the domestic communications satellite issue and to advise the FCC concerning the Administration's policy position. I want to join many others in wishing you well in your endeavor. In my opinion it is unfortunate that such leadership has not been forthcoming from the ODTM in the past.

During the Johnson/Rostow Task Force on Communications Policy, Mr. Walter Hinchman - now with the Department of Commerce, Boulder, Colorado - contributed some fine analysis in the field of your new effort. If you have not already made contact with Walt, I suggest you do so.

Please let me know if I can be of any assistance to you or your associates.

With personal regards,

Sincerely,

Fred

Fred W. Morris, Jr.
President

Dr. Clay T. Whitehead
Staff Assistant to The President
The White House
Washington, D.C.

mtg 5/27
10:30 am

FRED W. MORRIS, JR.
PRESIDENT

TELE-SCIENCES
CORPORATION
TELECOMMUNICATIONS
CONSULTANTS

9315 HOLLY OAK COURT
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TESTIMONY OF FRED W. MORRIS, JR.
PRESIDENT, TELE-SCIENCES CORPORATION (Washington, D.C.)

BEFORE THE SUBCOMMITTEE ON NATIONAL SECURITY POLICY AND SCIENTIFIC DEVELOPMENTS OF THE COMMITTEE ON FOREIGN AFFAIRS, HOUSE OF REPRESENTATIVES, CONGRESS OF THE UNITED STATES

THURSDAY, MAY 22, 1969 AT 10:AM, ROOM 2255, RAYBURN HOUSE OFFICE BUILDING.

"A COMMUNICATORS VIEW OF WORLDWIDE SATELLITE BROADCASTING"

Mr. Chairman and Members of the Committee: I appreciate this opportunity to appear before you as an independent telecommunications engineering and management consultant with a degree of background in the subjects of interest to the Committee as a result of both industry and government employment.

You have asked that I address my remarks to the subject of your pending resolution calling for aggressive action on the part of The President in the promotion and development of worldwide satellite broadcasting to improve the free flow of information among nations and peoples.

I agree wholeheartedly with the view that we should press for the utilization of the available technology and the developable technology to achieve the goals of an improved society and a free exchange of information throughout the world. Truly, communications do offer a powerful instrument of education and economic, political and social development. However, I will attempt to present some views developed as a result of my career and experience in telecommunications to urge that you not specify the means of transmission or reception of the services that you are encouraging.

The witnesses that have appeared before your committee in the past week and the documented studies you have before you present the status of development of our technical ability to provide worldwide broadband (as is required for television and high speed data) communications - including direct broadcast via satellite. We again find that our technological development and achievements are proceeding more rapidly than is our ability to accommodate and provide for the policy and regulatory environment in which to allow the technologies to be applied in the service of mankind. - The resolution under consideration and the area of interest to the Committee, as I understand it, do not involve the domestic United States. Therefore, the policy and regulatory environment we must address is that of the World Community.

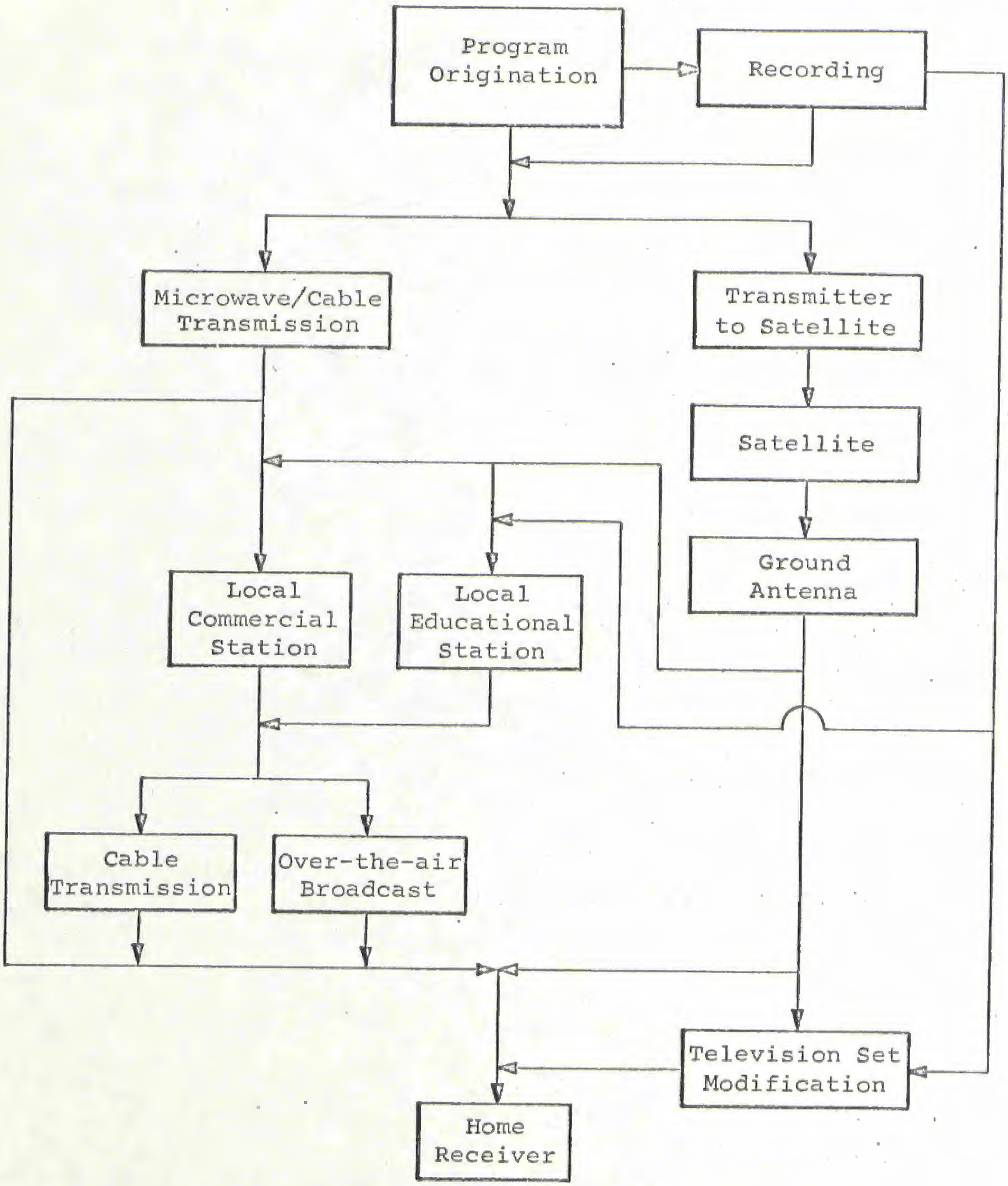
Previous witnesses before your committee alluded to the interaction of the thrust of your resolution with the views and interests of the United Nations, interpretations of the Treaty on the Peaceful Uses of Outer Space, and - indeed - the regulations, rules, and restrictions of the International Telecommunications Union (ITU). Also to be considered is the effect of the many nation commitment to the International Telecommunications Satellite Consortium (INTELSAT).

Having spent much of my professional life in the field of communications, I have learned the hard way to consider the many modes of communications available to meet requirements at hand. It is relatively easy to grasp for the newest of the technologies to supply new services. It is not always as easy to reconcile the economics and operational tradeoffs and the political environment with the call for immediate application of the new technology.

To be specific, everyday we are improving our use of the means available to disseminate and effect a freer exchange of information throughout the World - including the dissemination and distribution of broadband information such as television and high speed data. We utilize the means of improved transportation of video tapes and films by air transport. We have seen the international exchange of television programming by microwave means often assisted and supplemented by satellite point-to-point communications. In these instances the final transportation or transmission of the television programming to the end user has been through local or national networks of television broadcasting and/or closed circuit TV distribution by cable or the independent viewing of video tape through individual tape playback units. As indicated in Figure 1, there are many alternative paths or means from which to choose in proceeding from TV program origination to the end user - home or community receiver.

My point is that the economic tradeoffs matched with the requirements at hand do not always dictate that the direct transmission by broadcast to the end user from the originator is the most appropriate or acceptable.

In specific, rather unique situations - such as is represented by India - a satellite service providing nationwide point-to-point as well as distribution and probably community or direct broadcast transmission may



Courtesy: Spindletop Research

FIGURE 1...ALTERNATE TELEVISION PATHS OR MEANS.

well prove essential and economic. With the rudimentary and essentially non-existent communications network in India it is not difficult to envision the use of relatively narrow beam satellites to provide economic high grade telephone, record and data services between and among major cities and outlying towns and relay and/or broadcast of educational and instructional television programming originated in one or more national programming centers.

In India only about 20% of the population live in urban areas. The remaining 80% live in the approximately 568,000 villages scattered throughout the country. No more than half of the villages are connected by roads to the outside world. Only one television station exists in India. No Indian leader has ever been able to communicate with all of India.

In other developing country areas or continents where many independent nations are contained and where centers of population are more concentrated it may prove desirable to couple satellite service with augmented terrestrial and local distribution networks. In Latin America, for example, because of the surprisingly large number of television stations already existent and for political reasons, a direct broadcast satellite does not appear the most likely means of providing for television service. At recent count, Brazil had 47 television broadcast stations, Mexico 32, Colombia 14, and Peru 20. There are already over 2 million television receiving sets in Brazil, over 1 million in Mexico, and 200 thousand in Colombia. Here, what is most essential is improved program content and improved access to information from the World Community.

In considering television we must always remember that programming - not distribution - is the most costly element. In this country the average cost of <u>preparing</u> a half hour prime time commercial program is around $70,000. Even educational programming costs per hour run in excess of $20,000 with documentaries and dramatic productions running up to $80,000 per hour.

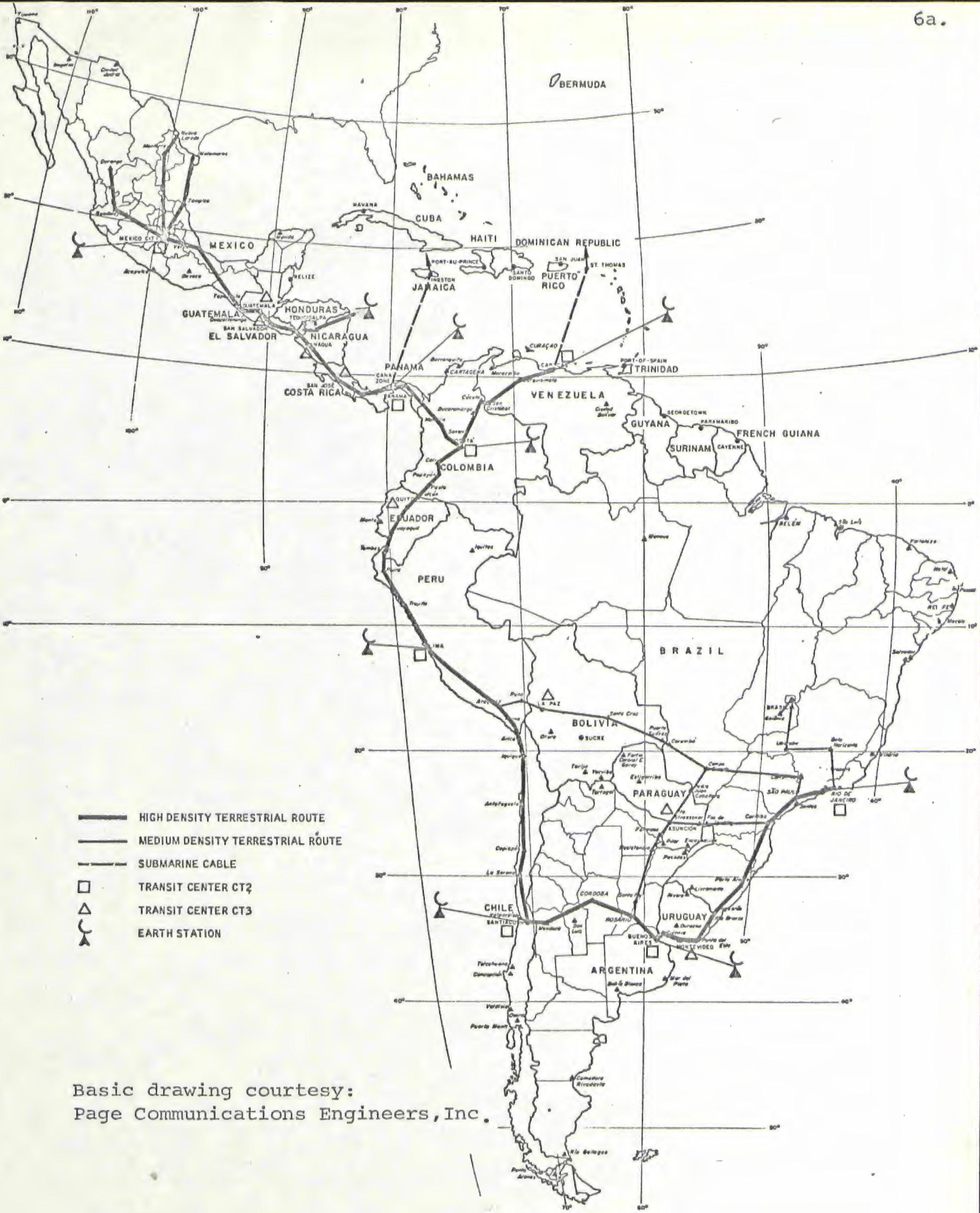
I bring up this latter point and wish to emphasize that one of the most serious missing ingredients in the exchange of information by television is good program content. Once program content is available, it is then a requirment upon communications to transport the programming. Earlier I mentioned the many means available for such transport.

Where individual national governments are concerned, it is my understanding that it is our United States foreign policy to assist the national governments to better identify with their citizens. A major assist can be given to the developing nation governments by providing television program content around which national or local governments or educational institutions can program for broadcast or other transmission to viewers.

Direct broadcast by satellite or other means to multiple nations (let alone a continent) does not assist the individual national governments in identifying with their citizens. I allow that such direct broadcasting would not contribute to improved stability, economic, political and social development.

In contrast with the situation in India let us briefly consider Latin America. Here we have a multination situation with a relatively urbanized population (ie. 125 cities in South America with populations in excess of 50,000) and with a rapidly developing telecommunications network incorporating improved high-frequency and microwave radio links as well as a complex of communications satellite earth stations working into the INTELSAT satellite system. Figure 2 discloses the configuration of the Interamerican Telecommunications Network (ITN) as now underway for completion in the early 1970s. Earlier I mentioned the surprising large number of television stations already existent. Television program distribution appears to be the most challenging requirement in the Latin America situation - not direct broadcast satellites.

Out of my personal experience I can testify to the anticipation of the five Central American Republics (Guatamala, San Salvador, Honduras, Nicaragua and Costa Rica) to being able to receive television program content from the United States and the rest of the World for use in their individual national television networks. A current program is underway as a cooperative venture of the five republics to link their capitals together with a broadband microwave system that will not only provide for voice, record and data transmission but will also provide - through the use of protection channels - television transmission. A recent decision of the Central American Regional Telecommunications Commission (COMTELCA) will now provide for a jointly owned and operated communications satellite earth station working into Atlantic satellites of the INTELSAT system and thence into the many earth stations of the



Basic drawing courtesy:
Page Communications Engineers, Inc.

FIGURE 2... CONFIGURATION OF THE INTERAMERICAN TELECOMMUNICATIONS NETWORK AS UNDERWAY FOR COMPLETION IN THE EARLY 1970s.

countries in the Atlantic basin.

As the capacity of the INTELSAT satellites increases and - in that the installed capacity is geared to peak demands - we can foresee the time when off-peak hour traffic can be carried on a reduced tariff basis. Off hour tariffing can be coupled with a special tariffing for one-way transmission of television programming to multiple destinations. With this near term possibility and with the many INTELSAT earth stations that are being committed to construction, the opportunity to make good program content available to many countries for their video tape recording and later programming for transmission via their national networks or for use in educational video tape libraries is exciting. Here the economic, operational and political tradeoff advantages over other means of transporting or transmitting program content may well favor the satellite distribution means of communications - but not favor the direct satellite broadcast means.

I hope that the Committee will not interpret my remarks to be in opposition to the technological development of the capability for direct broadcast via satellite of any of the classes of service discussed by Mr. Pritchard and Mr. Jaffee during last week's hearings or as so capably discussed in the publication of the National Academy of Sciences Panel 10 Report concerning Broadcasting as a Useful Application of Earth Oriented Satellites.

As the Chairman has noted in his remarks before the House of Representatives on April 30th, "it is technologically feasible...for the Soviet Union to put into synchronous orbit along the equator a broadcast satellite which could reach directly into the living room television sets of our American people". We must have, in my opinion, the same or superior technological capability. However, I do not foresee it as desirable to utilize the capability on a worldwide or multinational basis unless we are provoked to react in our own national interest and defense.

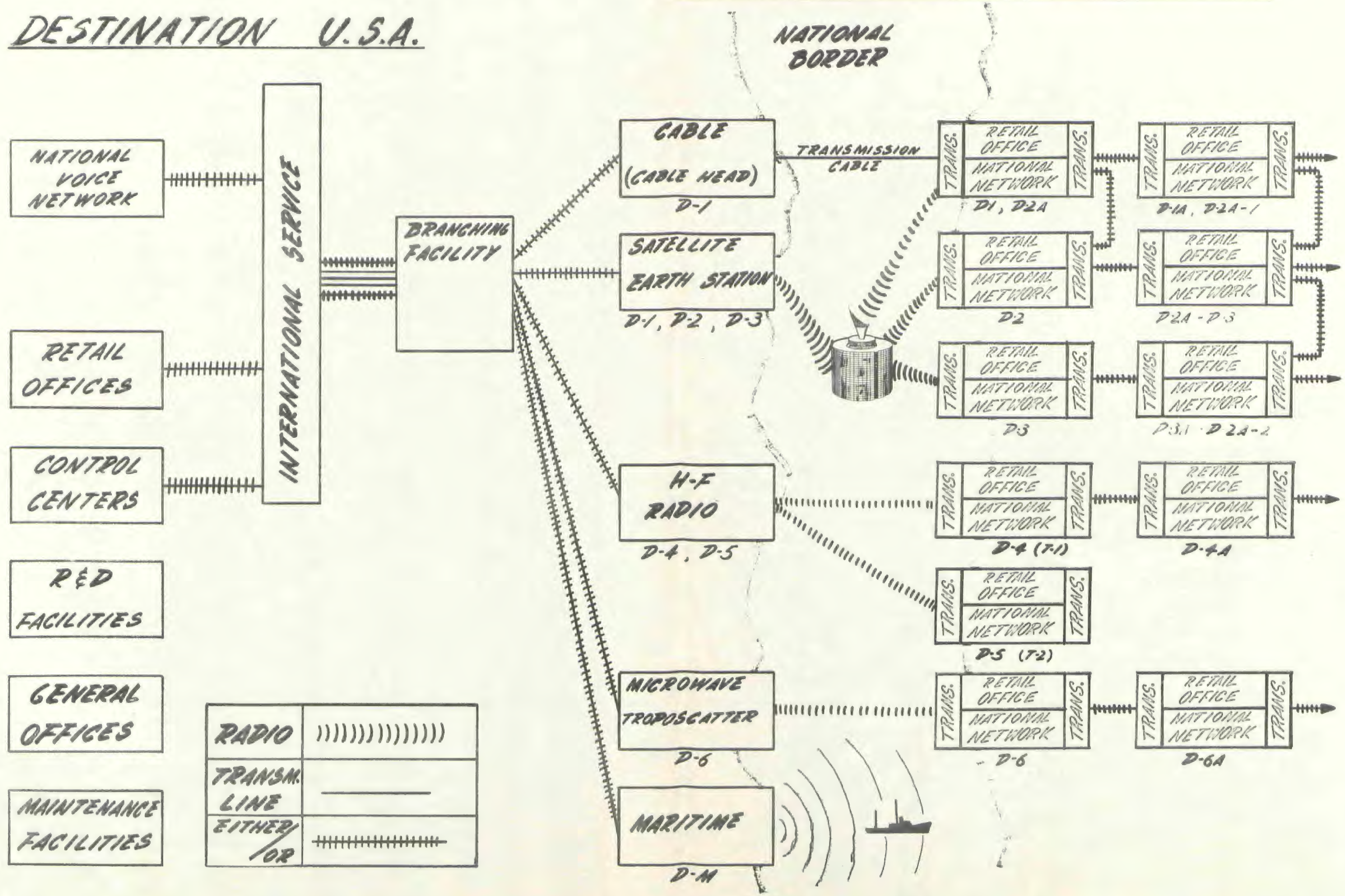
I am certain I have used my time as allotted, however, in closing I commend to the Committee's attention Chapter Four of the Report of President Johnson's Task Force on Communications Policy as released by the White House last Tuesday . The chapter is entitled "Satellite Communications and Educational Television in Less Developed Countries". The chapter is supplemented by Staff Paper Three bearing the same title. Possibly you will choose to include the Task Force chapter in the report of these hearings. The chapter and paper reference the fine work upon which they were based as conducted by Page Communications Engineers, Inc. (Washington, D.C.) and Stanford Research Institute (Menlo Park, California). I also recommend you give attention to aspects of a report prepared for the Task Force by Spindletop Research (Lexington, Kentucky) which attempts to identify and analyze alternatives for achieving greater television program diversity. An earlier report by Spindletop - prepared for the Director of Telecommunications Management, Executive Office of The President - evaluated alternatives for the production, distribution, and financing of television programs.

Again, let me say that I appreciate this opportunity to appear before you and to encourage you - in your consideration of House Concurrent

Resolution 236 - to modify the resolution to de-emphasize the "broadcast" mode in the use of satellite services as you call for improved exchange of information among nations and peoples as can be provided by modern communications in many technical forms.

INTERNATIONAL COMMUNICATIONS PICTORIAL CHART

DESTINATION U.S.A.



American Institute of Aeronautics and Astronautics

NATIONAL POLICY CONSIDERATIONS IN SPACE TELECOMMUNICATIONS

by

Fred W. Morris, Jr.
Associate Director of Telecommunications Management

Office of the Director of Telecommunications Management/
Special Assistant to the President for Telecommunications,
Executive Office of the President
Washington, D. C. 20504

AIAA Communications Satellite Systems Conference

WASHINGTON, D.C./ MAY 2-4, 1966

AIAA Paper
No. 66-261

NATIONAL POLICY CONSIDERATIONS IN SPACE TELECOMMUNICATIONS

Fred W. Morris, Jr.
Associate Director

Office of the Director of Telecommunications Management/
Special Assistant to the President for Telecommunications

Executive Office of the President

Washington, D. C. 20504

INTRODUCTION

Mr. Krassner, Ladies and Gentlemen, it is a pleasure to be with you. It has not been quite the same pleasure preparing remarks for public utterance on a topic where there are so many diverse views -- in and out of Government. Attempting to convey something to you concerning national policy considerations in space telecommunications is particularly difficult when there are the multitude of questions pending resolution before regulatory and Congressional authority.

As a nation, we face a world situation today which demands precise balance between technology and national policy. In the field of satellite telecommunications we have seen technological progress so dramatic that it has captured the imagination of the entire world. It is be-coming increasingly clear that this new technology brings opportunities for communications capabilities which can significantly change and profoundly affect economic, social, and political relations throughout the World.

My remarks here today will concern themselves with the task of matching national policy with the rapidly changing and advancing technology.

The relationship between technological change, on the one hand, and policy or legal change, on the other, is an extremely important one and one which is not always well understood.

If policy, law and regulatory activities are in step with technological change, we create a climate which stimulates progress. We have the chance to create capability which can have lasting impact upon every facet of our national security, our business, our social and political life. There is a delicate balance.

If our policies and laws and our regulatory actions are not in step with technological change, then major problems are created.

-- The rapid application of new technology is delayed.

-- Previous laws and policies become serious impediments to rapid exploitation of technological advancement.

-- Extended periods of amortization of older facilities make the rapid expansion of the new a complicated matter.

For these and other reasons, it is clearly in our national interest to devote a major element of our time and effort to the establishment of enlightened national telecommunications policy that can foster and support the powerful tools for progress and advancement of civilization that communications satellite technology has placed in our hands.

THE BASIS OF CURRENT POLICY

In the Communications Satellite Act of 1962, the Congress stated the policy and purpose for a dynamic communications development. The policy provided that new and expanded satellite telecommunications services should be made available promptly and extended to provide global coverage at the earliest practicable date.

Further, policy objectives were incorporated into the Act to provide:

-- Flexibility in the implementation of the Act which would permit the domestic and international corporate arrangements to evolve in accordance with needs that could not possibly have been foreseen at the time the Act was drafted.

-- A reconciliation of private ownership incentive and profit interests in a way which ensures a private enterprise venture but provides direct ties with the Government and direct responsibilities to pursue national interest objectives.

-- A compromise solution in the national interest which addresses the diverse goals of the Government, industry and the common carriers. An arrangement which provides reasonable accommodation of conflicting views and permits progress towards a common objective.

Acting under the law, and the interpretations found necessary within the Executive Branch, we have, to date, enjoyed significant progress in the field of space communications. The accomplishments of the past year have been impressive. I would like to recount some of them here as an example of what can be done with new technology when it is operating in a proper policy climate.

-- We have opened an entire new era of telecommunications in which satellite technology transforms distant capitals into close neighbors.

-- The first commercial satellite has been emplaced in synchronous orbit over the Atlantic Ocean linking the millions of people in North America and Europe with reliable and quality communications to augment in a major way the cables which span the Atlantic.

-- The Communications Satellite Corporation, with the assistance of the State Department, has spearheaded the growth in the international consortium of nations which have partnership in the global communications satellite system. There are now forty-eight countries joined in the agreement providing interim arrangements for the establishment of a single global commercial communications system.

-- A program has been initiated to provide early communications satellite service to bridge the Pacific and to expand coverage currently available in the Atlantic. Within this year, we can look forward to communications satellite space segment capability covering almost 75% of the globe.

-- Important progress has been made by the National Aeronautics and Space Administration in the development of advanced techniques and components which, even now, are being projected for application in the second generation communications satellites and more advanced developments that have recently been undertaken by the Communications Satellite Corporation.

-- The Defense Communication Satellite Program is being implemented under the terms of the Communications Satellite Act of 1962 which provides for establishment of separate systems to meet unique needs. The objective of the program, as defined by the President, is limited to that which will meet unique and vital national security needs which cannot be met by the commercial system.

To generally advise and assist this activity at the national level the President issued an Executive Order in January 1965 assigning responsibilities to his Director of Telecommunications Management, who also serves as Special Assistant to the President for Telecommunications. The order calls for:

-- Aid in planning, development and execution of a national program for the establishment and operation of a commercial communications satellite system.

-- Continuous review of all phases of the development and operation of the system.

-- Coordination of activities of government agencies with responsibilities in the field of telecommunications.

-- Insuring the availability and appropriate utilization of communications satellite services for government purposes.

-- Attaining coordinated and efficient use of the electromagnetic spectrum and the technical compatibility of communications satellite systems with existing communications facilities.

-- Assisting in carrying out certain Presidential functions.

-- Serving as chief point of liaison between the President and the Communications Satellite Corporation.

THE POLICY CHALLENGES AHEAD

As I have said, we are in an era of explosive technical advancement. Satellite communications systems are already on a horizon which can bring a whole new range of opportunity in the field of telecommunications.

Radically new capabilities usually present serious challenge to the status quo. They upset established interests and business patterns of the past. If the United States is to cope with these structural changes and continue to serve as the leader in telecommunications, then we must ensure that our concepts and our policies are adequate to meet the challenges of advancing communications satellite technology.

The Interim International Agreements and their Implications:

The international consortium and the management structure that has evolved as a result of the International Telecommunications Satellite System Agreement of August 1964 carries with it a whole range of national policy issues which must be addressed and resolved. The existence of the international consortium and the pattern of capital contributions and administrative arrangements that have been worked out present questions of policy which we have not yet successfully addressed.

Typical questions that we must face are:

-- What is the role of U. S. regulatory authorities with respect to the international contracting and operations activities of the Comsat Corporation acting as the manager for the consortium?

-- Should NASA use the same criteria in charging for launch services when Comsat is acting as a domestic corporation as when it is acting as an agent for the international consortium - INTELSAT?

-- What methods exist to ensure the development of rate structures which will truly reflect capital and operating cost reductions?

-- What encouragement should be given to the continued development and operation of other modes of communications internationally?

The Short Term Nature of Present Agreements:

The international agreements that were concluded in August 1964 -- and now acceded to by forty-eight nations -- are of an interim nature. By 1969 we are committed to negotiation of definitive arrangements for an international global system which will guide the application of communications satellite technology on a more permanent basis. As we approach the year 1969 the position of international leadership that the the U. S. currently enjoys in the communications satellite field is subject to:

-- Direct challenge on the part of several nations of the World.

-- Possible disintegration from within the present consortium if we do not maintain strong and forward-looking policies.

For these reasons, the next two years must be a period of intensive preparation. During this time, we will have to restudy the specific policy objectives and the guidance that has been provided by the Congress in the Communications Satellite Act of 1962.

We must set aside historic and artificial concepts and organizational frameworks which are being made obsolete and impractical in the new era of communications technology.

We must develop specific programs within the Executive Branch of the Government.

We must work out policies that will help to keep pace with world events and achieve national objectives within the framework of international cooperation in which satellite communications now must operate.

Responsiveness to the Public Need and National Objectives:

The challenge of determining the responsiveness of communications satellite technology to public need and of devising ways in which the technology can serve national objectives is the most important task in the field of national telecommunications management.

First of all, we must determine specifically what is the public need or rather what are the predominant public needs since this field of satellite communications cuts across a wide range of commercial and government activity. Secondly, we must find ways in which the public need and national objectives can be served. We must find answers to the questions of public interest such as these:

-- Is the public interest to be served by establishing direct broadcast satellite service domestically and/or overseas or, conversely, would such direct broadcast applications serve to undermine our currently strong communications base and adversely affect the national interests of our international colleagues?

-- Is the public need served well by making access to communications satellite services available to a wide range of direct authorized users?

-- What are the long term implications of proposals to establish gateway satellite terminals at inland domestic commercial centers?

-- From the viewpoint of public need, what are the implications of proposals to establish domestic communication satellite service for network relay of radio and television programs as well as nationwide transmission of telephone and telegraph, computer data, facsimile pictures and other communications.

-- Should domestic communications satellite service be provided as a part of the international global system or in some other manner?

I cannot deal substantively today with the points that I have raised concerning responsiveness to public needs and national objectives. I can say that we and many other elements of the Federal Government and the Congress are aware of the importance of such policy problems and that we are actively seeking ways and means to illuminate the policy issues and to progress.

Contribution of Communications Satellite Technology to World Peace and Understanding:

I would like to mention briefly here some of the specific policy problems that arise in pursuing the goal of better understanding between peoples. Clearly, communications satellite technology can play an important role in this area. First of all, we must recognize that communications satellites are in many ways a revolutionary force. This new technology tends to upset the status quo of established cable and conventional radio communications links. There is a well established publicly held capital investment and interest in the established communications structure.

The economic benefits and opportunities for improved patterns of social contact, international education, information exchange and commerce that satellite communications can bring are apparent to even the most uninformed observer. The larger problem of finding a way to apply this technology in the face of economic, cultural and diplomatic ties -- that often act to complicate progress -- is not so well recognized.

Let me assure you that these are the problems of real significance which require careful coordination, understanding and willingness to compromise to meet the needs and objectives of our foreign partners.

To make this important endeavor a success, we must develop a new kind of "technical statesmanship."

Satellite Communications as an Aid to Developing Nations:

One of the most exciting elements of satellite communications is its potential for providing assistance to the developing nations of the World. Dyhamic development of communications and transportation gives promise of providing a major tool for rapid development of the emerging nations. Properly planned satellite communications can:

-- Help achieve national unity.

-- Reduce social and economic pressures.

-- Effectively promote major strides in the field of education.

-- Provide the means for major improvement in the health and welfare standards of the nations.

With all of this potential for effective contribution to the problems of the less-developed nations, there are specific policy questions which must be solved. Some of the questions that we face in this area are these:

-- Sound development of a nation does not result when a few limited locations are provided advanced communications facilities while the remainder of the nation goes undeveloped.

How, then, can satellite communications provide effective aid to developing nations unless equal attention is given to a program for the development of intra-country communications facilities? In some instances, we are finding reluctance to provide improved international communications services because of potential taxing of established internal national communications facilities.

-- Is there some type of sliding scale economic ratio that can be applied wherein developing nations could make use of satellite communications during off-peak hours at reduced cost and thus make more viable the operation of satellite terminals?

-- Can we effectively marry satellite technology and computer technology on an international basis so as to let developing nations achieve benefits from their limited managerial and executive talent?

CONCLUSION

My remarks today, of necessity, have been a somewhat wide-ranging panorama of the important policy considerations in space telecommunications. I have posed more questions than I have provided answers. In my limited period with the Executive Office of the President, I have become increasingly aware that it is far easier to identify the important questions than it is to arrive at any workable set of answers and policy pronouncements.

I hope that I have been able to present -- with some measure of realism -- a summary of the problems involved in national policy formulation. I also hope that you will leave this conference somewhat reassured that a real effort is being made within the government to create policies which will match our progress in technology -- policies which are in step with rapid technological advancement and change. Policies under which:

-- Technology can serve the public needs.

-- Regulatory activities give early assistance and promote progress.

-- Established interests can participate in the new technology thereby bringing to the public opportunities for increased service at lower costs.

These are the objectives of our national policy considerations in the field of space telecommunications.

REFERENCES

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2. National Communications Satellite Programs Hearings before the Committee on Aeronautical and Spaçe Sciences, United States Senate, 89th Congress, 2d Session, January 25 and 26, 1966.

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4. Report by the Communications Satellite Corporation to the President and Congress Pursuant to the Communications Satellite Act of 1962 for the Year 1965. Issued February 4, 1966.

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91st CONGRESS
1st Session

H. CON. RES. 236

IN THE HOUSE OF REPRESENTATIVES

April 30, 1969

Mr. Zablocki submitted the following concurrent resolution; which was referred to the Committee on Foreign Affairs

CONCURRENT RESOLUTION

Whereas in its international relations the United States traditionally has championed the free flow of information among nations and peoples; and

Whereas the purposes of American foreign policy are served by this free flow of information; and

Whereas the scientific progress represented by broadcast satellites contains great potential for increasing international understanding, thereby contributing to world peace; and

Whereas the establishment of a worldwide satellite broadcast network could be a powerful instrument of education and economic, political, and social development: Now, therefore, be it

Resolved by the House of Representatives (the Senate concurring), That it is the sense of the Congress that the

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President of the United States should take the necessary steps to—

(1) promote international understanding of the benefits which satellite broadcasting can bring to mankind;

(2) encourage and support constructive international cooperation in the development of satellite broadcasting, within the framework of international law; and

(3) resist any effort to give exclusive control of satellite broadcasting to an international agency operating on the basis of unanimous agreement.

91st CONGRESS
1st Session

H. CON. RES. 236

CONCURRENT RESOLUTION

Expressing the sense of the Congress with respect to international policy on satellite broadcasting.

By Mr. ZABLOCKI

APRIL 30, 1969

Referred to the Committee on Foreign Affairs

Questions To Be Asked of Mr. Fred Morris, President, Telesciences Corporation
(Suggested by Congressman Fulton)

Question 1. Mr. Morris, I understand that you were an advisor to President Johnson's Commission on Telecommunications and were involved in the Report released by the White House. It seems to me that this report raises as many questions as it answers and leaves an enormous burden on this Administration to reconcile some of these problems. How do you view generally the policy statements in the report?

Question 2. Do you feel that there will be far-reaching repercussion from the release of this report? In what way?

Question 3. Mr. Morris, do your current efforts involve the Domestic Satellite issue and what, in your view, is the reason for delaying a decision? Should not this facility proceed? What are the problems in this field?

Question 4. What role, in your opinion, should the Communications Satellite Corporation play in the Domestic Satellite program?

Question 5. What role, in your opinion, should the Communications Satellite Corporation play in the exchange of information to underdeveloped countries? I believe that in most of the underdeveloped countries they lack the means of distribution of information as well as the input of program data. Does this mean that we will have to supply an internal distribution system?

Question 6. Mr. Morris, it appears to me that we are losing the opportunity to foster United States' interest in underdeveloped countries by not taking advantage of their media to provide the educational and other information needed by them. This information could be easily disseminated by a Broadcast Satellite. What are the technical and other problems associated with performing their function and why do we not proceed with it? Have we performed the necessary research either in NASA or COMSAT to provide the space segment of such a system? Who should finance these equipment developments and programming costs? Have we overlooked other means of communications?

Question 7. The task report endorses the idea of a single overseas telecommunications entity. What is your view of this consolidation? Do you feel that a savings can be demonstrated without a loss of efficiency or capability?

Question 8. In this regard, there is much controversy over the need for satellites as opposed to cables. Do these two methods not complement each other rather than compete and should we not encourage the installation of both methods?

Question 9. What is your view on Cable Television (CATV) and should we not stop the controversy and get along with the job?

MEMORANDUM

January 14, 1969

From: RICHARD NIXON

To: Mr. and Mrs. Frederick W. Morris, Jr.

Because of the tremendous volume of mail I have on my desk, I am taking this means of expressing my appreciation for your generous contribution to our successful campaign.

You may be assured that I will be doing everything within my power to live up to the faith and confidence you have placed in me and I look forward to the time I can thank you personally.

In the meantime, you have my heartfelt gratitude and warm regards.

RN

UNITED STATES
INDEPENDENT TELEPHONE ASSOCIATION
OFFICE OF THE PRESIDENT
SHERATON PARK HOTEL
SUITE 1-340
2660 WOODLEY ROAD
WASHINGTON, D.C. 20008
202-265-2000

January 30, 1969

Mr. Harry Fleming
Office of the President
The White House
Washington, D. C.

Dear Mr. Fleming:

It is my understanding that your office is considering Fred W. Morris, Jr. of Washington, D. C. for an appointment by President Nixon to a responsible position in the new administration in the field of telecommunications or possibly as a member of the Federal Communications Commission.

While I feel that Fred could be a tremendous asset to the new administration in any telecommunications position, I would not like to see the Honorable James D. O'Connell, currently Special Assistant to the President for Telecommunications and also Director of Telecommunications Management as well as Assistant Director of the Office of Emergency Preparedness, Executive Office of the President, be replaced too early in the new administration. I feel that General O'Connell has much in background and experience that would help President Nixon during the first six months or so of his administration.

With the above comment in mind, I do feel that Fred W. Morris, Jr. has the knowledge and experience to handle either General O'Connell's current assignment or to act as a Federal Communications Commissioner. He has an established background as a professional communications and electronics engineer and manager both in government and industry. His service during the period 1964-1966 as Assistant Director of Telecommunications Management and as the Principal Assistant to the Special Assistant to the President for Telecommunications demonstrated his abilities and appreciation for the needs of the government for national guidance in this critically important area.

He resigned from his position as a Career GS-18 in the Johnson administration because he felt the job that needed to be done was not being allowed to be accomplished. His political views and dedication as a Republican were contrary to the direction of the efforts then prevailing. I have discussed his views with him many times and I can assure you that he is opposed to big government and the usurping of the rights of private enterprise. He is strong for the efficient management of the radio frequency spectrum and against restrictions being imposed on the early application of new telecommunications technology to provide new and economic services to the public. He feels that the development and operation of the National Communications System must be improved to serve the nation's security requirements and to permit improved efficiency in civil government operations.

Fred was asked by Under Secretary of State Eugene Rostow to serve as the Technical Consultant to the President's Task Force on Communications Policy when that Task Force was established in 1967. While he, like myself, disagreed with much that was contained in the report, he endeavored to provide necessary advice to Chairman Rostow and the Task Force Members, requiring expert telecommunications background.

I believe Fred can well serve the nation and the new administration, and his political views are in tune with the needs of both. I recommend consideration be given his application.

To give you some idea of my background to justify my comments I offer the following. I entered the communications business with the New York Telephone Company in Albany, New York in 1928. After service in the Armed Forces during World War II, I went with the Chenango and Unadilla Telephone Corporation at Norwich, New York. At that time C&U served approximately 9,500 telephones in Central New York State, most of which were common battery or magneto. When I sold out the company at the end of 1968 to Continental Telephone Corporation, C&U then served nearly 44,000 telephones all of which were dial and we provided our subscribers with Direct-Distance Dialing and Data Communications. C&U also served several locations with Community Antenna Television facilities.

During my stay in Norwich, I became active in the Republican Party. I have served as an Alderman for Norwich, as Finance Chairman of the Chenango Republican County Committee and on the County Judiciary Committee. I am a Republican State Committeeman in New York State and was a Delegate to the Miami Convention. I served as National Chairman, Communications Volunteers for Nixon-Agnew here in Washington.

I am now a Vice President of Continental Telephone Corporation and President of the United States Independent Telephone Association which represents 92% of the non-Bell telephones in the country.

If I may be of any further service to you, please do not hesitate to call on me.

Sincerely,

William S. Kingman

William S. Kingman
President

WSK/slm

PAUL N. MCCLOSKEY, JR.
11TH DISTRICT, CALIFORNIA

COMMITTEE ON
GOVERNMENT OPERATIONS

Congress of the United States
House of Representatives
Washington, D.C. 20515

January 24, 1969

Brig. General George A. Lincoln
Director, Office of Emergency Preparedness
Room 304 Executive Office Building Annex
604 17th Street, N.W.
Washington, D.C. 20504

Dear General Lincoln:

I am writing to add my personal endorsement of Fred W. Morris, Jr., who, I understand, is being considered for a position in your office.

I have known Mr. Morris personally and by reputation in our community for some time and believe him to be the ideal type of individual to assist in the attainment of excellence in government.

The best endorsement I have seen is perhaps set forth in the attached letter from Mr. Esterly C. Page to Harry Flemming.

Good luck with your new job.

Respectfully,

Paul N. McCloskey, Jr.

PNMcC:Ci

Note:
"Pete" McCloskey and Fred Morris shared office suites in Palo Alto, California during the years 1962-64.
Congressman McCloskey speaks from personal knowledge.

Telcom INCORPORATED

8027 LEESBURG PIKE, McLEAN, VA. 22101

TELEX 89-2321

CABLE-TELCOM
WASHINGTON DC

AREA CODE 703
PHONE: 893-7700

14 January 1969

Mr. Harry Flemming
Office of President-Elect Richard M. Nixon
The White House
Washington, D. C.

Dear Mr. Flemming:

I understand that your office has under consideration recommendations concerning Fred W. Morris, Jr. of Washington, D. C. for an appointment by President-Elect Nixon to a responsible position in the new administration in the field of telecommunications management - possibly to assume the position now held by the Honorable James D. O'Connell, Special Assistant to The President for Telecommunications, who also serves as Director of Telecommunications Management and as an Assistant Director of the Office of Emergency Preparedness, Executive Office of The President. I want to add my words of recommendation in this matter.

I have known Fred both professionally and socially for a number of years. To qualify myself to comment in this matter, I point out that I have dedicated my carrer to telecommunications having started in 1920 as a shipboard wireless operator, then in the broadcast field, and during World War II as an Officer with Signal Corps and later founded Page Communications Engineering, Inc. of Washington, D. C. in 1947. I enclose a brief resume of my background for further information. Page Communications Engineers has since become one of the World's leading telecommunications engineering and management firms and has, since 1959, been an outstanding member of the Northrop Corporation organization. Since leaving Page Communications in 1962, I served as First Technical Director of the National Military Command System in the Office of the Secretary of Defense and, since 1965, as the Chief Executive Officer and Chairman of the Board of Directors of Telcom Incorporated, a McLean, Virginia firm in the telecommunications engineering field.

I endorse the appointment of Fred W. Morris, Jr. to the senior telecommunications management position in the Executive Branch or as a Commissioner of the Federal Communications Commission. I believe he is well qualified by his background and experience as a professional communications and electronics engineer and manager with established reputation in government and industry. His service during the period 1964-66 as Associate Director of Telecommunications Management and as the Principal Assistant to the Special Assistant to President Johnson for Telecommunications demonstrated his abilities and appreciation for the needs of the Government for national guidance in this critically important area. He resigned from his position as a Career GS-18 in the Johnson administration because he did not see the job that needed to be done in telecommunications being allowed to be done. His political views and dedication as a Republican were contrary to the direction of the efforts then prevailing. He opposes "big government" and the usurping of the rights of private enterprise. He has fought for efficient management of the radio frequency spectrum and against the restrictions being imposed on the early application of new telecommunications technology to provide new and economic services to the public. He has expressed particular concern to me that the development and operation of the National Communications System must be improved to serve the Nation's security requirements and to permit improved efficiency in civil government operations. I concur.

Although Fred resigned from Government in 1966, he accepted the invitation and appointment by Under Secretary of State Eugene Rostow to serve as the Technical Consultant to the President's Task Force on Communications Policy when the Task Force was established by President Johnson in the fall of 1967. While in disagreement with some of the political and social direction of the Task Force, he endeavored to provide necessary advice to Chairman Rostow and the Task Force Members regarding points requiring expert telecommunications background.

I believe you will find that Fred's abilities can well serve the Nation and the New Administration and that his political views are in tune with the needs of the Nation and the Administration. I recommend early consideration be given to his appointment.

I will be pleased to provide additional comments which President Nixon, you or your associates may desire. I can be reached either at my McLean, Virginia office, at my McLean, Virginia apartment (telephone (703) 356-7806), or at my Naples, Florida residence (telephone (813) 642-2235).

Yours truly,

Esterly C. Page

Esterly C. Page
Chairman of the Board and
Chief Executive Officer

(As of January 1969)

BRIEF RESUME OF

FRED W. MORRIS, JR.

TELECOMMUNICATIONS ENGINEERING AND MANAGEMENT CONSULTANT

9315 HOLLY OAK COURT
WASHINGTON, D.C. 20034
TELEPHONE:
(301) 469-6034

AGE: 46 years (Born February 28, 1922, Los Angeles, California)

CURRENT ACTIVITY: President
TELE-SCIENCES CORPORATION
Washington, D.C.
(An association of telecommunications specialists engaging in conduct of technical/economic/operational studies as consultants to industry and the Government independent of manufacturing or operating company interests.)

Consultant to the President
RADIATION INCORPORATED / HARRIS-INTERTYPE CORPORATION
Washington, D.C. & Melbourne, Florida

Expert Consultant to THE CENTRAL AMERICAN REGIONAL TELECOMMUNICATIONS COMMISSION and THE CENTRAL AMERICAN BANK FOR ECONOMIC INTEGRATION

Technical Consultant to SPRINDLETOP RESEARCH INSTITUTE and LOUISVILLE-NASHVILLE RAILROAD

EDUCATION:

1940-44 BS & EE - California Institute of Technology
1946-48* Graduate Study - Occidental College
1947* Graduate Study - Stanford University
1965-66* Graduate Study - George Washington University
(*Part Time)

Licensed & Registered PROFESSIONAL ELECTRICAL ENGINEER - State of California (EE #1218) since 1948

PRIOR EXPERIENCE:

1967-68 Technical Consultant to THE PRESIDENT'S TASK FORCE ON COMMUNICATIONS POLICY
The White House
Washington, D.C.

1966-69 Vice President- Corporate Planning & Special Assistant to the President
RADIATION INCORPORATED
Washington, D.C. & Melbourne, Florida

1964-66 Associate Director of Telecommunications Management (Advanced Concepts and Technology)
EXECUTIVE OFFICE OF THE PRESIDENT (OEP)
The White House
Washington, D.C. (Career Civil Service GS-18)

(For greater detail see complete resume - available on request)

EXPERIENCE (continued):

ALSO Principal Consultant to THE SPECIAL ASSISTANT TO THE PRESIDENT FOR TELECOMMUNICATIONS
The White House
Washington, D.C.

1954-64 Organizer and Principal - FRED W. MORRIS, JR. & ASSOCIATES
Palo Alto, California
(Electronic Engineering & Management Consultants to industry, research institutes, Federal and State Governments specializing in telecommunications system techo/economic analyses, management & planning studies)

1950-54 Electronic Scientist - US ARMY SIGNAL CORPS ENGINEERING LABORATORIES and ELECTRONIC DEFENSE LABORATORY
Fort Monmouth, New Jersey & Mountain View, California

1946-50 Instructor & Assistant Professor-Electrical Engineering
UNIVERSITY OF SOUTHERN CALIFORNIA
Los Angeles, California

1947-50 Special Consultant - US ARMY SIGNAL CORPS

1944-46 Technical Officer - US ARMY SIGNAL CORPS
(Communications and Electronic Warfare research, development and operations)

MEMBERSHIPS:

Senior Member - Institute of Electrical & Electronics Engineers

Associate Fellow - American Institute of Aeronautics & Astronautics
(Member of Technical Committee on Communications Systems - 1964 to date)

Life Member - Armed Forces Communications & Electronics Association

Member - American Management Association
National Security Industrial Association
National Industrial Conference Board

"RN ASSOCIATES" (Richard Nixon Associates)

PROFESSIONAL RECOGNITION:

Listed among AMERICAN MEN OF SCIENCE, WHO'S WHO IN ENGINEERING, and WHO'S WHO IN COMMERCE AND INDUSTRY

FAMILY DATA:

Married Nancy Renee Thompson in 1949

Formerly resided in Los Angeles, California; Red Bank, New Jersey; Menlo Park, California; Los Altos, California; McLean, Virginia; and Westmoreland Hills, Washington, D.C.

Current Residence: Bethesda, Maryland

SECURITY CLEARANCES:

TOP SECRET, AEC "Q" and SPECIAL (SI)

ESTERLY C. PAGE

Mr. Page, Chairman of the Board of Directors and Chief Executive Officer of Telcom, Inc., is an international authority and consultant on communications, and has been actively engaged in radio communications since 1920. He and his associates led the way in pioneering ionospheric and tropospheric-scatter propagation communication systems.

Communication System Management

He formed his first company in 1932, and at that time and during the next ten years was called upon to testify as an expert witness in important engineering hearings conducted by the Federal Communications Commission.

Mr. Page was Vice President in charge of engineering for the Mutual Broadcasting System (NYC) from 1945 until 1947, when he resigned to re-establish his own firm and concentrate on the development of advanced communications systems.

He was founder, President, and Chairman of the Board of Page Communications Engineers. He also founded U.S. Underseas Cable Corporation, Rixon Electronics, and Edison-Page of Rome, Italy. During this period he was a pioneer in the exploration and development of ionoscatter and troposcatter communication and his company engineered such systems as:

The North Atlantic Scatter System, first operational system.

The Pacific Scatter System, providing high reliability communications from Hawaii to Okinawa and the Philippines.

The Libyan National Telecommunications System.

The USAF UK-Spain troposcatter complex.

The USAF Turkey troposcatter system.

Planning study for the Pacific Missile Range.

The NATO Ionoscatter System (Project Double-Jump).

During the period 1947 to 1962 (date of his retirement) his company (in 1959 sold to Northrop Corporation) designed and installed the Tangier, Morocco, Philippines-Okinawa and Liberia High Powered Voice of America Relay Stations for the now U.S. Information Agency.

He has just completed a two year term as Chairman of the Board of Directors of CEIR a wholly owned subsidiary of Control Data.

Command/Control and Military Communications

During 1963 and 1964, Mr. Page served in the Office of the Secretary of Defense as Technical Director of the National Military Command System. In this capacity he was responsible to Dr. Harold Brown, Director of Defense Research and Engineering, for planning, directing and supervising the execution of technical support for the National Military Command System.

The National Military Command System includes those facilities provided explicitly for the President, the Secretary of Defense and the Joint Chiefs of Staff in direct exercise of command over the U.S. Armed Forces and those communications and arrangements required to provide strategic direction to operational commanders at home and abroad.

He held a number of important assignments, and was responsible for the engineering and installation of many complex communications systems, while serving with the U.S. Signal Corps during World War II. He was OIC, Radio Plans for the North African invasion, attached to AFHQ in London. He was also a member of the Advanced Reconnaissance Party in Africa and supervised setting up all GHQ radio circuits.

During part of the Tunisian campaign, he served as personal signal officer to the Allied Chief of Staff,(General Dwight D. Eisenhower). In Algiers, he supervised the engineering and installation of one of the first single-sideband radio communications systems (50-kw, 12 channels) in 1942. As staff officer in Field Marshal Alexander's headquarters, he was responsible for radio plans for the Sicilian and Italian invasions. In this assignment, Mr. Page designed a new system of mobile VHF radio-teleprinters and set up the first military radio-relay links using teleprinters.

Returning to the U.S. as Chief of Plans and Operations, Office of the Chief Signal Officer, he set up the Radio Propagation Section with responsibility to assemble and disseminate radio propagation and antenna information to the Army and Air Force. Mr. Page was awarded the U.S. Legion of Merit and the Order of the British Empire for outstanding services in the European Theater of Operations.

Later, Lt. Col. Page served in the Office of the Chief Signal Officer and was appointed Senior Army Member of the Wave Propagation Committee of the Joint and Combined Chiefs of Staff, where he assisted in supervision of the ionospheric measuring stations, and propagation research throughout the world.

A past President of the Capital Section, American Rocket Society, and a Senior Member of the IEEE, Mr. Page is also a member of the Radio Pioneers, Veteran Wireless Operators Association, life member of the Armed Forces Communications and Electronics Association and Director of the Washington Chapter, charter member of the Broadcasters Club of Washington and the Association of Federal Communications Consulting Engineers, and a Fellow in the Radio Club of America. He is a Registered Professional Engineer in the District of Columbia and North Carolina.

Mr. Page was born in Chicago in 1902. He attended Evanston schools and then the Chicago Telegraph Institute. He served as a marine radio operator for the American Marconi Company and Radio Corporation of America.

He is an Amateur Astronomer, having constructed several sizeable telescopes and has been a Radio Amateur since 1919, operating at present, his Station K3BP.

He makes his residence at Naples. Florida and maintains an apartment in McLean, Virginia.

He is married and has six daughters.

GILBERT GUDE
8TH DISTRICT, MARYLAND

COMMITTEES:
GOVERNMENT OPERATIONS
DISTRICT OF COLUMBIA

Congress of the United States
House of Representatives
Washington, D.C.

GORDON L. HAWK
ADMINISTRATIVE ASSISTANT
1509 LONGWORTH HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515

JAMES D. FAIRBAIRN
FIELD REPRESENTATIVE
DISTRICT OFFICE
11141 GEORGIA AVENUE
WHEATON, MARYLAND 20902
TELEPHONE: 933-3340

January 13, 1969

Mr. Harry Flemming
Office of the President-Elect
726 Jackson Place, N. W.
Washington, D. C.

Dear Mr. Flemming:

I am writing to you in order to forward the attached resume to you, in behalf of Mr. Fred W. Morris, Jr., who is interested in being appointed to the position of Director of Telecommunications Management in the Executive Office of the President.

Mr. Morris has served as Associate Director of Telecommunications Management and as the principal consultant to the Special Assistant to the President for Telecommunications during the years 1964-66. I am enclosing some background material concerning Mr. Morris, which is all self-explanatory.

I certainly hope you will give his application favorable consideration. I would appreciate being kept advised as to the status of this request. Thank you so much for your time and attention to this applicant.

Sincerely,

Gilbert Gude

cc: Mr. Fred Morris, Jr.

FRED W. MORRIS, JR.
9315 Holly Oak Court
Bethesda, Maryland 20034

UNDER SECRETARY OF STATE
FOR POLITICAL AFFAIRS
WASHINGTON

January 10, 1968

Dear Dr. Boyd:

The President in transmitting his Message on Communications Policy to the Congress of the United States last August appointed a Task Force of government officials to make a comprehensive study of communications policy. The President designated me as Chairman of the Task Force.

It was recommended that we seek the services of Fred W. Morris, Jr., your Vice President and Special Assistant, to assist the Task Force in its study of technological questions. We recognize Mr. Morris' background of experience as a professional communications and electronics engineer with an established reputation in government and industry in the field of telecommunications, technology and management. I have concluded that Mr. Morris is a man of unusual distinction who could make a first-rate contribution to our work, and I have, therefore, asked Mr. Morris to serve as Technical Consultant to the President's Task Force for the coming year on a part-time basis, not to exceed one hundred and thirty days during the year.

It is gratifying that Mr. Morris is interested in helping us during the coming year. It is my understanding that you are willing to permit him to serve. It would be essential that the services be rendered without regard to corporate interests and with complete respect for the privacy of information involved. Mr. Morris has furnished us with a letter dated November 9, 1967, which discusses these points. Correlatively, as I am sure you understand,

Dr. Joseph A. Boyd, President,
Radiation Incorporated,
Melbourne, Florida 32901

we must be satisfied that Mr. Morris' consultantship is fully consistent with the law and policy of the United States respecting conflicts of interests.

With these criteria, among others, in mind, I am satisfied that it will be helpful to have Mr. Morris contribute to the work of the President's Task Force on Communications Policy. We appreciate your cooperation in permitting him to accept a special appointment with the Government.

Yours very truly,

Eugene V. Rostow

Eugene V. Rostow

HEADQUARTERS
SIGNAL CORPS ENGINEERING LABORATORIES
FORT MONMOUTH, NEW JERSEY

October 5, 1953

TO WHOM IT MAY CONCERN:

The following is a brief accounting of the professional activities of Mr. Fred W. Morris, Jr., during the period June 1950 to March 1953 as Electronic Scientist, Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey. Mr. Morris was Chief of the Research Studies Section (Countermeasures Branch, Evans Signal Laboratory), an activity concerned primarily with the critical evaluation of United States developed electronic weapons in respect to their vulnerability to enemy countermeasures, and to recommendation for modifications to improve their security. The work included supervision of and participation in internal study and test, external contracts, and field trials in collaboration with the agencies developing the prime equipments.

Mr. Morris participated in the whole countermeasures program of the Signal Corps; significant examples are his administration of the activities of the Electronic Defense Group of the University of Michigan and the Signal Corps portion of the Stanford University research program. However, his most important personal contribution was in the establishment and vigorous prosecution of the guided missiles countermeasures program of the Army. In this connection, he acted as senior advisor to the undersigned and to various elements of Army command, including the Chief Signal Officer. Mr. Morris did an excellent staff and liaison job in obtaining the cooperation of Department of Defense elements, university contractors, and commercial developers of prime equipments, to effectively carry out the Army's responsibility for countermeasures. He represented the Army on pertinent panel and working groups of the Research and Development Board, Department of Defense, and represented the Signal Corps in briefings on countermeasures to top echelons such as Director of Guided Missiles, Office of the Secretary of Defense, Chief, Army Field Forces, British Technical Staffs, etc., in order to describe existing programs and to emphasize the urgency and necessity for expanding the countermeasures activities.

The effectiveness of his efforts are evidenced in the establishment of Project Locust and in the creation of the Electronic Defense Laboratory on the West Coast as a comprehensive countermeasures facility of the Signal Corps. Mr. Morris was assigned to this facility as representative of the Chief Signal Officer in the capacity of Signal Corps Resident Engineer.

Mr. Morris has demonstrated marked ability in the planning, administration and coordination of Research and Development activities. His judgment and staff work are excellent, and his flair for important detail and his skill in resolving diverse - and oftime conflicting - interests to achieve a useful end result has been of no small support in furthering the Army's countermeasures program. Mr. Morris is a self-starter and needs no prodding. I recommend him unreservedly to anyone who has an important job to be done.

M. Keiser
M. KEISER
Chief, Countermeasures Branch
Evans Signal Laboratory

February 26, 1964

The Honorable George P. Miller
House of Representatives
House Office Building
Washington, D. C.

Dear Mr. Miller:

It is my understanding that you have had discussions with Mr. Fred W. Morris, Jr., Electronics Engineering Consultant, concerning possible consulting assignments in behalf of the House Committee on Science and Astronautics. I have known Fred for the past thirteen years and may be able to furnish observations of some value to you and your colleagues. Since my retirement from the Army in 1959 I have myself been active in the science, astronautics, and communications field first as Vice President of the General Telephone and Electronics Laboratories, thereafter as a consultant to Stanford Research Institute and others and concurrently as Chairman of the Joint Technical Advisory Committee of the Institute of Electronic and Electrical Engineers and the Electronic Industries Association.

During both his military and civilian career and increasingly during the past three years, I have been associated with Fred, and have benefitted by his almost unique breadth of experience in the electronics and communications field. As a result of his experience in research and development in the military, in industry and at Stanford Research Institute he has developed an unusually comprehensive understanding of national defense and industrial problems, and he is a thoughtful and capable analyst of the impact of science and technology upon the solutions of these problems. His knowledge of key people in the military, industrial and academic communities is extraordinarily comprehensive and his background combines technical knowledge and management planning experience.

At least of equal importance is the fact that I have found him to be discreet, conscientious, highly ethical, very cooperative, helpful and very industrious.

Sincerely,

James D. O'Connell

James D. O'Connell
Lieut. General USA (Ret.)

11481 St. Joseph Avenue
Los Altos, California

BRIEF RESUME OF

FRED W. MORRIS, JR.

TELECOMMUNICATIONS ENGINEERING AND MANAGEMENT CONSULTANT

9315 HOLLY OAK COURT
WASHINGTON, D.C. 20034
TELEPHONE:
(301) 469-6034

AGE: 47 years (Born February 28, 1922, Los Angeles, California)

CURRENT ACTIVITY: President
TELE-SCIENCES CORPORATION
9315 Holly Oak Court
Washington, D.C. 20034
Telephone: (301) 469-6034

(An association of telecommunications specialists engaged in conduct of technical/economic/operational studies as consultants to industry, research institutes and the Government independent of manufacturing or operating company interests.)

Consultant
DEPARTMENT OF STATE
Washington, D.C.

Expert Consultant
CENTRAL AMERICAN REGIONAL TELECOMMUNICATIONS COMMISSION and
CENTRAL AMERICAN BANK FOR ECONOMIC INTEGRATION

Technical Consultant
SPINDLETOP RESEARCH INSTITUTE and LOUISVILLE-NASHVILLE RAILROAD

EDUCATION:
1940-44 BS & EE - CALIFORNIA INSTITUTE OF TECHNOLOGY
1946-48* Graduate Study - OCCIDENTAL COLLEGE
1947 Graduate Study - STANFORD UNIVERSITY
1965-66* Graduate Study - GEORGE WASHINGTON UNIVERSITY
(* Part Time)

Licensed and Registered PROFESSIONAL ELECTRICAL ENGINEER -
State of California (EE #1218) since 1948

PRIOR EXPERIENCE:

1967-68 Technical Consultant to THE PRESIDENT'S TASK FORCE ON COMMUNICATIONS POLICY
The White House
Washington, D.C.

1966-69 Vice President-Corporate Planning & Special Assistant to President
RADIATION INCORPORATED / HARRIS-INTERTYPE CORPORATION
Washington, D.C. and Melbourne, Florida

1964-66 Associate Director of Telecommunications Management (Advanced Concepts and Technology)
EXECUTIVE OFFICE OF THE PRESIDENT (OEP)
The White House
Washington, D.C. (Career Civil Service GS-18)

ALSO Principal Consultant to THE SPECIAL ASSISTANT TO THE PRESIDENT FOR TELECOMMUNICATIONS
The White House
Washington, D.C.

(As of March 1969)

EXPERIENCE (continued)

1954-64 Founder and President
FRED W. MORRIS, JR. & ASSOCIATES
Palo Alto, California

(Electronic Engineering & Management Consultants to industry, research institutes, universities, Federal and State Governments specializing in telecommunications system techno/economic analyses, management and planning studies.)

1950-54 Electronic Scientist
US ARMY SIGNAL CORPS ENGINEERING LABORATORIES and
ELECTRONIC DEFENSE LABORATORY
Fort Monmouth, New Jersey and Mountain View, California

1946-50 Instructor and Assistant Professor of Electrical Engineering
UNIVERSITY OF SOUTHERN CALIFORNIA
Los Angeles, California

1947-50 Special Consultant - US ARMY SIGNAL CORPS

1944-46 Technical Officer - US ARMY SIGNAL CORPS
(Communications and Electronic Warfare research, development and operations)

MEMBERSHIPS:

Senior Member - Institute of Electrical & Electronics Engineers

Associate Fellow - American Institute of Aeronautics & Astronautics
(Member of Technical Committee on Communications Systems - 1964 to date)

Life Member - Armed Forces Communications and Electronics Association

Member - American Management Association
National Security Industrial Association
National Industrial Conference Board
National Space Club

"RN ASSOCIATES" (Richard Nixon Associates)

PROFESSIONAL RECOGNITION: Listed among AMERICAN MEN OF SCIENCE, WHO'S WHO IN ENGINEERING, and WHO'S WHO IN COMMERCE AND INDUSTRY.

FAMILY DATA: Married Nancy Renee Thompson in 1949.

Formerly resided in Los Angeles, California; Red Bank, New Jersey; Menlo Park, California; Los Altos, California; McLean, Virginia; and Westmoreland Hills, Washington, D.C.

Current Residence in Bethesda, Maryland

SECURITY CLEARANCES: TOP SECRET, AEC "Q" and SPECIAL (SI).

(For greater detail see complete resume - available on request)

POSITION DESCRIPTION for Position With
Executive Office of The President
Incumbent: Fred W. Morris, Jr.
from August 1964 to September 1966
Career Civil Service Appointment
Grade GS-18

Electronic Engineer/
Associate Director of Telecommunications Management
GS-855/301-18

I. GENERAL DEFINITION

This is the position of Associate Director of Telecommunications Management (Advanced Concepts and Technology), Executive Office of the President. The Director of Telecommunications Management (Presidential Appointee), who is also Special Assistant to the President for Telecommunications and an Assistant Director of the Office of Emergency Planning, is the chief Presidential advisor with respect to telecommunications functions. He acts in accordance with responsibilities assigned and authority delegated pursuant to various Congressional Acts and Memoranda, Executive Orders, and Directives from the President (these include E.O. 11191 and E.O. 10995, and Presidential Memorandum dated August 21, 1963, copies attached as Tab 1).

The Advanced Concepts and Technology Directorate is the focal point within the Office of the Director of Telecommunications Management/ Special Assistant to the President for Telecommunications for identifying and exploiting opportunities for innovation, progress and increased efficiency in the telecommunications field. This Directorate is responsible for providing the long-range prescription, evaluation, and coordination of technologies bearing upon the character, emphasis and organization of telecommunications, both domestically and as an instrument of United States foreign policy and international relations. An essential element of the Associate Director's role is the establishment, within industry and Government, of an environment in which orderly and effective planning proceeds on the basis of the ultimate reaches of technology, not on partial and uncoordinated innovations which are, in the long run, uneconomic and do not sustain the United States in a leadership role in world telecommunications. The incumbent directs a small, highly professional staff in accomplishment of the missions assigned the Directorate, including the initiation and administration of contracts for research studies and surveys and the organization and staff support of intragovernmental and industry advisory councils and ad hoc study groups.

The incumbent of this position, as a technically qualified electronic engineer and as a communications specialist and consultant, has the primary responsibility to support the Director of Telecommunications Management and provide staff assistance to him in the accomplishment of responsibilities assigned by the President. More specifically:

II. DESCRIPTION OF DUTIES:

1. Directs the activities of the Advanced Concepts and Technology Directorate reporting to the Director of Telecommunications Management. Participates in, coordinates and evaluates the accomplishment of projects and studies which develop, identify and exploit advanced telecommunications concepts, plans and policies which will serve the national security, contribute to development of world trade and commerce, and ensure that the full advantages of technological development accrue to the nation and to the users of telecommunications.

2. Is responsible for development of analyses of the impact of advanced telecommunications concepts and technology. These are broadscale, comprehensive projections of: the scientific and technical problems to be met; what engineering adaptations to existing systems and operations are required; the economics, organization and management of various alternatives; and international political and operational requirements. These analyses are from the standpoint of the total United States telecommunications community, both private and public. They take into account trends in the national economy, and the full and efficient employment of telecommunications capabilities in support of national goals.

3. Provides leadership in the conduct of studies pertaining to: advances in telecommunications technology; impact of advanced telecommunications management concepts; technological and organizational changes and effect upon telecommunications management and the national economy.

4. Is responsible for development of advanced concepts of telecommunications management and for establishment and maintenance of a technology and economic base of information in cooperation with the Office of Science and Technology and the Bureau of the Budget, Executive Office of the President, for use in review of telecommunications research and development activities of government agencies and industry. This work is aimed toward the analysis of new telecommunications technology and the development of an integrated government-wide program for improved telecommunications of all forms.

5. Is directly responsible to the Director of Telecommunications Management/Special Assistant to the President for Telecommunications, providing staff assistance and aid in planning and development, and aid in fostering the execution of a national program for the establishment and operation of government and commercial communications satellite systems. To this end, maintains constant surveillance and provides liaison between the Office of the Director of Telecommunications Management, Presidential staff, Executive Branch Departments and Agencies, and the Communications Satellite Corporation personnel in guiding and encouraging the execution of a national program for establishment and operation of a global communications satellite system. Provides effective coordination of activities of governmental agencies with responsibilities in the field of telecommunications, so as to ensure that there is full and effective compliance at all times with the policies set forth in the Communications Satellite Act of 1962 and related documents.

6. Is responsible in behalf of the Director of Telecommunications Management for preparation and coordination of an Annual Report on Activities and Accomplishments under the Communications Satellite Act of 1962 for submission by the President to the Congress.

7. Prepares studies and recommendations for submission by the Director of Telecommunications Management to the President and others, as appropriate, with respect to steps necessary to ensure the availability and appropriate utilization of communications satellite systems for governmental and commercial purposes.

8. Keeps abreast of technical development programs in the field of satellite communications including those bearing on the utilization of this new technology. Directs efforts to stimulate and support research and development in areas considered of particular importance to the future capability of satellite communication systems.

9. Assists the Director of Telecommunications Management/Special Assistant to the President for Telecommunications and provides staff direction and support for telecommunications advisory councils and committees. Organizes and acts as Chairman, Co-chairman and/or member of government and professional society ad hoc study groups in the accomplishment of assignments. Incumbent currently serves as Chairman of the "Ad Hoc Intragovernmental Study Group on Early

Communications Satellite Service for Lesser-Developed Nations" and as Cochairman of the "Ad Hoc Intragovernmental Study Group on Space Service Spectrum Saturation." Serves as an ex-officio member of the "Panel of Experts on Telecommunications Science and the Federal Government" convened by the Department of Commerce. Serves as a member of the Technical Committee on Communications, American Institute of Aeronautics and Astronautics.

10. Is responsible for initiating and providing technical direction of contracts of equal scope. Current examples include contracts for: (1) "Telecommunications Management Support Program," including task assignments: "Case Studies of Telecommunications Management and Requirements in Crises" and "Compilation of Command Control Communications Studies;" and (2) "Study of the Needs of the Space Services between Now and 1980 and the Means of Satisfaction in the Light of Spectrum Saturation." In such instances the incumbent serves as Contracting Officer's Technical Representative.

11. Provides for joint effort and cooperation with the Frequency Management and National Communications Directorates, Office of the Director of Telecommunications Management, in respect to tasks, projects and problems of mutual concern.

III. SCOPE AND EFFECT OF WORK

The end product of the work performed by the incumbent and the Advanced Concepts and Technology Directorate is in the highest level of policy enunciation and action. The substance of problems and questions dealt with in order to arrive at these broad and coordinated policy bases for action is in the examination and interpretation of the rapid and radical changes in scientific, engineering and management concepts coming from all segments of the national economy. These are matters of current and prime concern to the President and to the Congress.

Successful accomplishment of assigned responsibilities will result in comprehensive review and evaluation of communication developments; provide for effective utilization of advanced telecommunications technology to meet the needs of the Federal Government, civilian, military and diplomatic, under all conditions ranging from a normal situation to national emergencies and international crises, including nuclear attack; sustain and contribute to the development of world trade and commerce; strengthen the position and serve the best interests of the United States in negotiations with foreign nations; and permit more effective use of resources through better telecommunications management.

IV. OTHER

Incumbent must be capable of acting for and directly representing the Director of Telecommunications Management/ Special Assistant to the President in the performance of assigned duties. Incumbent must possess outstanding creativity, imagination and resourcefulness and be recognized in his field as a technical and management authority. His recommendations and conclusions are considered authoritative and must be technically sound. Incumbent must, therefore, be a highly qualified electronic engineer with technical and management experience. He must have wide experience and knowledge of systems analysis and be familiar with specialists and authorities in all fields of telecommunications who may be called upon for advice and consultation.

GOVERNMENT USE OF SATELLITE COMMUNICATIONS

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON GOVERNMENT OPERATIONS HOUSE OF REPRESENTATIVES

EIGHTY-NINTH CONGRESS

SECOND SESSION

AUGUST 15, 16, 17, 18, 19, 29, 30, 31, AND SEPTEMBER 1, 6, 7, 12, 13, AND 14, 1966

Printed for the use of the Committee on Government Operations

Mr. O'CONNELL. It seems to work out very well. We have gotten some extraordinarily good men in there. So you have a comment—asked for or not.

Mr. ROBACK. What is the status of your office? We urged that it be upgraded, developed, and you gave us a little report on some of your expansion, but you also told us some of your people are leaving. Are you leaving, Mr. Morris?

Mr. MORRIS. Yes; I am planning to resign effective the middle of the month of September.

Mr. O'CONNELL. I twisted Mr. Morris' arm to join us for a couple of years.

SEPARATE STATEMENT OF FRED W. MORRIS, JR.

Mr. MORRIS. Mr. Roback, might I correct a possible implication that was on the record earlier?

Mr. ROBACK. I don't want any wrong implications on the record. [Laughter]

Mr. MORRIS. I might just mention for the record that for 10 years prior to accepting my current Government appointment in 1964 I did maintain an independent electronic engineering and management consulting practice in Palo Alto, Calif. It was known as Fred W. Morris, Jr. & Associates.

Mr. ROBACK. What was the nature of your work?

Mr. MORRIS. Mainly of a technical consultative nature to universities, research institutes, and industry.

Mr. ROBACK. In the communications field?

Mr. MORRIS. In communications and electronic warfare.

In my practice, I did have the pleasure to have associates working with me in the conduct of particular programs.

Mr. ROBACK. In other words, when you had a particular contract or subcontract, you might take on a consultant or an adviser on a given job?

Mr. MORRIS. I would say as an associate.

Mr. ROBACK. Associate?

Mr. MORRIS. I had the pleasure to have gentlemen from Stanford University working with me in the same vein that General O'Connell was able to work with me on programs particular organizations desired. It is only in that way that we were associated.

I was very pleased in 1964 to accept Mr. O'Connell's invitation to join him, when he accepted the appointments of the President, not only because of the opportunity to work with a man I have over many years been very devoted to, and who is a dedicated public servant, but also because I saw the challenge that was here and the need for telecommunications management at the national level.

Mr. O'CONNELL. I might say that he has learned a lot.

[Laughter.]

Mr. ROBACK. Learned a lot and I am sure he has also contributed a lot because I consider him an outstanding analyst of the subject.

Mr. O'CONNELL. He is indeed. He has contributed a great deal.

Mr. MORRIS. I might say, Mr. Chairman, I moved here from the San Francisco Bay area and our wonderful California——

Mr. HOLIFIELD. I hope you didn't live in Woodside.

Mr. MORRIS. To accept the appointment as Associate Director of Telecommunications Management. I am now resigning from my appointment as a career civil service, GS-18, electronic engineer, partly because I am disappointed that we have not been able to do more and because it does not appear that the job needed to be done by the DTM and his staff is to be allowed to be done. I might say also—and this is not a cleared statement with Mr. O'Connell—partly because the committee's recommendations——

Mr. ROBACK. You mean we have been an obstacle?

Mr. MORRIS (continuing). Have not been acted upon. I do feel that action upon your committee's recommendations would be highly desirable.

The recommendations have correctly pointed out the needs of the DTM. Unfortunately—in my opinion—the recommendations have not been acted upon by the Government. I believe there is an important need for the U.S. Government to find a way to encourage and to allow new technology and changing concepts of telecommunications to come into being and to remove the obstacles of established outmoded organizations, vested interests, obsolete management, and procedures which deny the benefits that technology has delivered or is ready to deliver.

Mr. HOLIFIELD. This is flattering to the committee's judgment in these matters. We are sorry that you are resigning, but, as Mr. O'Connell knows, we have certainly been a strong supporter of his office in trying to make his office as effective as we think it could be. We appreciate the contribution he is making to the office, too, I can tell you that.

(Note: The following background information re Fred W. Morris, Jr. resignation from employment with the Executive Office of The President, The White House, may be of interest. This information was released incident to Hearings before the Military Operations Subcommittee of the House of Representatives 9/29 - 31/66)

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Mr. James D. O'Connell, Director of Telecommunications Management, Executive Office of The President, and Special Assistant to The President for Telecommunications, The White House, in his testimony before the Military Operations Subcommittee of the Committee on Government Operations, House of Representatives, this week (August 31, 1966) discussed some of the staffing problems of his office. He disclosed that Mr. Fred W. Morris, Jr., his Associate Director of Telecommunications Management, with responsibilities for consideration of advanced telecommunications concepts and technology will be resigning soon "after more than two years of outstanding and dedicated service" and that he is "now faced with the extremely difficult task of seeking a replacement."

During the hearing, Mr. Morris was asked concerning his resignation. While his plans for new employment were not disclosed, he did indicate that he will be remaining in the Washington area in an executive capacity with an electronics industry organization. Responding to the questions of the Committee, Mr. Morris stated that he is resigning shortly from Government employment as a career Civil Service GS-18, Electronic Engineer, because it does not appear that the job needed to be done by the DTM and his staff is to be allowed to be done. He noted that the Committee has repeatedly pointed out the needs of the DTM and that part of the reason for his resignation was the failure of the Government to respond to these recommendations. Mr. Morris indicated that he hopes to do more outside of the Government employ to improve the lot of telecommunications than has been possible from inside Government.

He later remarked that a most important need, as he sees it, "is for the U.S. Government to find a way to encourage and to allow new technology and changing concepts of telecommunications to come into being and to remove the obstacles of established outmoded organization, vested interests, obsolete management and procedures which deny the benefits that technology has delivered or is ready to deliver."

Prior to joining the Executive Office of The President in 1964, Mr. Morris for ten years had maintained an electronics engineering and management consulting practice in Palo Alto, California, which served U.S. Government agencies, academic and research institutions, and the electronics and aerospace industry. He was an Army Signal Corps officer during WW II following his graduation from the California Institute of Technology.

TELE-SCIENCES CORPORATION

TELECOMMUNICATIONS CONSULTANTS

9315 HOLLY OAK COURT
WASHINGTON, D. C. 20034
TELEPHONE (301) 469-6034

TESTIMONY OF FRED W. MORRIS, JR.
PRESIDENT, TELE-SCIENCES CORPORATION (Washington, D.C.)

BEFORE THE SUBCOMMITTEE ON NATIONAL SECURITY POLICY AND SCIENTIFIC DEVELOPMENTS OF THE COMMITTEE ON FOREIGN AFFAIRS, HOUSE OF REPRESENTATIVES, CONGRESS OF THE UNITED STATES

THURSDAY, MAY 22, 1969 AT 10:AM, ROOM 2255, RAYBURN HOUSE OFFICE BUILDING.

"A COMMUNICATORS VIEW OF WORLDWIDE SATELLITE BROADCASTING"

Mr. Chairman and Members of the Committee: I appreciate this opportunity to appear before you as an independent telecommunications engineering and management consultant with a degree of background in the subjects of interest to the Committee as a result of both industry and government employment.

You have asked that I address my remarks to the subject of your pending resolution calling for aggressive action on the part of The President in the promotion and development of worldwide satellite broadcasting to improve the free flow of information among nations and peoples.

I agree wholeheartedly with the view that we should press for the utilization of the available technology and the developable technology to achieve the goals of an improved society and a free exchange of information throughout the world. Truly, communications do offer a powerful instrument of education and economic, political and social development. However, I will attempt to present some views developed as a result of my career and experience in telecommunications to urge that you not specify the means of transmission or reception of the services that you are encouraging.

The witnesses that have appeared before your committee in the past week and the documented studies you have before you present the status of development of our technical ability to provide worldwide broadband (as is required for television and high speed data) communications - including direct broadcast via satellite. We again find that our technological development and achievements are proceeding more rapidly than is our ability to accommodate and provide for the policy and regulatory environment in which to allow the technologies to be applied in the service of mankind. - The resolution under consideration and the area of interest to the Committee, as I understand it, do not involve the domestic United States. Therefore, the policy and regulatory environment we must address is that of the World Community.

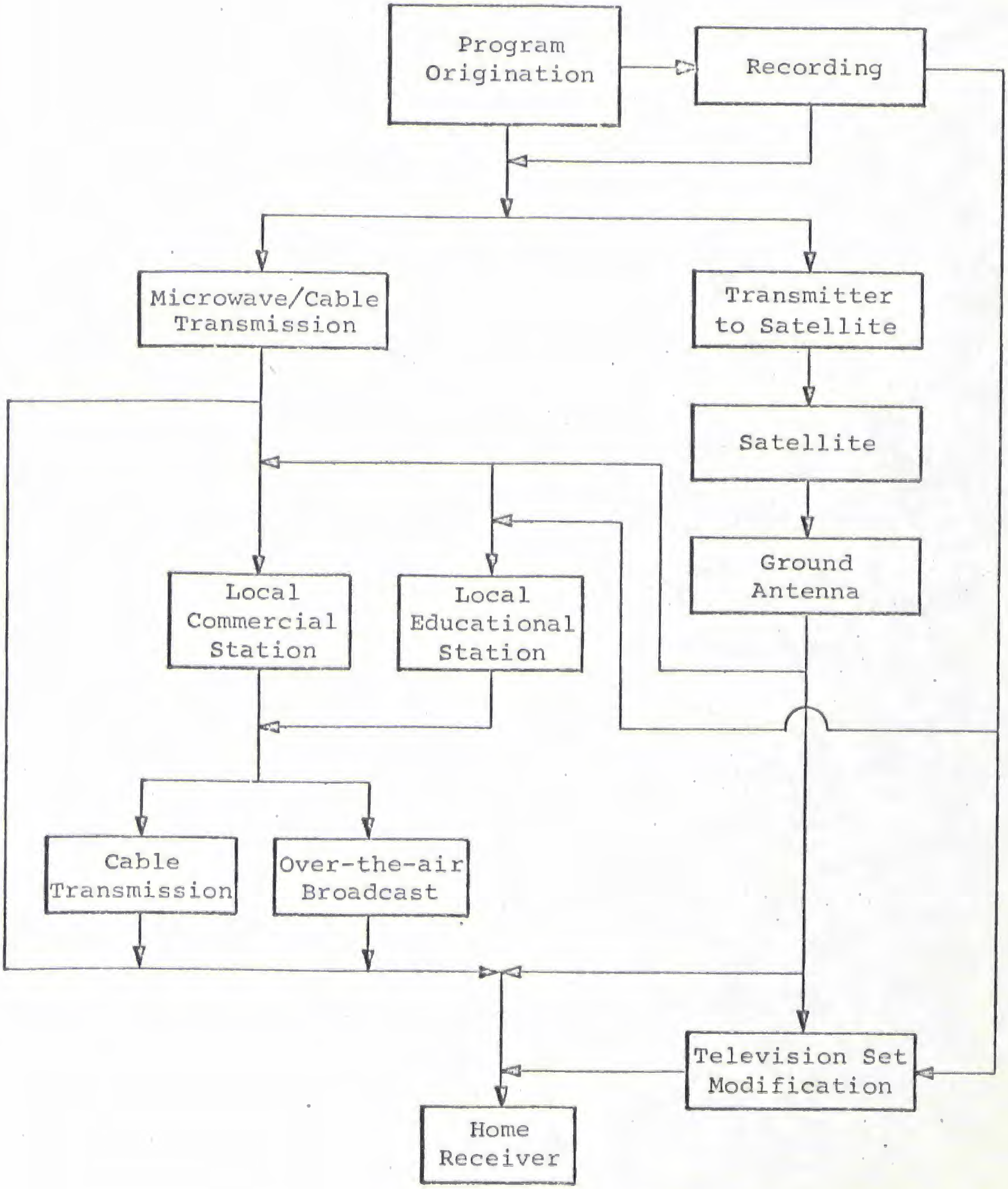
Previous witnesses before your committee alluded to the interaction of the thrust of your resolution with the views and interests of the United Nations, interpretations of the Treaty on the Peaceful Uses of Outer Space, and - indeed - the regulations, rules, and restrictions of the International Telecommunications Union (ITU). Also to be considered is the effect of the many nation commitment to the International Telecommunications Satellite Consortium (INTELSAT).

Having spent much of my professional life in the field of communications, I have learned the hard way to consider the many modes of communications available to meet requirements at hand. It is relatively easy to grasp for the newest of the technologies to supply new services. It is not always as easy to reconcile the economics and operational tradeoffs and the political environment with the call for immediate application of the new technology.

To be specific, everyday we are improving our use of the means available to disseminate and effect a freer exchange of information throughout the World - including the dissemination and distribution of broadband information such as television and high speed data. We utilize the means of improved transportation of video tapes and films by air transport. We have seen the international exchange of television programming by microwave means often assisted and supplemented by satellite point-to-point communications. In these instances the final transportation or transmission of the television programming to the end user has been through local or national networks of television broadcasting and/or closed circuit TV distribution by cable or the independent viewing of video tape through individual tape playback units. As indicated in Figure 1, there are many alternative paths or means from which to choose in proceeding from TV program origination to the end user - home or community receiver.

My point is that the economic tradeoffs matched with the requirements at hand do not always dictate that the direct transmission by broadcast to the end user from the originator is the most appropriate or acceptable.

In specific, rather unique situations - such as is represented by India - a satellite service providing nationwide point-to-point as well as distribution and probably community or direct broadcast transmission may



Courtesy: Spindletop Research

FIGURE 1...ALTERNATE TELEVISION PATHS OR MEANS.

well prove essential and economic. With the rudimentary and essentially non-existent communications network in India it is not difficult to envision the use of relatively narrow beam satellites to provide economic high grade telephone, record and data services between and among major cities and outlying towns and relay and/or broadcast of educational and instructional television programming originated in one or more national programming centers.

In India only about 20% of the population live in urban areas. The remaining 80% live in the approximately 568,000 villages scattered throughout the country. No more than half of the villages are connected by roads to the outside world. Only one television station exists in India. No Indian leader has ever been able to communicate with all of India.

In other developing country areas or continents where many independent nations are contained and where centers of population are more concentrated it may prove desirable to couple satellite service with augmented terrestrial and local distribution networks. In Latin America, for example, because of the surprisingly large number of television stations already existent and for political reasons, a direct broadcast satellite does not appear the most likely means of providing for television service. At recent count, Brazil had 47 television broadcast stations, Mexico 32, Colombia 14, and Peru 20. There are already over 2 million television receiving sets in Brazil, over 1 million in Mexico, and 200 thousand in Colombia. Here, what is most essential is improved program content and improved access to information from the World Community.

In considering television we must always remember that programming - not distribution - is the most costly element. In this country the average cost of <u>preparing</u> a half hour prime time commercial program is around $70,000. Even educational programming costs per hour run in excess of $20,000 with documentaries and dramatic productions running up to $80,000 per hour.

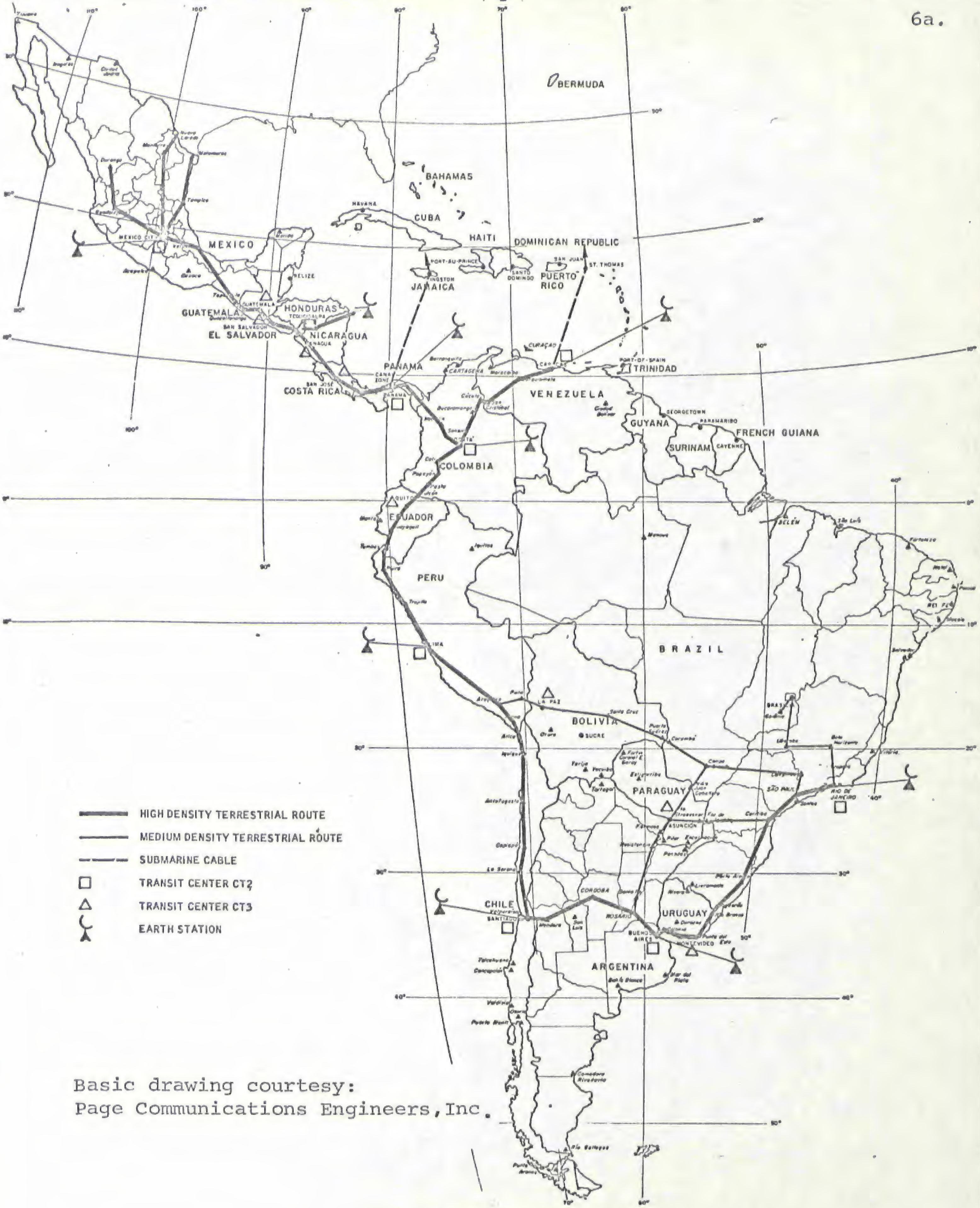
I bring up this latter point and wish to emphasize that one of the most serious missing ingredients in the exchange of information by television is good program content. Once program content is available, it is then a requirment upon communications to transport the programming. Earlier I mentioned the many means available for such transport.

Where individual national governments are concerned, it is my understanding that it is our United States foreign policy to assist the national governments to better identify with their citizens. A major assist can be given to the developing nation governments by providing television program content around which national or local governments or educational institutions can program for broadcast or other transmission to viewers.

Direct broadcast by satellite or other means to multiple nations (let alone a continent) does not assist the individual national governments in identifying with their citizens. I allow that such direct broadcasting would not contribute to improved stability, economic, political and social development.

In contrast with the situation in India let us briefly consider Latin America. Here we have a multination situation with a relatively urbanized population (ie. 125 cities in South America with populations in excess of 50,000) and with a rapidly developing telecommunications network incorporating improved high-frequency and microwave radio links as well as a complex of communications satellite earth stations working into the INTELSAT satellite system. Figure 2 discloses the configuration of the Interamerican Telecommunications Network (ITN) as now underway for completion in the early 1970s. Earlier I mentioned the surprising large number of television stations already existent. Television program distribution appears to be the most challenging requirement in the Latin America situation - not direct broadcast satellites.

Out of my personal experience I can testify to the anticipation of the five Central American Republics (Guatamala, San Salvador, Honduras, Nicaragua and Costa Rica) to being able to receive television program content from the United States and the rest of the World for use in their individual national television networks. A current program is underway as a cooperative venture of the five republics to link their capitals together with a broadband microwave system that will not only provide for voice, record and data transmission but will also provide - through the use of protection channels - television transmission. A recent decision of the Central American Regional Telecommunications Commission (COMTELCA) will now provide for a jointly owned and operated communications satellite earth station working into Atlantic satellites of the INTELSAT system and thence into the many earth stations of the



Basic drawing courtesy:
Page Communications Engineers, Inc.

FIGURE 2... CONFIGURATION OF THE INTERAMERICAN TELECOMMUNICATIONS NETWORK AS UNDERWAY FOR COMPLETION IN THE EARLY 1970s.

countries in the Atlantic basin.

As the capacity of the INTELSAT satellites increases and - in that the installed capacity is geared to peak demands - we can foresee the time when off-peak hour traffic can be carried on a reduced tariff basis. Off hour tariffing can be coupled with a special tariffing for one-way transmission of television programming to multiple destinations. With this near term possibility and with the many INTELSAT earth stations that are being committed to construction, the opportunity to make good program content available to many countries for their video tape recording and later programming for transmission via their national networks or for use in educational video tape libraries is exciting. Here the economic, operational and political tradeoff advantages over other means of transporting or transmitting program content may well favor the satellite distribution means of communications - but not favor the direct satellite broadcast means.

I hope that the Committee will not interpret my remarks to be in opposition to the technological development of the <u>capability</u> for direct broadcast via satellite of any of the classes of service discussed by Mr. Pritchard and Mr. Jaffee during last week's hearings or as so capably discussed in the publication of the National Academy of Sciences Panel 10 Report concerning Broadcasting as a Useful Application of Earth Oriented Satellites.

As the Chairman has noted in his remarks before the House of Representatives on April 30th, "it is technologically feasible...for the Soviet Union to put into synchronous orbit along the equator a broadcast satellite which could reach directly into the living room television sets of our American people". We must have, in my opinion, the same or superior technological capability. However, I do not foresee it as desirable to utilize the capability on a worldwide or multinational basis unless we are provoked to react in our own national interest and defense.

I am certain I have used my time as allotted, however, in closing I commend to the Committee's attention Chapter Four of the Report of President Johnson's Task Force on Communications Policy as released by the White House last Tuesday . The chapter is entitled "Satellite Communications and Educational Television in Less Developed Countries". The chapter is supplemented by Staff Paper Three bearing the same title. Possibly you will choose to include the Task Force chapter in the report of these hearings. The chapter and paper reference the fine work upon which they were based as conducted by Page Communications Engineers, Inc. (Washington, D.C.) and Stanford Research Institute (Menlo Park, California). I also recommend you give attention to aspects of a report prepared for the Task Force by Spindletop Research (Lexington, Kentucky) which attempts to identify and analyze alternatives for achieving greater television program diversity. An earlier report by Spindletop - prepared for the Director of Telecommunications Management, Executive Office of The President - evaluated alternatives for the production, distribution, and financing of television programs.

Again, let me say that I appreciate this opportunity to appear before you and to encourage you - in your consideration of House Concurrent

Resolution 236 - to modify the resolution to de-emphasize the "broadcast" mode in the use of satellite services as you call for improved exchange of information among nations and peoples as can be provided by modern communications in many technical forms.

STUDY OF INTERNATIONAL INTERCONNECTIONS
OF THE
CENTRAL AMERICAN REGIONAL TELECOMMUNICATIONS NETWORK

PREPARED FOR THE

CENTRAL AMERICAN REGIONAL TELECOMMUNICATIONS COMMISSION

AND THE

CENTRAL AMERICAN BANK FOR ECONOMIC INTEGRATION

BY:

FRED W. MORRIS, JR. - Professional Engineer

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Management Consultant
9315 Holly Oak Court - Potomac/Bethesda
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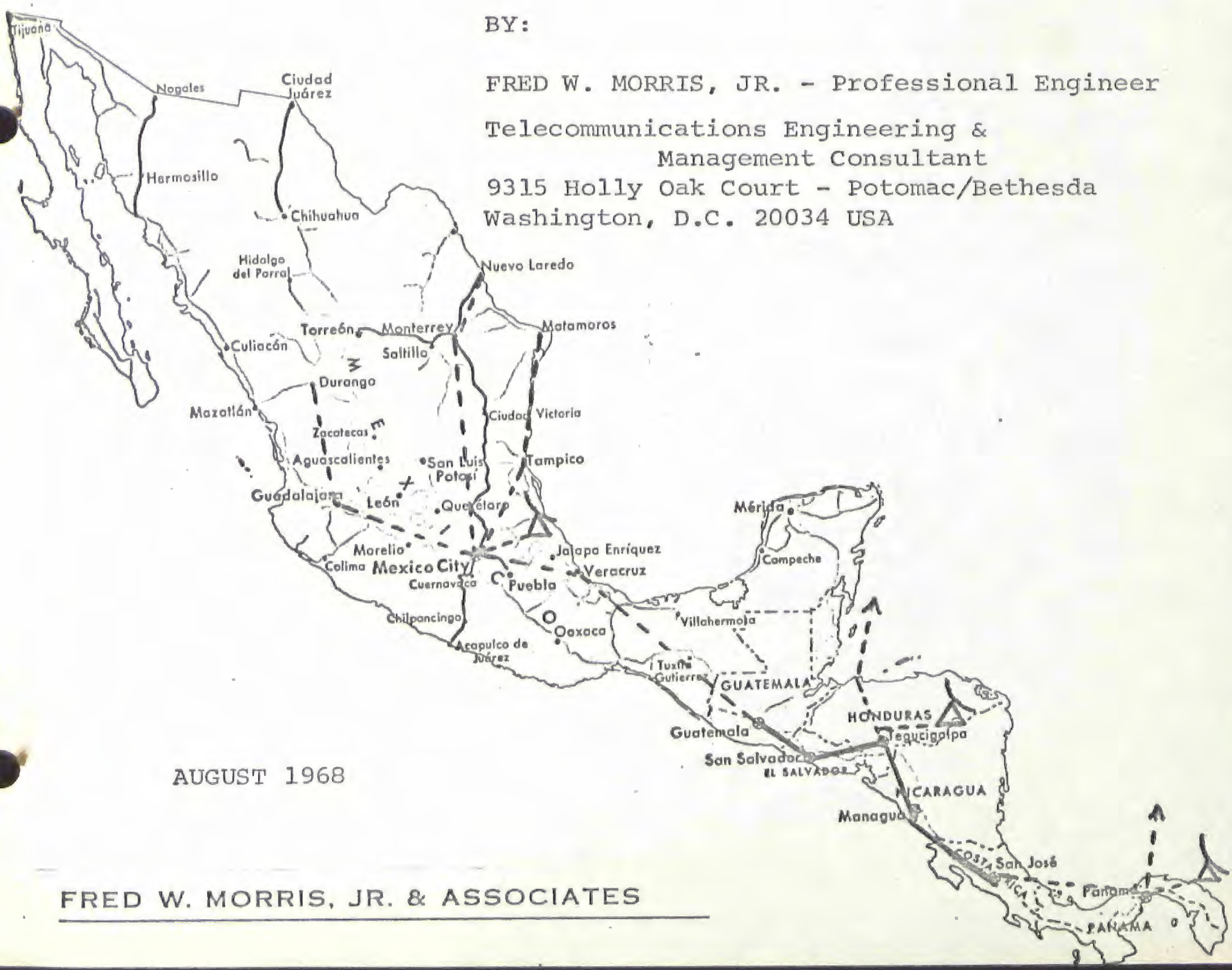

AUGUST 1968

FRED W. MORRIS, JR. & ASSOCIATES

STUDY OF INTERNATIONAL INTERCONNECTIONS
OF THE
CENTRAL AMERICAN REGIONAL TELECOMMUNICATIONS NETWORK

TABLE OF CONTENTS

I...PREFACE

This brief study was undertaken at the invitation of the Central American Bank for Economic Integration acting for the Central American Regional Telecommunications Technical Commission (COMTELCA). The intent of the study is set forth in Resolution No. 3 of The Commission made during the April 3, 1968 meeting of the Commission in Tegucigalpa, Honduras. (See Exhibit I-A).

The intent of the Resolution was to have the study prepared by a team of independent telecommunications experts and completed before the month of August 1968 in order to contribute to decision considerations during the course of negotiations for the construction of the Central American Telecommunications Network which will link together the five countries of Central America and interconnect with Mexico on the North and Panama on the South.

Messrs. Lars E. Gustafsson (ITU Technical Assistance Expert, Central America), Frank L. McCutchen (Telecommunications Consultant, Fairfax, Virginia, USA) and Fred W. Morris, Jr. (Telecommunications Engineering and Management Consultant, Washington, D.C., USA) were invited to undertake the study. An initial meeting was convened in Tegucigalpa, Honduras on July 1, 1968.

During the period July 1 to 6, 1968 work was initiated with discussions with members of COMTELCA and executives of the Central American governments' telecommunications entities and administrations, the Central American Bank for Economic Integration, and the Interamerican Development Bank. Requirements for data re international exit traffic patterns and projections were determined and alternative study models for international interconnections were enumerated and tentative decisions were made to emphasize selected models and discard other models.

It developed that sufficiently reliable data were not available upon which to base and undertake the entire scope of study desired by COMTELCA. It also became clear that time and funds were not available for an exhaustive search to develop the data at this time. However, it was determined that basic conclusions concerning the economic viability of a third international link of the Central American Telecommunications Network, besides the already proposed natural links through Mexico and Panama, could be developed. It was also determined that a comparative analysis of alternative physical means (submarine cable or communications satellite earth station) could be made.

During the period July 14 to 27 members of the team contacted executives of the following organizations:

International Telecommunications Union
United States Executive Office of The President
United States State Department
United States Federal Communications Commission
Interamerican Development Bank
Page Communications Engineers, Inc.
Telcom Incorporated
US Underseas Cable Corporation
Communications Satellite Corporation
International Telecommunications Satellite Consortium
RCA Global Communications
American Telephone & Telegraph Company
ITT World Communications, Inc.
ITT Central American Cables and Radio
Western Union International, Inc.
Stanford Research Institute.

Appreciation is expressed for the assistance rendered by these organization and their interest and encouragement.

Mr. Lars Gustafsson contributed substantially to the study and his conclusions as to traffic patterns and traffic projections are contained in this report. His work was substantial and beneficial to the study. Appreciation is expressed for his assistance.

In undertaking the preparation of a report of findings it unfortunately developed that it was not possible for Messrs. McCutchen and Morris to join in a jointly prepared report. A decision was, therefore, made that Mr. McCutchen would prepare a separate report in support of his conclusion and recommendation for the selection of a submarine cable linking Puerto Cortés, Honduras and Miami, Florida as the physical means to accomplish an independent exit for the Central American Telecommunications Network. The undersigned undertook the preparation of this report - based upon Mr. Gustafsson's traffic patterns and projections - attempting to provide information contributing to a decision as to the alternative means to be selected to accomplish an independent exit for the Central American Network. Basically, Mr. McCutchen's calculations of investment and operating costs of a submarine cable exit are used in this study. Comments are added and substantial material is presented concerning the alternative selection of a satellite earth station as the exit means to link the Central American Network with the INTELSAT global communications satellite system utilizing the Atlantic Basin satellite(s).

The undersigned will be pleased to receive your comments concerning the material presented and to supply additional information which may be available but not included in this report or considered due to the lack of sufficient time for its collection, analysis and reporting.

It should be realized that this is a preliminary report - limited in nature by the time constraints imposed.

Fred W. Morris

Fred W. Morris, Jr.
Professional Engineer

EXHIBIT I-A

FIRST EXTRAORDINARY MEETING OF THE REGIONAL TELECOMMUNICATIONS TECHNICAL COMMISION

(COMTELCA)

RESOLUTION No. 3

WHEREAS: There is an urgent need to firmly define the International exit of telecommunications traffic of the Central American region in order to be able to decide on capacity, time, etc., of the possible alternatives given in the specifications of the network.

RESOLVES:

To increase the scope of Resolution No. 10 taken in the Costa Rican meeting, for the following study:

"STUDY ON INTERNATIONAL INTERCONNECTIONS OF THE CENTRAL AMERICAN REGIONAL TELECOMMUNICATIONS NETWORK

The study shall be prepared by highly qualified independent experts selected jointly by COMTELCA, the Central American Bank for Economic Integration and I.T.U. The object of the study shall be:

1. To determine the economic viability of a third international link of the Central American Telecommunications Network, besides the already proposed natural links through Mexico and Panama, undertaking a comparison between the following possibilities:

   a. Through the Guatemala-Mexico microwave network;

   b. Through the Costa Rica-Panama microwave network; and,

   c. Through its own outlet of the Central American Network, giving priority to the study of an exit to be located in Honduras, and taking into account any other possibility that is considered viable.

Present and projected traffic of the Central American region with the different regions of the outside world; transit tariffs established for each of the systems outside the region as well as transit tariffs that have to be paid to the COMTELCA member countries for international traffic, must be taken into consideration for the economic comparison and determination of viability.

2. To determine the physical means and routes through which these interconnections should be established and the initial and final capacity of same.

3. To determine the dates on which each one of the links considered viable must enter into operation, based on the estimated traffic volumes and projections of same.

4. This study must be completed before the month of August, 1968 and shall be financed by the Central American Bank for Economic Integration."

-o-o-o-o-o-o-o-o-o-o-o-o

Note: Resolution No. 3 made on April 3, 1968, Tegucigalpa, Honduras, COMTELCA meeting.

II...PREAMBLE - A STATEMENT BY THE PRESIDENT OF THE UNITED STATES

The following excerpt from President Lyndon B. Johnson's MESSAGE ON COMMUNICATIONS POLICY to The Congress of the United States (August 14, 1967) bears on the subject under study.

.....

.....

"Today I reaffirm the commitments made in 1962 and 1964. We support the development of a global system of communications satellites to make modern communications available to all nations. A global system eliminates the need for duplication in the space segment of communications facilities, reduces the cost to individual nations, and provides the most efficient use of the electro-magnetic frequency spectrum through which these communications must travel.

"A global system is particularly important for less developed nations which do not receive the benefits of speedy, direct international communications. Instead, the present system of communications --

-- "encourages indirect routing through major nations to the developing countries,

-- "forces the developing nations to remain dependent on larger countries for their links with the rest of the world, and

-- "makes international communications service to these developing nations more expensive and of lower quality.

"A telephone call from Rangoon to Djakarta must still go through Tokyo. A call from Dakar, Senegal to Lagos, Nigeria is routed through Paris and London. A call from American Samoa to Tahiti goes by way of Oakland, California. During the recent Punta del Este conference, I discovered that it usually cost Latin American journalists more than their American colleagues to phone in their stories because most of the calls had to be routed through New York.

"Such an archaic system of international communications is no longer necessary. The communications satellite knows no geographic boundary, is dependent on no cable, owes allegiance to no single language or political philosophy. Man now has it within his power to speak directly to his fellow man in all nations.

"We support a global system of commercial satellite communications which is available to all nations -- large and small, developed and developing -- on a non-discriminatory basis.

"To have access to a satellite in the sky, a nation must have access to a ground station to transmit and receive its messages. There is a danger that smaller nations, unable to finance or utilize expensive ground stations, may become orphans of this technological advance.

"We believe that satellite ground stations should be an essential part of the infrastructure of developing nations. Smaller nations may consider joint planning for a ground station to serve the communications needs of more than one nation in the same geographic area. We will consider technical assistance that will assist their planning effort.

"Developing nations should be encouraged to commence construction of an efficient system of ground stations as soon as possible. When other financing is not available, we will consider financial assistance to emerging nations to build the facilities that will permit them to share in the benefits of a global communications satellite system."

.....

.....

/s/ Lyndon B. Johnson

NOTE: Underlining for emphasis re this study only.

III...ASSUMPTIONS, CONDITIONS AND LIMITATIONS

Before addressing the body of this report it is necessary to set forth the following assumptions, conditions and limitations.

The basis of this study is predicated on the following general assumptions and conditions relative to the now existing or possible new international exits to the Central American Regional Telecommunications Network.

The study specifically excludes consideration of the following factors not judged to be pertinent to the economic or technical decision-making relative to the study:

a) Individual Central American country national interests relative to the position of the four other countries;

b) Individual national investment and revenue division incident to use of the available existing international exits (Mexico or Panama) or a possible new regional exit; and

c) Benefits and revenue derivable from additional service capability of the alternate modes of transmission (i.e. television reception or transmission, broadband data, facsimile, etc.).

The study is based upon the following assumptions:

a) Regional economic interests rather than individual national interest considerations;

b) Any new exit for international services must be undertaken and supported as a regional-joint venture rather than on any single country national basis;

c) Intra-regional transit tariffs and revenue accrual shall apply on all international traffic through existing or new regional exits;

d) All international traffic shall go through the existing Mexico and possible Panamanian exits of the regional network or a new exit or a combination of all exits to provide diverse capabilities and routing; and

e) All existing high frequency radio international circuits owned and operated within the individual countries will be dis-established and no longer used to serve the international needs of the five regional countries at the time of commissioning of the regional telecommunication network and/or the possible establishment of a new regional international exit.

The study is limited by factors mentioned in the Preface and does not address the relative economic viability of the three international links under consideration for the Central American Telecommunications Network. Current traffic and tariff data and their projections were unavailable as was information relative to transiting charges and revenue retention agreements. These factors could be developed in a more detailed analysis and with the availability of time for assemblage of the data base.

The author is of the opinion that the conclusions reached in this study and the supplementary background information furnished will permit initial policy decisions to be formulated in spite of the limitations which developed during the one-month study.

IV...TRAFFIC PATTERNS AND TRAFFIC PROJECTIONS - INTERNATIONAL

Forecasting of the traffic is of utmost importance in every study of the viability of telecommunications projects. The reliability of the forecasts is of even greater importance in a techno-economic comparison study of different physical alternative means than in a viability study of one specific means. In the latter case, it may be sufficient that the traffic forecasts show that a project is viable, even if the degree of viability may be uncertain.

In the COMTELCA study, where the object is to determine whether or not an independent exit for telecommunications traffic is viable and then to determine which of different alternative means - each one in itself viable - shall be recommended, the projection of the future traffic should be very reliable. A forecast of volume and distribution of traffic mainly with the United States may, at least initially, make a submarine cable - essentially a "busbar" - more economically attractive. A slightly different forecast with multiple destinations for traffic extending throughout the Atlantic Basin and the World may prove satellite service to be more attractive.

A projection of international telecommunication traffic should be based upon statistical data for the traffic during recent years. Preferably, a continuous set of data for several years should be available. The data should show telephone and telex traffic, including: 1) number of calls in total per year or number of charged minutes per year to and from different countries, 2) average charged minutes per call, 3) the volume of traffic carried during the busiest season of the year, 4) the concentration of the 24-hour traffic in the busy hour of the day, and 5) the circuit holding time per call (including conversation and operation time).

Data of the indicated type has not been available to a sufficient extent in considering the Central American countries to permit standard projection techniques to be used. For the purpose of this limited study it was, therefore, necessary to seek data from other sources and to make certain gross assumptions.

It has been taken as an assumption that all traffic between each of the COMTELCA countries on the one hand, and Panama and Mexico on the other hand, will be carried on terrestial circuits passing the Costa Rica/Panama border and Guatemala/Mexico border respectively. This traffic, therefore, will not affect the new exit for the Central American countries. This assumption may be in error when considering the incremental cost of satellite services to Mexico and Panama if a satellite earth station is selected and established for the COMTELCA countries and competitively priced agreements made with the operators of the Mexican and Panamanian earth stations.

In addition to the considerable traffic from and to the COMTELCA countries which terminates or originates in the USA, the remaining international traffic is, at present, nearly 100% routed on circuits between the Central American countries and the USA where it is transited to US international carrier exits. The US Federal Communications Commission (FCC) maintains records of not only the traffic originating and terminating in the USA but also of traffic transited via the USA. The specific data on terminating traffic and transiting traffic are not published by FCC in their annual statistical report. However, they were obtained from the FCC for the purpose of this study. (The years 1964 - 1967 were used.) Thus, dependable figures were obtained for all traffic terminating and originating in the USA and for traffic transited via the USA to and from the rest of the World. However, no records are collected re the ultimate destination of the transit traffic. For the distribution of traffic transited via the USA, a sample of the traffic during the month of April 1967 was used (as made available by AT&T). However, one-month's sampling cannot be considered sufficiently reliable to determine the distribution of the traffic with each of the Central American countries; but the uncertainty is somewhat decreased if the five Central American countries are taken together as one group. The actual traffic - expressed in number of charged minutes - based on FCC records for traffic terminating and originating in the USA during the year 1967 is tabulated in Table IV-A. Likewise, the traffic between the Central American countries and South America, the Caribbean Islands, Canada, Europe and the Near East, as well as the Pacific and Far East, is tabulated in Table IV-B.

The projection of the traffic from 1967 onward included in the tabulations has been made in the following manner. For the traffic between each of the Central American countries and the USA, the traffic increase from 1967 up to 1972 has been assumed to follow the historical trend for each specific country.1/

1/ The historical trend calculated on the traffic 1964-1967 is:

Costa Rica	17.2%	Nicaragua	12.3%
Guatemala	12.2%	El Salvador	8.1%
Honduras	16.8%		

PROJECTION OF TELEPHONE TRAFFIC COMTELCA COUNTRIES - U.S.A.
TOTALS OF OUTGOING AND INCOMING TRAFFIC,
TERMINATING AND ORIGINATING IN U.S.A.

	COSTA RICA			GUATEMALA			HONDURAS		
Year	Charged Minutes	Erlang, Busy Hour	Number of Circuits	Charged Minutes	Erlang, Busy Hour	Number of Circuits	Charged Minutes	Erlang, Busy Hour	Number of Circuits
1967	221660	2.76	7	232494	2.89	7	153318	1.92	6
--									
1970	356873	4.45	10	328262	4.1	9	244236	3.05	7
1971	565921	7.05	14	504210	6.35	13	386381	4.83	10
1972	897550	11.2	19	774467	9.7	17	613235	7.92	15
1973	1077060	13.4	22	929360	11.6	20	735882	9.24	17
--									
1975	1550966	19.4	29	1338278	16.8	26	1059669	13.2	22
--									
1978	2680069	33.5	46	2312545	28.9	40	1830962	22.8	33
--									
1980	3545731	44.2	57	3059497	38.2	51	2421447	30.2	42
--									
1985	7130465	89	107	6152648	77.0	93	4869530	61.0	76
--									
1990	14339365	179	201	12372975	154	175	8792625	110	128
--									
1995	28836462	360	400	24882053	311	354	17681969	220	241
1996	33161931	415	457	28614361	357	420	20334264	255	275

Table IV-A

PROJECTION OF TELEPHONE TRAFFIC
COMTELCA COUNTRIES - U.S.A.
PAGE TWO - Table IV-A

	NICARAGUA			EL SALVADOR		
Year	Charged Minutes	Erlang, Busy Hour	Number of Circuits	Charged Minutes	Erlang, Busy Hour	Number of Circuits
1967	178004	2.22	6	101229	1.26	4
--						
1970	251984	3.15	8	127852	1.60	5
1971	387199	4.83	10	191139	2.39	6
1972	595125	7.41	14	285753	3.56	8
1973	714150	8.92	16	342904	4.29	9
--						
1975	1028376	12.8	21	493782	6.15	12
--						
1978	1777034	22	32	853225	10.7	19
--						
1980	2351016	29	40	1128856	14.9	24
--						
1985	4727893	59	74	2270129	28.4	40
--						
1990	9510793	119	138	4565229	57.0	71
--						
1995	19126205	238	275	9180676	115	133
1996	21995136	275	415	10557777	132	154

PROJECTION OF TELEPHONE TRAFFIC COMTELCA COUNTRIES - REST OF THE WORLD
TOTALS OF OUTGOING AND INCOMING TRAFFIC

	SOUTH AMERICA			CARRIBEAN ISLANDS			CANADA		
Year	Charged Minutes	Erlang, Busy Hour	Number of Circuits	Charged Minutes	Erlang, Busy Hour	Number of Circuits	Charged Minutes	Erlang, Busy Hour	Number of Circuits
1967	28645	0.41	3	39535	0.49	3	16947	0.21	2
--									
1970	41679	0.59	3	57790	0.72	3	24779	0.31	3
1971	64562	0.92	4	89517	1.12	4	38380	0.48	3
1972	100007	1.43	5	138662	1.74	5	59451	0.74	4
1973	120008	1.72	5	166394	2.07	6	71341	0.89	4
--									
1975	172812	2.42	6	239607	2.97	7	102731	1.29	5
--									
1978	298618	4.26	9	413841	5.16	11	178319	2.23	6
--									
1980	395072	5.6	11	547512	6.8	13	235996	2.95	7
--									
1985	794488	11.4	20	1101047	12.6	21	474588	5.9	12
--									
1990	1597715	22.8	33	2214206	27.6	39	954396	11.9	20
--									
1995	3213005	46	59	4452768	56	70	1919290	24	35
1996	3604956	51	65	5120683	64	79	2207184	29	40

Table IV-B

PROJECTION OF TELEPHONE TRAFFIC
COMTELCA COUNTRIES - REST OF THE WORLD
PAGE TWO - Table IV-B

	EUROPE & NEAR EAST			PACIFIC & FAR EAST		
Year	Charged Minutes	Erlang, Busy Hour	Number of Circuits	Charged Minutes	Erlang, Busy Hour	Number of Circuits
1967	31853	0.64	3	1412	0.04	2
--						
1970	46569	0.94	4	2065	0.05	2
1971	72135	1.45	4	3197	0.08	2
1972	117737	2.33	6	4952	0.12	2
1973	134084	2.68	7	5942	0.15	2
--						
1975	193081	3.9	9	8556	0.21	2
--						
1978	333644	6.6	13	14785	0.37	3
--						
1980	441411	8.8	16	19561	0.49	3
--						
1985	887678	17.8	27	39337	0.98	4
--						
1990	1785120	36	48	79107	1.98	6
--						
1995	3589876	71	87	159084	3.97	9
1996	4128357	83	99	182947	4.56	10

SUMMARY

PROJECTION OF TOTAL INTERNATIONAL TELEPHONE TRAFFIC
COMTELCA COUNTRIES - USA AND REST OF THE WORLD
(excluding Regional, Mexico and Panama traffic)

YEAR	CHARGED MINUTES (in thousands/year)			CIRCUITS		
	With USA	Rest of World	TOTAL	With USA	Rest of World	TOTAL
1967	886.7	118.4	1,005.1	30	13	43
--						
1970	1,309.2	172.9	1,482.1	39	15	54
1971	2,034.9	267.8	2,302.7	53	17	70
1972	3,166.1	420.8	3,586.9	63	22	85
1973	3,799.1	497.8	4,297.2	84	24	108
--						
1975	5,471.1	716.8	6,187.9	110	29	139
--						
1978	9,453.8	1,239.2	10,693.0	160	42	202
--						
1980	12,506.5	1,639.6	14,146.1	203	50	253
--						
1985	25,150.7	3,297.1	28,447.8	390	84	474
--						
1990	49,581.0	6,630.5	56,211.6	713	134	847
--						
1995	99,707.4	13,334.0	113,041.4	1403	260	1663
1996	114,663.5	15,244.1	129,907.6	1721	293	2014

Table IV-C

An independent exit for the international traffic to and from the Central American countries has been assumed to be put into operation in mid 1971, coincident with the coming into operation of the Central American Regional Network. Following experiences from other countries, when new high-quality telecommunications services are made available to meet new demands, a great increase in the traffic during a relatively short period occurs - the so-called "impulse jump." This impulse jump has, for the traffic of the Central American countries, been assumed to be 100%; however, as the new exit is assumed to be put into operation in mid 1971, this impulse jump has been separated out for the years 1971 and 1972. After the compounded increase equal to 100% and in addition to the aforementioned historical trend, a further considerable increase of the traffic has been assumed to continue equal to 20% per year up to the year 1978. From 1978 on, a flattening out of the increase to 15% has been assumed for the remainder of the period for which the traffic has been projected.

The "impulse jump" assumption of 100% was based upon the past traffic experience of several countries which recently experienced analoguous jumps in their traffic due to the installation of new submarine cable and/or satellite service. Where satellite services have been made available, frequently the impulse jumps have been considerably higher.

The calculation of the traffic expressed in Erlangs in the busy hour was made in the following way. The traffic carried during the busy months was assumed to be 1/10 of the traffic carried during the entire year. This assumption does not seem to be too high and, to some extent, is substantiated by investigations of the Honduras/USA traffic. The traffic during one normal working day was assumed to be 1/25 of the traffic during one month. The traffic carried during the busy hour was taken as 1/8 of the traffic carried during one normal working day. Further, the ratio between circuit holding time (including conversation and operation time) and the number of charged minutes has been assumed to be 9/6. The corresponding number of circuits for carrying the traffic, as recommended by CCITT, was found from standard Erlang tables.

The base calculation of traffic to and from the Central American countries and the rest of the World for the year 1967 was made in a similar way. However, it is not possible to reliably project the traffic increase on a historical trend basis for this type of traffic in this case. Changes have occurred in the routing of the traffic. For example, traffic between Guatemala and Mexico, which was formerly transited via the USA has, during the recent years, been carried on direct circuits between the two countries. Therefore, the traffic increase from 1967 up to 1972 has been assumed to be equal to the average increase of the traffic between Central America and the USA; i.e. 13.5%.

The inpulse jump and the traffic growth after the impulse jump, as projected in Table IV-B was made in the same manner as the projection of the traffic with the USA. In calculating the traffic load during the busy hour, the sun time difference was considered. This means that in situations where there is a considerable time difference, one has to consider heavier concentrations of traffic in the busy hour(s).

In the projections as described above, the same impulse jump was used for traffic with the USA as well as with the rest of the World. This may not necessarily be born out if the new exit under consideration is put into operation. The telephone traffic demand between the Central American countries and the international telephone traffic demand to countries other than the United States has been and is now suppressed - because of extremely limited transmission quality - and circuit availability to a greater extent than the traffic demand between Central America and the USA has been suppressed. Thus, there is a likelyhood that a greater impulse jump in the case of the non-US traffic will be experienced. However, the ability to predict this eventual impulse jump is limited. Therefore, the projections of traffic to the "rest of the World" are considered conservative.

In the feasibility study for the Inter-American Telecommunications Network, prepared by the IDB and CITEL, an important study has been made of the correlation between international trade and telecommunications traffic. This study technique might indicate a potential for a greater increase in the traffic between the Central American countries and the rest of the World, than with the USA. However, it seems necessary to take into consideration not only the total trade between countries but also the type of trade in order to have confidence in the predictions of traffic.

An indication of a possibility for a greater impulse jump in the telephone traffic with countries other than the USA is given by viewing the telegraph traffic with the USA. It is a fact that the current relation between the telegraph traffic with countries other than the USA to the telegraph traffic with the USA differs substantially. The percentage of telegraph traffic to countries other than the USA is from 26 to 44% for the individual Central American countries. The percentage of telephone traffic with other countries than the USA is only from 5 to 30% for the individual Central American countries. This indicates that there may well be a demand for telephone communication with countries other than the USA that is now suppressed to a greater extent than is true for telegraph service.

Because of limited availability of facilities and, to some extent, because of unfavorable rates, it is not possible to reliably estimate an impulse jump on the basis of very general assumptions.

The charged minutes per year and total circuit requirements are summarized in Table IV-C. This table is of particular significance in considering when installed cable capacity might be exceeded. The capacity of the satellite earth station is limited only by satellite access availability (which can rise to thousands of circuits) and earth station carrier and multiplex equipment. It should also be noted that a Central American earth station will permit the retention of revenue on chargeable minutes for the full half circuits to anywhere in the Atlantic Basin served by an earth station, whereas a submarine cable will only permit retention of revenue on half circuits to the Eastern United States.

No consideration was given in determining the projections set forth in this limited study to demands for data and television services or for leased line services for alternate voice/record/data which are bound to develop once a capability exists for quality - low cost transmission. This factor makes the projections even more pessimistic, particularly when considering a satellite earth station exit capability.

V... STUDY MODELS - INTERNATIONAL EXIT ALTERNATIVES AND DISCUSSION

V-1... MODELS

The COMTELCA network as presently planned will have outlets at both ends of the system. To the South a 960 channel microwave system will connect to Panama where an outlet to Florida is available through a 128 channel (4 KHz channel spacing) cable which can be expanded by the use of TASI equipments to provide for some additional channels[1]. In addition a Panamanian earth station has been completed which will provide direct access to the INTELSAT Atlantic Basin satellite(s). The Atlantic Basin satellites will provide direct communications to all earth stations in view of the satellites. (See Appendix A for a map and Appendix E for a listing of the earth stations now existing or proposed for availability by 1972. Note that there will be at least 34 countries with earth stations within the view of the Atlantic Basin satellite by 1972).

To the North the COMTELCA network will be connected by at least a 960 and possibly by an 1800 channel microwave system. The microwave system will provide access to the United States and also to a Mexican earth station near Mexico City. The satellite earth station has been completed and can provide the same satellite access as via the earth station in Panama.

Thus, outlets are available with significant channel capacity to connect the COMTELCA network with the World-wide telecommunications network. However, transiting of other countries is required and retained revenue diminished.

The capital city of each of the Central American Republics is designated as CT-3 switching point or transit center. In the proposed ITU switching hierarchy, CT-3 centers of Guatemala, El Salvador and Honduras would home on the CT-2 center in Mexico and Nicaragua and Costa Rica would home on the CT-2 in Panama. For purposes of regional integration - and particularly if a third exit is to be provided within the Central American Republics - it appears desirable to have all countries in COMTELCA home on a COMTELCA controlled CT-2. This was considered at the ITU World Plan Committee Meeting - Mexico '67.

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[1] However, the capacity cannot be doubled due to requirements for full time leased channels which cannot use TASI. No authorization has been requested or considered for equiping the Panama-US cable with TASI and it is questionable as to whether or not the US FCC would authorize TASI on this cable.

On economic and operational grounds it is worthwhile considering if an exit within one of the five Central American Republics could provide advantageous service. A COMTELCA regional exit point could be considered the primary outlet - with Mexico and Panama handling local destination traffic and overflow (and emergency) international traffic. To consider this point requires study of several models.

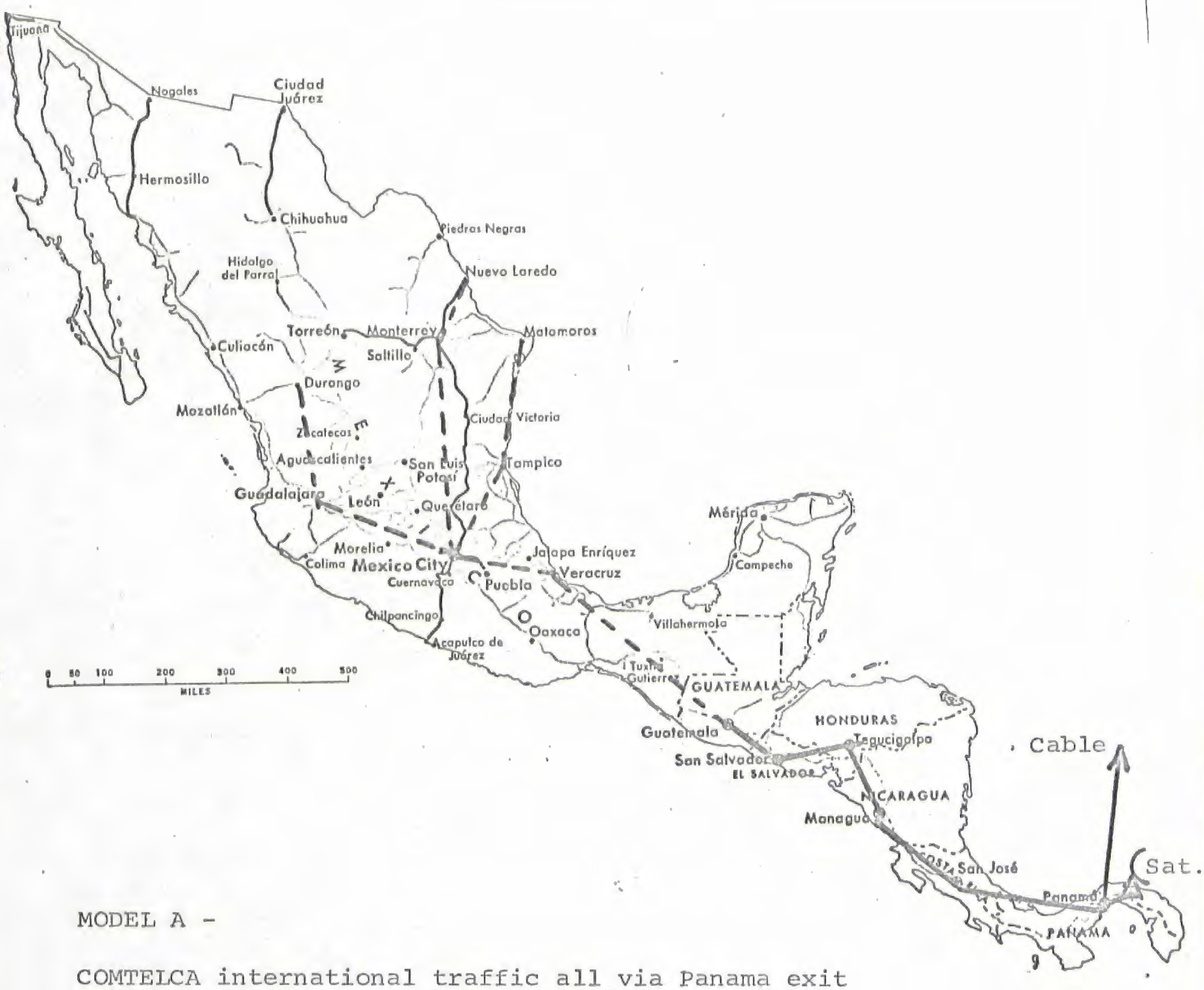
The following maps disclose the alternative models that have been and should be considered. (See Maps V-A through E).

Intuitive economic and operational reasoning permits the discarding of Models A and B. The COMTELCA countries should not permit themselves to be dependent solely on Mexico or Panama for transiting international traffic.

Model C should be considered as an alternative to proceeding with plans for an early installed capability "third" Central American Network exit. Divided dependence on Mexico and Panama could provide for flexibility and negotiation re transit tariffs and allow COMTELCA international traffic to develop before making a commitment to a third exit. However, as will be pointed out later in this study, in the meantime some otherwise retained revenue may be lost.

Model D provides the maximum of flexibility. However, economic analysis suggests that once the Central American Network exit is established the countries should use it to the maximum in order to derive maximum economic (retained revenue) and operational benefits.

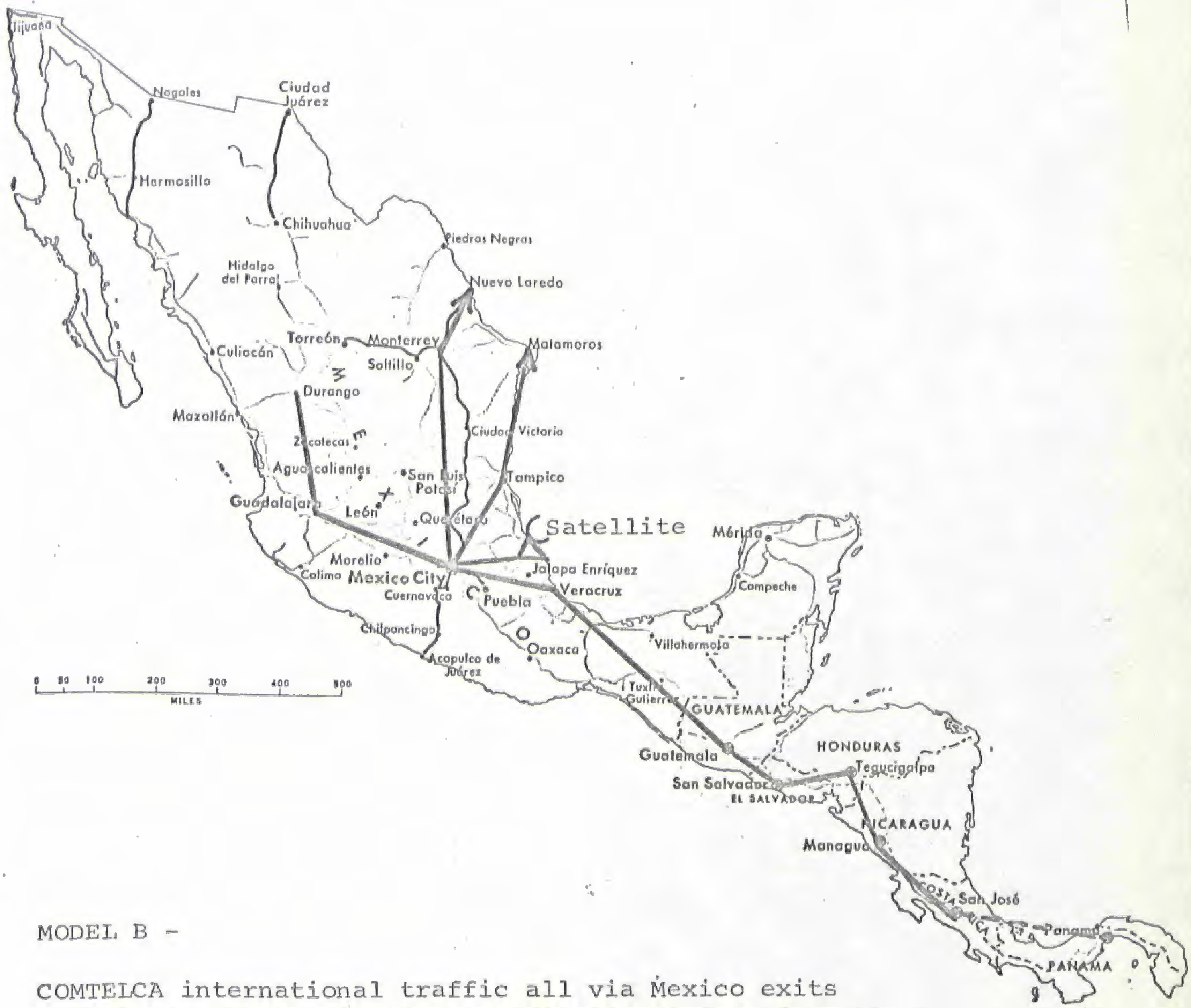
Carried to an extreme, Model E suggests that all international traffic (other than that destined for within Mexico and Panama) be routed through a Central American Regional Network exit.



MODEL A -

COMTELCA international traffic all via Panama exit (only Mexico destination traffic diverted to Mexico)

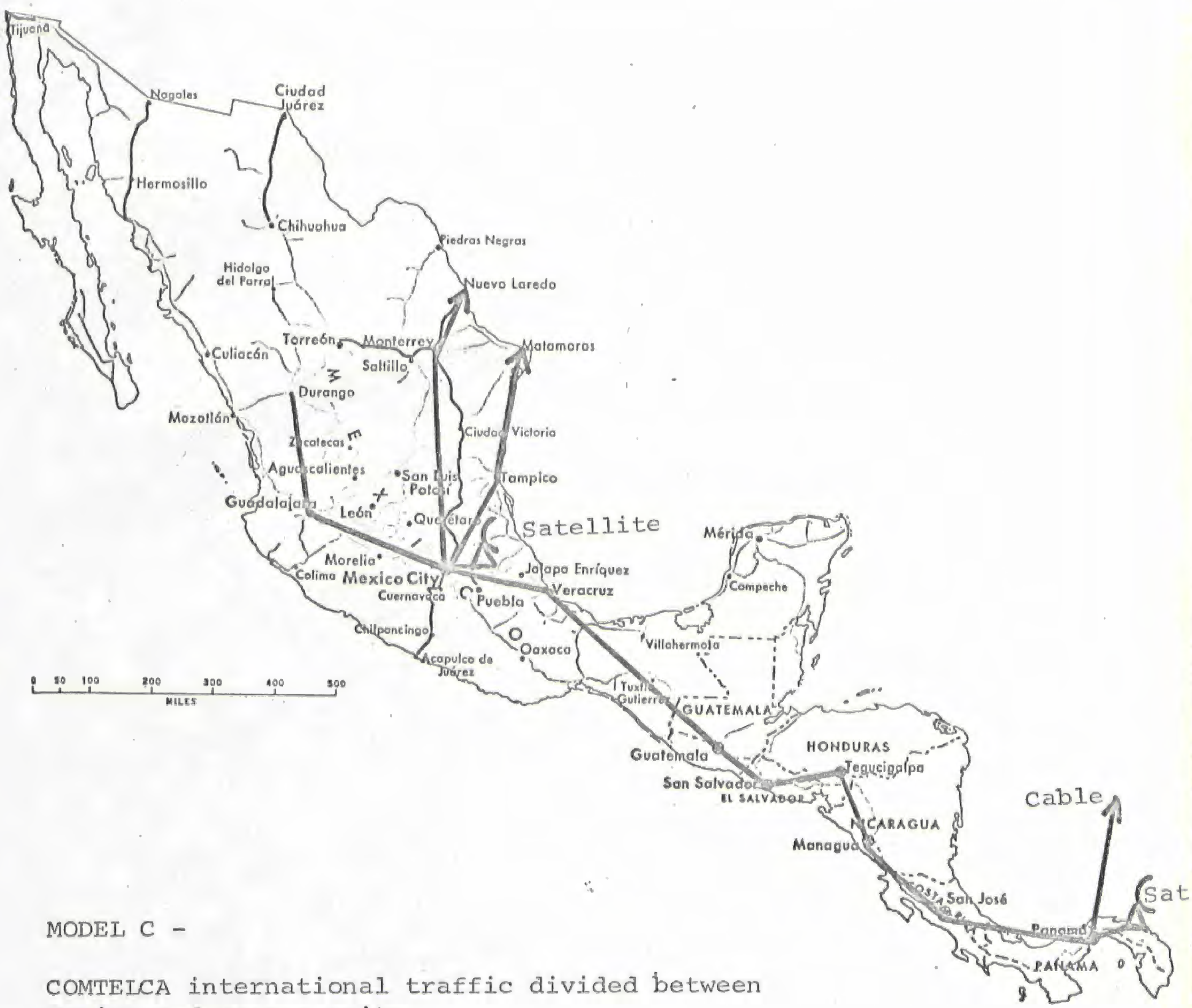
MAP V-A



MODEL B -

COMTELCA international traffic all via Mexico exits
(only Panama destination traffic diverted to Panama)

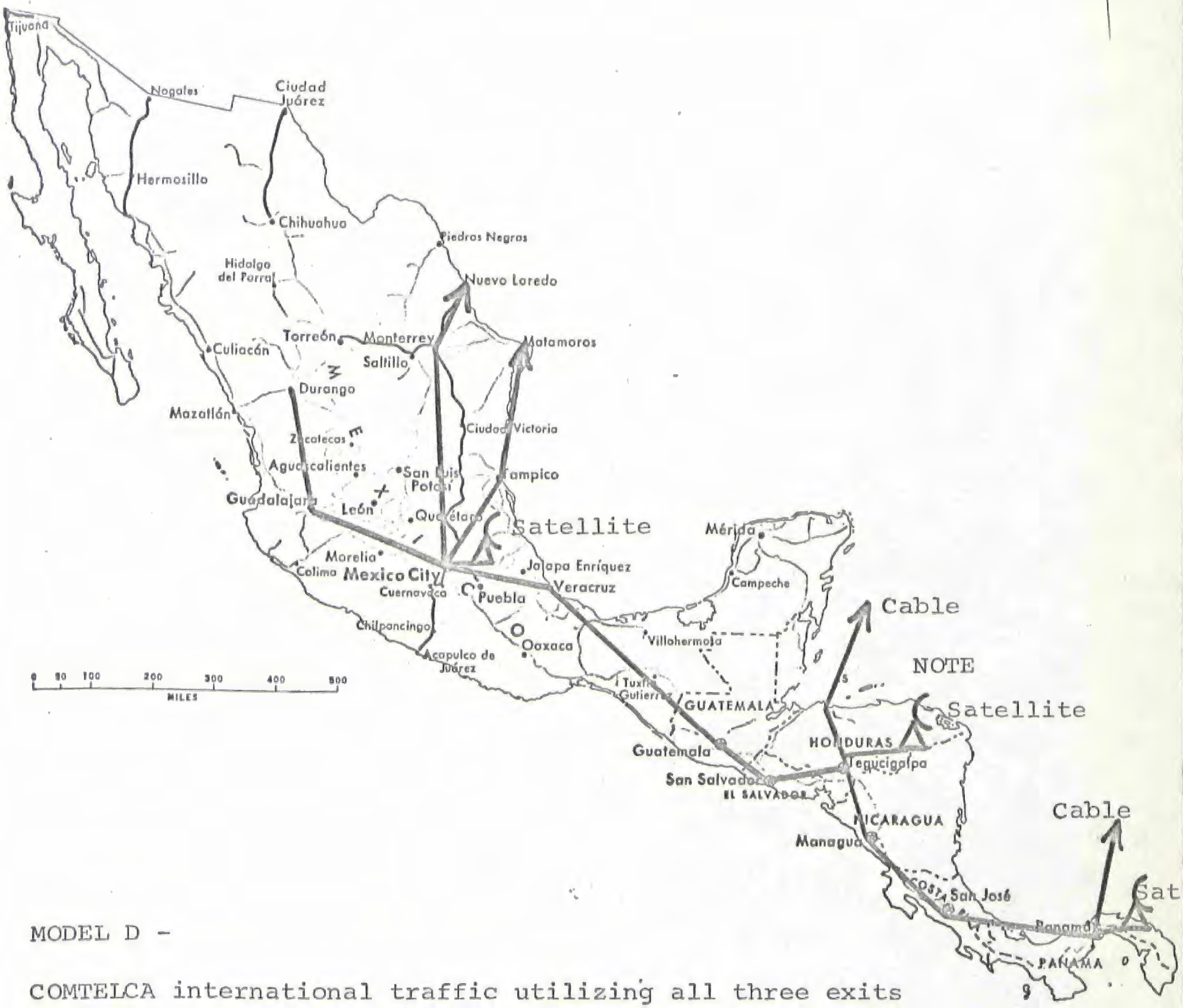
MAP V-B



MODEL C -

COMTELCA international traffic divided between Mexico and Panama exits

MAP V-C

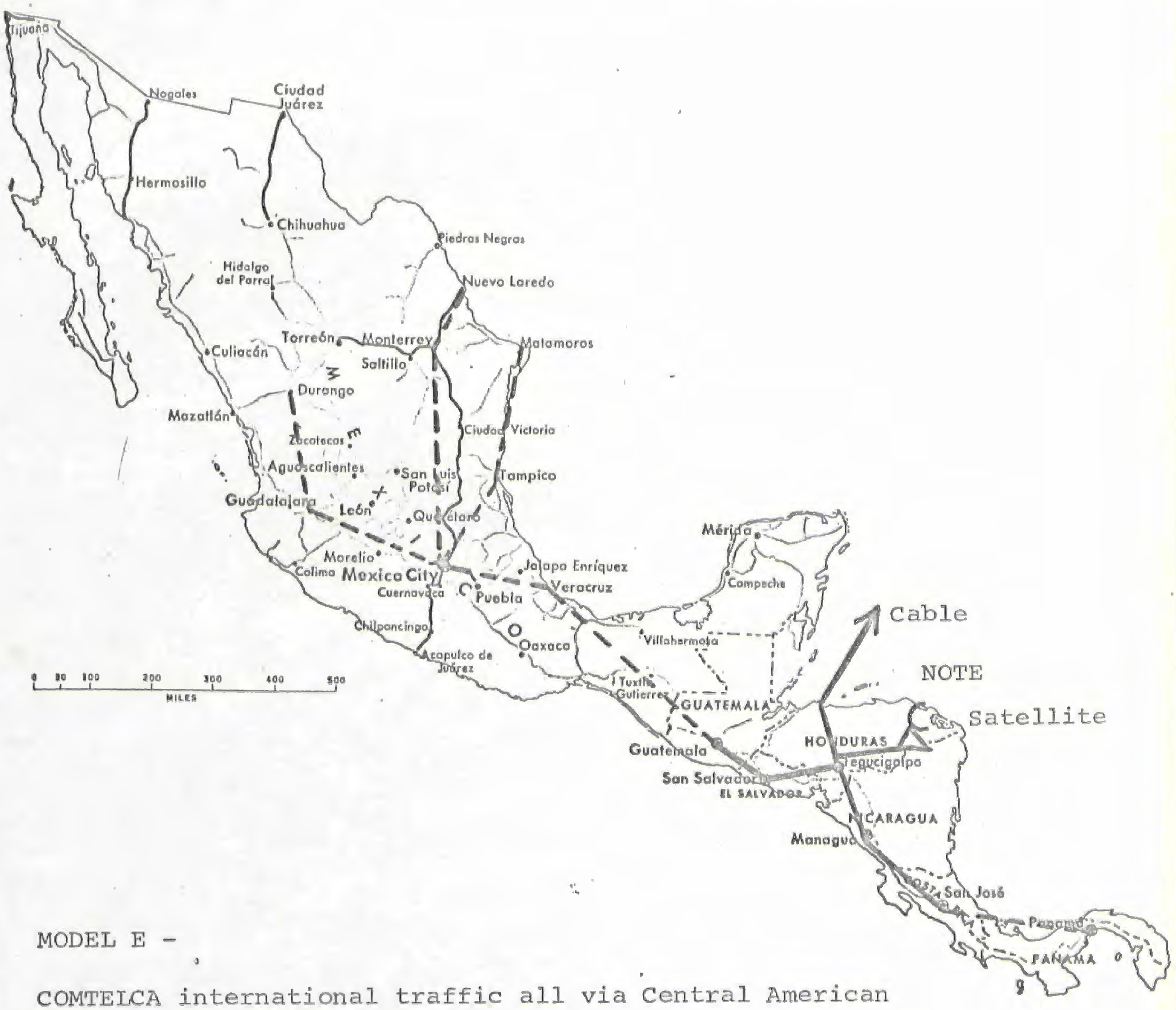


MODEL D -

COMTELCA international traffic utilizing all three exits

NOTE: The indication of both Cable and Satellite Earth Station for the Central American Regional Network does not imply proposal that both be installed.

MAP V-D



MODEL E -

COMTELCA international traffic all via Central American Regional Network exit
(only Mexico and Panama destination traffic diverted to Mexico and Panama)

NOTE: The indication of both Cable and Satellite Earth Station for the Central American Regional Network exit does not imply proposal that both be installed.

MAP V-E

V-2... PROPOSED EXITS FOR COMTELCA

It is expected that the Central American Regional Telecommunications Network will be providing telecommunications service linking the five Central American Republics by mid 1971. Proposals have been submitted for a COMTELCA Regional exit - a "third exit" - in addition to the presently planned exits via Mexico and Panama. Two unsolicited proposals for a submarine cable exit were submitted during 1967 and a proposal for a satellite earth station was presented in 1968. In addition, an economic feasibility study was prepared by the Communications Satellite Corporation - as manager of INTELSAT - to determine and advise re the breakeven revenue requirements for a satellite earth station. For completeness it is considered desirable to briefly mention the feasibility study and proposals in this study report and to credit their contribution to the background thinking.

The Tropical Radio/American Telephone & Telegraph Company proposed cable would provide 128 (4 KHz) channels (or 144 channels of 3 KHz channel spacing) initial capacity. With the addition of TASI, the cable could provide additional channels. The overall approximate cost suggested was $10,600,000. without TASI. The future TASI addition would add another $2,000,000. to the basic cost. The Tropical Radio proposal suggested that they were willing to install the entire project and offer leased circuits at $18,000. per voice channel (½ circuit) per year over a period of 24 years with a provision for sharing of profits after realizing a 10% return (after taxes) on their investment.

The Western Union International/US Underseas Cable Corporation proposed cable would provide 60 (4 KHz) or 80 (3 KHz) telephone channel initial capacity. With further additional terminal multiplex equipments the cable would provide an ultimate capacity of 300 (4 KHz) or 400 (3 KHz) channels. The overall approximate cost proposed was $11,600,000. for the initial 80 (3 KHz) channel system.

Both the Tropical Radio/AT&T and the WUI/USUSCC proposals suggested that the cable be landed in the vicinity of Puerto Cortés on the North coast of Honduras and with the US terminus South of Miami providing interconnect to World-wide facilities through transiting the United States to US international carrier exits.

Followup correspondence from AT & T and conversations have disclosed an additional option for consideration by the Central American governments; ie. the choice of direct joint ownership of a cable system to be installed by AT&T.

The communications satellite proposal by RCA Global Communications suggests the construction of an earth station on a joint venture basis. With the traffic projections set forth in the proposal (and assuming no change in tariffs) the earth station would be profitable essentially from its inauguration.

The Communications Satellite Corporation's breakeven analysis (revised issue of May 1968) discloses a revenue requirement per half circuit per year in 1972 of $22,500 diminishing to $10,700 per half circuit per year in 1976.

The following sections of this study attempt brief and independent analyses of the alternatives of submarine cable or satellite earth station as the physical means for a third international link of the Central American Network.

VI...TECHNICAL ALTERNATIVES

The technical alternative physical means considered for a "third" international link of the Central American Regional Telecommunications Network include: 1) a satellite earth station; and 2) a submarine cable.

Clearly, it is not possible to directly compare the two means as they have inherent different characteristics and provide different services. Any comparison has aspects of "a comparison of apples and oranges."

Significant differences include:

1) A submarine cable inherently links two physical points providing fixed communications between the points;

2) Submarine cable economics demand that substantial traffic must be carried between the two points of service to permit reasonable per circuit revenue requirements to result. Frequently, this requires that traffic destined for more distant points must be transited via foreign countries and foreign owned facilities before reaching its destination (see Section II for a statement by President Johnson expressing concern re this constraint);

3) Satellite service inherently provides great flexibility of service linking directly together any two or multiple points within a large geographic area (i.e. the entire Atlantic Basin - US, Canada, Central and South America, Europe, Africa and the Near East) and providing for global service by interconnection with other satellites or via terrestial means (see Appendix A for a map of the geographic areas in view of each of the several satellites which will be in place this year);

4) Submarine cable has an expected design lifetime that must extend over many years (20-25 years) in order to permit reasonable amortization of the initial costly installation;

5) Once a commitment is made to the submarine cable and the cable is in place and cablehead terminals installed, it has not proven economically feasible to alter the characteristics or to improve the operational capability as technological improvements occur;

6) Satellite technology is progressing rapidly. New qualities and flexibility of service as well as reduced cost of service are constantly being achieved and made available to all users. A commitment to satellite service and to the construction of an earth station does not limit the capability that can evolve over the years of operation. Features of demand access, TV transmission and expanded capacity can be added as techniques and user demands develop;

7) Submarine cable has an inherent limited bandwidth. While the initial capacity can be expanded by the use of such techniques as TASI, the expansion possibilities over that initially installed and paid for is normally somewhat less than double (full time lease circuits and specially conditioned circuits cannot have TASI applied);

8) Submarine cable technology does not now permit - nor is it foreseen as feasible - the transmission of television, wideband data or facsimile. Such transmission capabilities are well established in the satellite service; and

9) Submarine cable is vulnerable to physical damage by underseas earth movements and manmade accidents as well as operational difficulties (see Appendix B for data relative to reliability). While operational difficulties can and do cause satellite service outages, the data discloses proven high reliability. There is an inherent deterent to the intentional disruption of satellite service by hostile or "accidental" action against the satellite system owned by the large consortium of nations because of the political ramifications, let alone the technical difficulties to be overcome to affect disruption.

VI-1...SATELLITE COMMUNICATIONS SERVICE

The satellite communications system in commercial operation today represents significant advances over the system that five years ago was generally expected to exist by now. Most of the studies of that time postulated a satellite system comprising a fleet of many satellites moving across the face of the earth in relatively low orbits. Extensive earth station complexes were expected, costing perhaps $15 million to $30 million each since several antennas would be required at each complex to track the many satellites and to hand over uninterrupted communications from satellites disappearing from view to other satellites coming into view.

The cost of creating the space segment of the system was then projected at several hundred millions of dollars and total system costs for global coverage were projected at between one-half billion and one billion dollars. It was generally believed that there would be only a few such earth station complexes throughout the world, each serving a rather large geographical area. Few nations were expected to wish to join in what then seemed to be a high-cost and high-risk venture - the International Communications Satellite Consortium (INTELSAT) (see Appendix C for a listing of current member nations).

The prevailing expectation was that it would require many years of research and development before the capacities and reliabilities of space technology would make it possible to provide satellite communications services on a basis economically comparable to that of the familiar means of telecommunications.

But the realized benefits of space communications during the past half decade have far exceeded earlier general expectations. The capacities of satellites have outstripped the estimates, and the cost of a satellite system providing global coverage has proved to be far less than was expected.

The earth facilities to put the satellites to use have proved to be simpler and less expensive than was believed to be possible five years ago, an economy which is contributing to a rapid increase in the number of earth stations throughout the world (see Appendix D for listing).

The geostationary synchronous satellite has proved to be entirely satisfactory for commercial use. Because these satellites remain in a fixed position, it is possible to focus their energy to provide economical, high-capacity services to specific areas as well as over broad areas.

As the global system is established, the differences between satellite communications and other means of telecommunications have emerged as more significant than the similarities.

As was mentioned previously, satellites have a "broadband" transmission capability over very great distances without regard to oceans or other traditional barriers. This capability has opened up a whole new potential for television and high speed information transfer by digital means between the continents of the World. Recently nine computers in the United States in different locations from New York to California were linked with one in France. They exchanged the same amount of marketing and financial information in 30 minutes that has heretofore taken six to eight hours to transmit by the conventional means that have been used. Demonstrations such as this emphasize the future potential of satellites for computer exchange as well as for the transmission of newspaper and other facsimile materials.

Satellites have a multipoint distribution capability - that is, the ability to transmit information from a single point for reception at many points.

Satellites have a "collection" capability - that is, the ability to gather information simultaneously from many remote points, including mobile points such as ships or aircraft, and relay this to a single collection point. It is this ability which mainly gives rise to the contemplation of applications such as traffic control and emergency rescue for aircraft and ships at sea, or continuous, real-time telemetry from supersonic aircraft.

VI-1.1...THE INTELSAT II SERIES OF COMMERCIAL SATELLITES

Three satellites in the INTELSAT II series were successfully launched during 1967. Each was positioned in its intended synchronous orbit and put into commercial service, extending satellite coverage to more than two-thirds of the world.

Larger and more powerful than the Early Bird and reaching the Southern as well as the Northern hemisphere, each INTELSAT II series satellite provides approximately 240 two-way voice circuits, when used with standard earth station antennas, and multiple-access capability that permits it to operate with several earth stations at one time.

The first of the 1967 launches occurred on January 11, and the satellite (Pacific I) was positioned near 173.0 degrees east longitude for service over the Pacific.

The second (Atlantic II) was launched on March 22 and was positioned near 8.1 degrees west longitude for service over the Atlantic.

The third (Pacific II) was launched on September 27 and was positioned near 175.0 degrees east longitude, providing additional commercial service in the Pacific area. The Pacific II also serves as a backup for other operational satellites and could be repositioned over either ocean to assure substantial continuity of service.

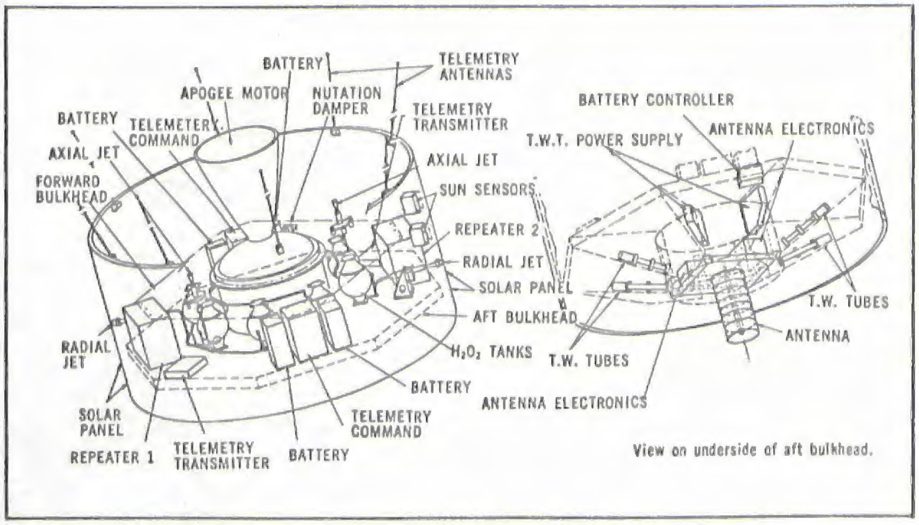
These satellites were launched from Cape Kennedy, Florida, by the National Aeronautics and Space Administration (NASA) under a costs-reimbursable contract with COMSAT as Manager for INTELSAT. Hughes Aircraft Company was the manufacturer of the satellites, which cost approximately $2.2 million each, plus additional payments for longevity and technical performance.

Working with appropriate earth stations, the INTELSAT II satellites transmit all forms of modern commercial communications - telephone, telegraph, data, facsimile and television (black and white or color).

The first INTELSAT II series satellite, launched October 26, 1966, did not reach synchronous orbit because a newly designed apogee motor failed to burn through its planned duration. After modifications to prevent a recurrence of this difficulty, the apogee motors in the next three satellites in this series fired satisfactorily, and the satellites reached their intended stations at synchronous altitude of approximately 22,300 miles. Construction of a fifth satellite in the INTELSAT II series was completed in March 1968. This satellite is being held as an on-the-ground spare.

Chart VI-1 summarizes details concerning the INTELSAT II Series Satellites.

CHART VI-1



General Arrangement of INTELSAT II Satellites

Characteristics
INTELSAT II Series Satellites

Shape:	Cylindrical, 56 inches in diameter, 26½ inches long excluding apogee motor nozzle and antennas; overall length, 60 inches.
Weight:	357 pounds at launch and 192 pounds after apogee motor firing.
Control System:	Two hydrogen peroxide control systems capable of providing a total velocity increment of 580 feet per second and providing five years of station-keeping capability.
Electrical Power:	Over 85 watts from the solar cell array at plus or minus 23 degrees sun angle. Two rechargeable nickel-cadmium batteries of 4.5 amperes each, sufficient to power two traveling wave tubes and repeaters through eclipse.
Telemetry:	Two 1.8 watt transmitters.
Communications System:	Two redundant linear repeaters with 126 megaHertz bandwidth, four six-watt traveling wave tube repeaters. The system provides a minimum effective radiated power of 25 watts with two traveling wave tubes operating.

VI-1.2...INTELSAT III SERIES OF COMMERCIAL SATELLITES

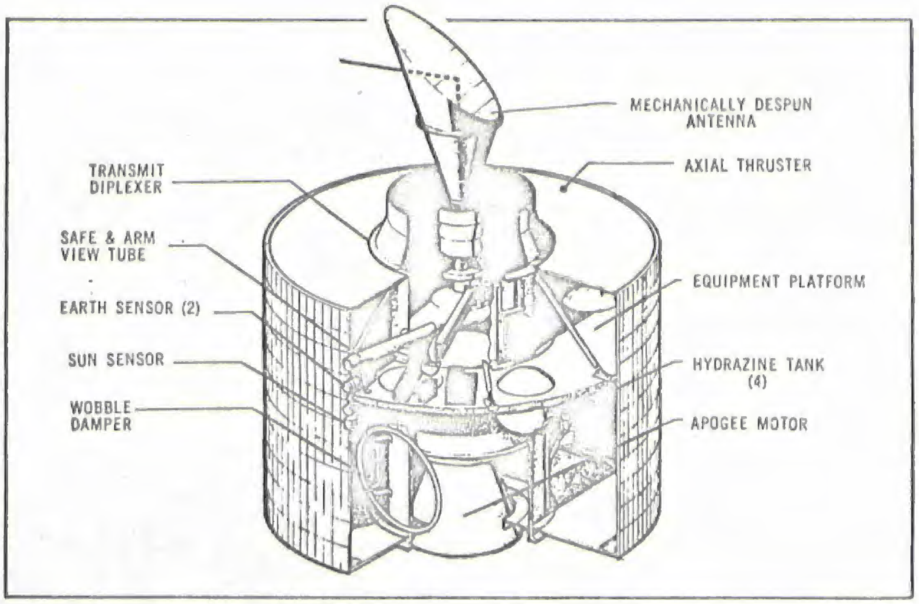
Each of the INTELSAT III series of satellites, with an expected life of five years, will have a design capacity of approximately 1,200 two-way voice-grade telephone circuits when used with standard earth stations having large antennas (85 to 100 feet in diameter) and appropriate low-noise receivers.

COMSAT, as manager for INTELSAT, entered into a contract with TRW Systems of Redondo Beach, California, in early 1966 for the development and manufacture of six flight spacecraft at a base price of $32,375,000. Certain difficulties have been encountered by the contractor, with the result that the scheduled delivery date for the first satellite in this series has slipped from spring to late summer, 1968.

While TRW Systems is the prime contractor, several subcontractors are building subsystems and components for the satellites. Several non-US companies are building subsystems and components for the last two of the six satellites and any follow-on INTELSAT III satellites that may be required.

Chart VI-2 summarizes details concerning the INTELSAT III Series Satellites.

CHART VI-2



General Arrangement of INTELSAT III Satellites

Characteristics

INTELSAT III Series Satellites

Shape:	Cylindrical, 56 inches in diameter, 41 inches long excluding apogee motor nozzle and antennas; overall length, 78 inches.
Weight:	608 pounds at launch and 303 pounds after apogee motor firing.
Antennas:	Mechanically despun antenna for communications and two omni antennas for command and telemetry. The despun electronics are "slaved" to an onboard earth sensor or may be controlled by ground command.
Electrical Power:	More than 130 watts from storage battery and the solar cell array. Effective radiated power: More than 158 watts at synchronous altitude.
Communications System:	Two complete microwave transponders, each a linear translator repeater that includes a PAM/FM/PM telemetry encoder, a PAM decoder, two-stage tunnel diode initial amplification and a traveling wave tube for final amplification. Each transponder bandwidth is 225 megaHertz.

VI-1.3...THE INTELSAT IV SERIES OF COMMERCIAL SATELLITES

Proposals for the development and construction of the INTELSAT IV series have been received by INTELSAT and negotiations are proceeding. Plans are to award a contract and commence development before the end of 1968 for delivery of the first INTELSAT IV satellite by the end of 1970.

The INTELSAT IV satellite design will provide twelve transponders capable of accommodating a multiplicity of communications services. The equivalent of 5,000 to 6,000 voice circuits (2 way, 4 KHz each) will be provided by each satellite with a higher effective radiated power than previously achieved; i.e. approximately 24 dbW EIRP in a 17^{o} global coverage beam and approximately 35 dbW in 4.5^{o} "spot" beams. The design life of the satellites in orbit will be five to seven years.

VI-2...SUBMARINE CABLE SERVICE

This technical alternative mode of service is reportedly discussed in detail in the study prepared by Mr. Frank McCutchen and submitted, concurrent with this study report, to COMTELCA and the Central American Bank for Economic Integration. Therefore, a repetition of the discussion in this report would be without purpose.

VII...ECONOMIC ANALYSIS OF ALTERNATIVES

VII-1...REVENUE REQUIREMENT APPROACH

This study is not directed to - the results are not presented in the form of - a profit-and-loss operation or viability analysis. Instead, the approach used is that of analyzing the annual revenue requirements for the alternative physical means of achieving a third international link for the Central American Regional Telecommunications Network. The study, therefore, developes the range of revenues which must be earned by a "third" exit in order to "break-even" at various levels of traffic - i.e. to earn sufficient revenues to cover costs. The alternate means analyzed are those of submarine cable and communications satellite earth station.

The profit-and-loss approach was not used as it has been found impossible at this time to develop all the data necessary for such a study - i.e. tariffs, retention and division of revenue, local charges, costs of extension hauls, etc. As a result, the costs developed for a (half) circuit per year through the alternate physical means do not constitute actual or even suggested rates for the circuits. Instead they represent the estimated cost for operation which must be recovered if the exit is to break even. The actual rates or prices to be charged either by the operators of the exit (or exits) for half circuits or by the telecommunications administrations or their designated entities for each telephone call, telegraph or TELEX message, leased line, etc., depend on factors outside the scope of this study and analysis.

The annual revenue requirements (total and per half circuit) are developed and set forth and are based on the summary of cost calculations presented in the following discussion of components of annual cost. The discussion is separated and considers, first, the selection of a satellite earth station as the exit means and, second, the selection of a submarine cable. The revenue requirements presented are based on the estimates of investment amortization (depreciation and interest), personnel and overhead, and terminal operation. To these - in the case of satellite service - are added the cost of the units of utilization of the satellite space segment which must be acquired from INTELSAT as the owner and operator of the satellites.

VII-2...SATELLITE EARTH STATION ALTERNATIVE

VII-2.1...COMPONENTS OF ANNUAL COST DETERMINING REVENUE REQUIREMENT

(A) Initial Investment and Amortization

(1) Technical Specification - Relation to Initial Investment Cost for Earth Station

The earth station considered and costed is a full standard earth station meeting the criteria established by INTELSAT, with integrated receiving and transmitting equipments capable of operating with the INTELSAT satellite system without penalty for substandard performance (i.e. the G/T criteria of 40.7 db for earth station performance is used).

This type of earth station is normally built utilizing a 90 - 100 foot diameter antenna with a shaped reflector. The pedestal is designed so that the antenna can be pointed at satellites in approximately equatorial geostationary orbit or other orbits with low rates of orbital velocity with respect to the earth. The building is designed to provide expansion space to accommodate new elements of the earth station such as may evolve in coming years (i.e. demand access equipments, etc.).

The initial cost estimate for the earth station is based upon the average contract price for full standard earth stations of awards made during the past year by nine governments (see Appendix E for detailed price analyses of the generations of earth stations to date and for details concerning the specific bid price spread experienced by the telecommunications administration of one government). The current generation of earth stations (termed the "third generation") average contract award price is $3.8 million including civil works, installation and test, initial spare parts and a one "hop" microwave link to a terrestial network node/switching point. This average price also includes television transmission capability. For the purpose of this study, the cost of the TV transmit capability (approximately $400,000) has been deducted inasmuch as to consider a television transmission, let alone reception, is meaningless when an analysis is being made considering, as an alternative, the selection of submarine cable where no TV receive <u>or</u> transmit capability is considered or feasible.

The cost of earth stations over the years has been reduced as a result of the compound effect of many factors. The first generation of earth stations was experimental and included equipment and test facilities no longer required or even desired in every earth station. Design and technological advances - as well as increased industrial competition - has resulted in decreasing cost experience with new generations of earth stations (the chart included in Appendix E discloses an analysis of earth station price trends predicting even lower costs by the time the Central American earth station would be required incident to the availability of the Central American Regional Telecommunications Network in mid-1971). An 18-month lead time for construction of an earth station in advance of the operational requirement is considered ample.

A table detailing the estimated capital investment cost of an earth station for the Central American exit is provided as Table VII-1.

The earth station costed would include redundancy low noise parametric preamplifiers with bandwidths of 500 MHz and gains of 40 db providing amplification of the signal received from the satellite to a level suitable for transmission to the receiver equipment installed in the earth station building. In the building the signal is applied via appropriate signal dividing equipment to the inputs of nine standard microwave receivers arranged to provide for two telephony carriers with full redundancy, plus three telephony carriers without full redundancy, plus TV video and sound. The receivers are standard microwave receivers having down converters to translate the 4 GHz signal down to an intermediate frequency of 70 MHz before applying it to the FM demodulators. Seven threshold extension demodulators and two conventional demodulators are normally provided.

Signals to be transmitted to the satellite are fed from baseband equipment to six FM exciters (for two telephony carriers with full redundancy and two for TV video and sound without redundancy - if TV transmit capability is included) comprising modulators, up converters and combining equipment. The output of the exciters is then fed to redundant traveling wave tube drivers with bandwidths of 500 MHz. These drive redundant 500 MHz TWT power amplifiers are then fed to the antenna feed via the transmit/receive diplexer.

The antenna is positioned in azimuth and elevation by motors which form part of a servo loop with the antenna so that, in the autotrack mode, error signals applied to the antenna servo cause the antenna to accurately track the communications satellite.

TABLE VII-1

ESTIMATE OF CAPITAL INVESTMENT FOR AN
EARTH STATION FOR THE CENTRAL AMERICAN EXIT
(90-100 Foot Equivalent Diameter, in Thousands of Dollars)

Land-including Acquisition Costs	$ 100[a)]
Site Survey	30
Architectural & Engineering	122
Site Improvements	100[b)]
Building	150[b)]
Land and Buildings - Sub Total	$ 502
Antenna System - Reflector, supports & feeds, pedestal, foundation & equip., bldg., tracking & drive system, system integration & test	
Antenna - Sub Total	$1,100
Pre-amplifier	$ 175
Transmitter	200
Multiplex-demultiplex	250
Receiver, modulator, demodulator, ground microwave link (one hop) etc.	500
Electronics - Sub Total	$1,125[c)]
Boresight Facility	$ 100
Test Equipment	150
Test Equipment - Sub Total	$ 250
Spares	$ 150
Technical Training	112
Documentation	75
Initial Program Mgmt. & Engr.	200
Start-up Costs - Sub Total	$ 537
Contingencies - not now determinable - Sub Total	$ 300
TOTAL	$3,814
Less TV Transmit Capability	(400)[c) & d)]
GRAND TOTAL	$3,414

NOTES:

a) If a suitable site can be found on government land, cost for land may be eliminated.

b) A purely functional, or utilitarian structure can be erected for less.

c) Electronics cost includes equipment for TV transmission. Exclusion of TV transmit facilities can save $400,000 without affecting TV reception capability.

d) TV Transmission capability deducted in using figure for comparative analysis with submarine cable as cable would not have TV transmit or receive capability.

In addition the system includes main power switchboards, control and monitoring subsystems, certain terminal equipments, and power generating equipment. The cost includes systems design, integration, installation, and testing for the complete station as well as a complete set of instruction handbooks and manuals and an initial inventory of spare parts.

The earth station costs considered here include site improvement and building costs which can vary with the location of the earth station. A site convenient to public works (road, commercial power, sewer, water, etc.) could cost less than $100,000 to prepare and could reduce other costs; and a simple structure to house the equipment need not cost $150,000. Boresite facilities are not absolutely essential to an earth station but are included (i.e. $250,000). A contingency of $300,000 for undetermined items of cost is also included. Initial cost of the earth station can be higher or lower than that shown, depending upon the desires of the prospective owner(s) with respect to the functions and the desirability of some operational items and to cost for aesthetic appeal and possible tourist attraction interest.

It is suggested that a Central American Regional Network satellite earth station exit could be located proximate to one of the Central American capitols located on the COMTELCA "backbone" microwave network. The earth station need be removed from the microwave network by only a distance (dependent upon geography) sufficient to prevent possible operational limitations due to frequency interferance between the terrestial and space services. In the Central American situation it is suggested that this could be accomplished with the location of an earth station within one microwave "hop" of a switching point or transit center co-located with a regional network node (See page V-1). A possible selection of the node would be Tegucigalpa, Honduras. An analysis of the traffic projections indicate this node to be located close to the center of the traffic pattern "center of gravity" as well as geographic center of the five Central American countries.

(2) Calculation of Amortization (Depreciation and Interest) of Investment for Earth Station

The life expectancy of electronic and antenna drive equipment in an earth station can be assumed to be 12 years. However, the basic facilities, civil works, antenna, power equipment, etc. have an extended life. In order to make a comparative analysis with submarine cable it is necessary to consider a period of operation extending to 20 or 25 years - i.e. the possible life of a submarine cable and the period over which the relative high initial cost investment for cable must be amortized so as to justify the cost and investment in a cable installation. Twenty-four years of operation have been assumed for the purpose of this study. Therefore, at the end of 12 years it has been assumed that the electronics and antenna drive equipment, in total, would be replaced for an additional life of the earth station extending to 24 years.

In the interim, technological updating equipments might be desired for installation in the Central American earth station. Such equipments could permit greater flexibility in the use of the earth station to accommodate demand time assignment of circuits to world destinations where traffic would not normally justify essentially full time circuit allocations. The cost of equipment changes to accomplish such updating is not appropriate for consideration in this study when comparison is being made with a submarine cable which inherently cannot provide flexibility and does not permit changes afforded by new technology to be accommodated once the cable is installed and the initial investment made.

Annuity tables show the capital recovery component factor for 12 and 24 years at 7% annual interest rate to be .126 and .087 respectively. These factors have been used in the computation of depreciation and interest on the capital investments.

(B) Annual Operation and Maintenance

Annual operation and maintenance costs for a Central American earth station would consist of: (1) personnel cost (plus overhead) for both national and foreign personnel; (2) training costs for national personnel (including overhead); and (3) spare parts costs and the substantial cost of electrical power (not included in the overhead estimate).

(1) Personnel Requirements for Earth Station Operation

The annual operations and maintenance estimates are based primarily on the professional manpower required to operate and maintain the station. The manpower estimated as required to operate the Central American earth station on a 24-hour basis is 21 persons of varying skills (Table VII-2). It is assumed that, initially, there will be largely foreign employees who will be replaced by Central American nationals over a 4 year period (Table VII-3).

In order to phase-out the foreign personnel, a number of national personnel should be trained at the station. The actual schedule of manning, training and phasing-out of foreign personnel is presented in Table VII-3. Table VII-4 translates into annual operation and maintenance cost the manning schedule of Table VII-3.

The U. S. overseas personnel cost could be assumed to average $17,100 per man per year including overseas bonus, and 40 per cent overhead.[1/] A more detailed breakdown of the $17,100 charge for foreign personnel per year would be as follows:

Base Salary	$11,050
15% Overseas Bonus	1,658
40% Overhead	4,420
Total	$17,128

The U.S. foreign base salary figure of $11,050 per year was determined on the basis of the average projected base salary at the Brewster Flats, Washington earth station of the COMSAT Corporation. The 15% overseas bonus is based on the average figure used by the United States Agency for International Development in its foreign technical assistance contracts. The 40% overhead factor was calculated on the basis of actual experience in operating the U. S. earth station at Brewster Flats during the first three months of 1967.

NOTE 1/ The following items are represented in the overhead computation: overhead, fringe benefits, staff overhead and miscellaneous; operating and housekeeping supplies; motor vehicle expenses; office equipment rentals; postage and freight; reproduction supplies; heat and water; and insurance. (Note: electrical power is costed separately.

TABLE VII-2

ESTIMATE OF THE PERSONNEL
REQUIRED TO OPERATE AN EARTH STATION

Electronics Engineer - Chief Engineer	1
Facility Engineer	1
Mechanic	1
Electrician	1
Maintenance Men - Ground & Buildings	2
Technical & Maintenance - Sub Total	6
Shift Supervisors	4
Operations Technicians	10
Shift Crews (Technical) - Sub Total	14
Administration/Store Keeper - Sub Total	1
TOTAL PERSONNEL [a]	21

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a) Excluding national personnel assigned to the station as part of the training program.

TABLE VII-3

MANNING AND TRAINING
SCHEDULE FOR THE CENTRAL AMERICAN EARTH STATION
(Phasing Out of Foreign Personnel)

	Years of Operation of Earth Station				
	1971 (Half Year)	1972	1973	1974	1975 and Thereafter
Administrative:					
Foreign	1	1	0	0	0
National	0	0	1	1	1
Sub Total	1	1	1	1	1
Technical:					
Foreign	17	17	12	6	0
National	3	3	8	14	20
Sub Total	20	20	20	20	20
Total Personnel	21	21	21	21	21
National Trainees[a]					
2nd Year of Training	6[b]	6	6	2	2
1st Year of Training	6	6	2[c]	2	2
Total Trainees	12	12	8	4	4

---

a) Assumes a two-year training cycle, starting at the time of the contract for earth station construction.

b) Assumes the first "class" of trainees started a year earlier, at the time of earth station construction.

c) The number of new trainees necessary annually to keep the manning of the earth station at full strength (assuming a 10% turnover of personnel).

TABLE VII-4

ANNUAL OPERATIONS AND MAINTENANCE COSTS FOR THE CENTRAL AMERICAN EARTH STATION
(In Thousands of U. S. Dollars)

	1971 (Half Year)[e]	1972	1973	1974	1975	1976 and Thereafter	Annual Average 1st-12th year	Annual Average 13th-24th year
PERSONNEL & OVERHEAD[a]								
Administrative:								
Foreign	$ 8	$ 17	$ 0	$ 0	$ 0	$ 0		
National	0	0	8	8	8	8		
Sub Total	$ 8	$ 17	$ 8	$ 8	$ 8	$ 8	$ 9	$ 8
Technical:								
Foreign	$145	$291	$205	$103	$ 0	$ 0		
National	13	25	67	118	168	168		
Sub Total	$158	$316	$272	$221	$168	$168	$200	$168
Training Program:[b]								
2nd year "class"	$ 15	$ 30	$ 30	$ 10	$ 10	$ 10		
1st year "class"	15	30	10	10	10	10		
Sub Total	$ 30	$ 60	$ 40	$ 20	$ 20	$ 20	$ 25	$ 20
TOTAL	$196	$393	$320	$249	$196	$196	$234	$196
SPARE PARTS[c]								
TOTAL	$112	$112	$112	$112	$112	$112	$113	$112
STATION POWER[d]								
1.3M KWH/yr. @4¢/KWH								
TOTAL	$ 26	$ 52	$ 52	$ 52	$ 52	$ 52	$ 52	$ 52
TOTAL OPERATIONS AND MAINTENANCE	$334	$557	$484	$413	$360	$360	$399	$360

a) Based on personnel as per Table VII-2 and discussion pages VII-6, 7, and 11.
b) Based on personnel as per Table VII-3 and discussion page VII-11.
c) Spare Parts - see discussion page VII-11.
d) Station Power - see discussion page VII-12.
e) Represents 6 month total starting with first operation of station in July 1971.

The national professional personnel cost is assumed to average $8,400 per person per year. The cost of such personnel is computed as follows:

Base Salary	$6,000
40% Overhead	2,400
Total	$8,400

The base salary assumed is an estimate of the present salary levels of professional manpower in Central America. The overhead factor is similar to that used for foreign personnel.

(2) Training Costs for National Personnel

A certain number of engineers should be trained at the Central American earth station each year both to replace foreign personnel and to cover normal turnover on a continuing basis. These trainees are professional men with an engineering degree but without prior experience in satellite communications operations.

The cost of training these men can be estimated on the basis of $5,000 per man per year based on salary levels of technical manpower ($4,000) in Central America plus $1,000 overhead allowance for training and incidental costs.

The decision as to the duration of the training program that would be required to meet the needs of the system will have to be based upon general experience and prior professional educational factors of the local personnel selected for further training. Table VII-3 assumes an 18 month to two year training cycle and a complete phase-out of foreign personnel within 4 years. The number of trainees shown in the table for 1973 would be the level required to continue on, considering normal attrition and personnel turnover.

(3) Spare Parts

The annual operations maintenance and cost allowances must provide for spare parts consumption. This consumption is a function of failure rates and of the quantity of electronic equipment in an earth station. Generally, the failure rate of electronic equipment will not exceed 10% of the value of all electronic equipment. For the Central American earth station, therefore, $112,000 would be an ample annual allowance for replacement of spare parts. This figure is generous and assumes that redundant equipment in the earth station is maintained in "hot standby" condition. If such operation is not deemed essential, considerable savings can be made in the consumption and, therefore, cost of spare parts (as well as in other savings).

(4) Station Electrical Power

The cost of electrical power has been stated as an item of annual cost not included in overhead, due to the substantial amount of power required. A consumption rate of 150 Kilowatts per hour has been estimated for the earth station operating with all redundant equipments maintained in "hot standby" operation. This consumption could be reduced if such operation is not required.

The capital investment, amortization and depreciation of the earth station power generating equipment has been included separately. Therefore, a direct operating cost of 4¢/KWH has been assumed for the "O & M" cost of locally generated power. This is considered generous.

It is entirely possible - in that the earth station can be located proximate to a population center where commercial power is available - that the earth station power generating equipment be used only for emergency operation. A savings would thus result from the substantially lower cost of commercial power.

(C) Space Segment Cost (INTELSAT)

As mentioned in the beginning of this section (page VII-1), in addition to the costs for investment amortization (depreciation and interest), personnel and overhead, and terminal operation costs, there must be added the cost of the "Units of Utilization" of the satellite power. The units of utilization are acquired from the International Communications Satellite Consortium (INTELSAT). Each unit of utilization accommodates an earth station providing one circuit with the satellite.

The INTELSAT unit of utilization charge is changed as satellite developments and utilization as well as revenues progress. Although no agreement has been reached establishing the utilization charges for the period from 1971 on, there is good reason to believe that the unit of utilization charge with the INTELSAT IV "generation" of satellites (5,000 or more circuit satellites projected for use by 1971) will be approximately $10,000 per year declining to $5,000 by 1976. After that time it is reasonable to expect that the charge will continue to decline. For purposes of this study it is assumed that after 1976 the unit of utilization space segment charge will be $2,500 per year.

Space segment costs are certain to be reduced radically. Furthermore, demand assignment schemes are being developed which will not only reduce unit of utilization charges but also permit immediate access to various destinations on an on-call basis, thereby eliminating the need for maintenance of full time circuits to small demand destinations.

The rapid advances in satellite communications technology will make it possible for a Central American earth station to benefit from reduced costs and from added services and flexibility of operation which will inherently result. There is no reason to believe that an earth station built to current standards will not be adaptable to utilize the developing technology of satellite communications throughout the years to come.

VII-3...SUBMARINE CABLE ALTERNATIVE

This alternative is reportedly discussed in detail and a techno-economic analysis presented in the study prepared by Mr. Frank McCutchen and submitted, concurrent with this study report, to COMTELCA and the Central American Bank for Economic Integration. Therefore, a repetition of the discussion in this report would be without purpose.

The author of this report has reviewed the cost analysis prepared by Mr. McCutchen (as of 7/26/68) for the cable choices from which selection could be made to link the Central American Network with Florida. From Florida it would be necessary to depend on transiting on to destinations within the United States or on to the US exits of the US international communications common carriers for transmission to ultimate destinations, via the carriers' foreign correspondents' facilities.

Mr. McCutchen's cost analysis has been used (with minor exceptions) as the basis for the presentations in Tables VII-6 and VII-8 in this report and for subsequent comparative analyses.

The format and presentation of the economic analysis re the satellite earth station alternative in the previous section (VII-2) and in Tables VII-5 and VII-7 in Section VII-4, were made to substantially conform with Mr. McCutchen's format and analysis technique. For example, while there would otherwise be no need to carry the earth station projection for the extended period of 24 years, the satellite service analysis has attempted to project for this period.

It should be noted that the analyses differ in at least two ways:

(1) the capital investment, amortization, depreciation, interest, maintenance and operation - in the case of the satellite earth station alternative - includes the microwave link to interconnect the earth station with the COMTELCA Network. This link can be short inasmuch as the earth station can be located near a switching point in the network (as has previously been discussed). In the case of the submarine cable alternative, the extended microwave link between the cablehead terminal located on the Caribbean Coast and the COMTELCA Network has been separately considered and included in the capital investment, amortization, depreciation, etc. computations; and

(2) the capital investment amortization, depreciation and interest - in the case of the satellite earth station alternative - includes provision for earth station electric power generation equipment. The operating cost has been itemized separately and costed at 4¢ per KWH (per Table VII-4 and incident discussion). In the case of the submarine cable alternative, no station power generation equipment was included in the capital cost estimate. Therefore, the operating cost for electric power generation is included at 10¢ per KWH to cover all costs.

VII-4...SUMMARY ANALYSES

VII-4.1...CAPITAL ANALYSES

Tables VII-5 and VII-6 present the investment costs and develop the basis for investment amortization (interest and depreciation) for the alternatives of satellite and submarine cable service, respectively.

VII-4.2...ANNUAL REVENUE REQUIREMENT ANALYSES

Tables VII-7 and VII-8 present the annual operating costs and develop the annual revenue requirements for the alternatives of satellite and submarine cable service, respectively.

Graph VII-1 compares the revenue requirements per circuit for the alternatives of satellite earth station and submarine cable operation as dependent upon the quantity of circuits used.

Graph VII-2 compares the revenue requirements per circuit for the traffic projections in each of the several years considered in Section IV. This graph takes into account the varying space segment charge through the years. In considering these comparisons, the technical and operational service differences in the alternatives of satellite and cable service (Section VI) should be considered. Furthermore, it should be recognized that the revenue requirement for satellite (half) circuits provides for communication service halfway to any destination served by an earth station within the entire Atlantic Basin (United States, Canada, Central and South America, Europe, Africa and the Near East). On the other hand, the revenue requirement for submarine cable service provides for the service halfway to Florida and the Eastern United States.

In considering the economic advantages and disadvantages of the alternate choices it should also be borne in mind that the opportunity for a <u>greater</u> sharing by the Central American countries in retained revenue or division of revenue will accrue in using satellite service (to destinations other than the Eastern United States) than will accrue when the retained revenue or division of revenue is only based upon the portion of the service to Florida. In any case, the division of revenue will be no less for satellite service than for submarine cable service.

Considered in perspective, the revenue requirement for either of the alternate choices for service is minimal with respect to current or probable tariffs. Let us consider two examples:

(1) On a chargeable minute basis - using the projections of international telephone traffic between the COMTELCA Countries, the USA and the rest of the World (Table IV-C) - for 1972 (3,587,000 chargeable minutes using 85 circuits) the revenue requirement comparison discloses -

Using SD Cable	25¢ per chargeable minute for half circuit to Florida

Using SF Cable — 42¢ per chargeable minute for half circuit to Florida

Using Satellite Service — 42¢ per chargeable minute for half circuit to Eastern United States & Canada, South America, Europe, Africa, and/or Near East.

(2) By 1975 - again using the projections (Table IV-C) - (ie. 6,187,000 chargeable minutes using 139 circuits) the revenue requirement comparison discloses -

Using SD Cable (with TASI) — 16¢ per chargeable minute for half circuit to Florida

Using SF Cable — 24¢ per chargeable minute for half circuit to Florida

Using Satellite Service — 25¢ per chargeable minute for half circuit to Eastern United States & Canada, South America, Europe, Africa, and/or Near East.

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TABLE VII-5

CENTRAL AMERICAN NETWORK "THIRD" EXIT CAPITAL ESTIMATE ANALYSIS
FOR SATELLITE SERVICE
(for Circuits with Atlantic Basin Satellite)
(for 24 year operation)

INITIAL EARTH STATION INVESTMENT------------------------ $ 3,400,000

This cost estimate is based on the average current contract price for a full "standard earth station (including civil works, power generating equipment, land acquisition, test equipment and start up costs - but without TV transmit facilities); e.g. this estimate results from an averaging of the contract award prices for nine recent standard earth stations. (SEE discussion in Section VII-2 and Appendix E). This estimated cost includes provision for one microwave "hop" link to the COMTELCA Network switching point (e.g. Tegucigalpa, Honduras - assuming the station proximate to the City).

REPLACEMENT EQUIPMENT & INSTALLATION INVESTMENT---------- $ 1,300,000

(After 12 years of operation of initial facility) This cost estimate includes replacement of all electronics and antenna drive equipments to permit continued operation of the earth station to 24 years. (SEE discussion in Section VII-2).

THEREFORE, investment	amortized	over	24 years		$2,100,000;
"	"	"	1st 12 years		1,300,000; &
"	"	"	2nd 12	"	1,300,000.

TABLE VII-6

CENTRAL AMERICAN NETWORK "THIRD" EXIT CAPITAL ESTIMATE ANALYSIS
FOR SUBMARINE CABLE SERVICE
(for 24 year operation)

CABLE INVESTMENT The following estimated costs include cost of cable (half of cable to Florida) plus Central American cablehead terminal station but not including microwave link to COMTELCA Network. The cable choice alternatives include:	
TYPE SD CABLE providing 128 (4 KHz)* voice circuits-	$ 5,300,000
TASI Equipment to increase capacity to approximately double capacity of Type SD Cable------	1,000,000
	or
TYPE SF CABLE providing 540 (4 KHz)* voice circuits-	11,250,000
INITIAL MICROWAVE LINK INVESTMENT---------------------- To the cable cost must be added the cost of a multihop microwave link to the COMTELCA Network switching point from the cablehead; e.g. Puerto Cortes to Tegucigalpa, Honduras (i.e. 125 miles @ $3,000/mile).	375,000
REPLACEMENT MICROWAVE LINK INVESTMENT------------------ After 12 years of operation of the microwave link from the cablehead to the COMTELCA Network switching point it is assumed that the electronics should be replaced. The cost of replacement is estimated to provide for continued operation of the link to 24 years.	75,000

THEREFORE, if TYPE SD Cable is selection, investment amortized over 24 years (and assuming TASI added after 4 years) would be calculated on basis of:

amortization	over	24 years	$5,300,000;
"	"	20 "	1,000,000;
"	"	24 "	300,000;
"	"	1st 12 years	75,000; &
"	"	2nd 12 "	75,000.

THEREFORE, if TYPE SF Cable is selection, investment amortized over 24 years would be calculated on basis of:

amortization	over	24 years	$11,250,000;
"	"	24 "	300,000;
"	"	1st 12 years	75,000; &
"	"	2nd 12 "	75,000.

*(SEE note on following page)

TABLE VII-6 (continued)
CENTRAL AMERICAN NETWORK "THIRD" EXIT CAPITAL ESTIMATE ANALYSIS
FOR SUBMARINE CABLE SERVICE

NOTE: * If it is not desired to use ITU standard voice channel spacing of 4 KHz then the installed capacity of the Type SD Cable could be increased from 128 to 144 circuits and the Type SF Cable from 540 to 720 circuits. However, standard circuits via satellite are taken as 4 KHz circuits; therefore, for purposes of this analysis, it is considered desirable to consider the capacity comparability and revenue requirement per circuit to be based upon 4 KHz circuits.

TABLE VII-7

CENTRAL AMERICAN NETWORK "THIRD" EXIT ANNUAL REVENUE REQUIREMENT ANALYSIS FOR SATELLITE SERVICE

(for Circuits with Atlantic Basin Satellite)
(For 24 year operation)

ANNUAL OPERATING COSTS:	YEARS 1st-12th	YEARS 13th-24th
EARTH STATION -		
Investment Amortization (Depreciation & Interest) (Equal annuity - 7% interest - no residual or reinvestment capital) (SEE Table VII-5 & discussion)		
e.g. 1st to 12th year		
\$2.1M x .087 = \$182,700		
1.3M x .126 = 163,800	\$346,500	
13th to 24th year		
\$2.1M x .087 = \$182,700		
1.3M x .126 = 163,800		\$346,500
Personnel & Overhead (SEE Table VII-4 & discussion)		
Administration (average over period)	9,000	8,000
Technical (average over period)	200,000	168,000
Training (average over period)	25,000	20,000
Terminal Operation		
Overhead expense has been included as an expense incident to personnel with the exception of Spare Parts costs and Station Electric Power.		
Spare Parts (SEE Table VII-4 & discussion) This expense is based on 10% per year of the Earth Station's electronics equipment valued at \$1,125,000. This is generous and can be reduced if standby equipment is not maintained "hot" at all times.	113,000	112,000
Station Electric Power (SEE Table VII-4 & discussion). 150 KW per hour consumption rate assumed, 24 hour operation, 365 days per year with cost of power at 4¢/KWH	52,000	52,000
TOTAL EARTH STATION ANNUAL OPERATING COSTS	\$745,500	\$706,500

TABLE VII-7 (continued)
CENTRAL AMERICAN NETWORK "THIRD" EXIT ANNUAL REVENUE REQUIREMENT ANALYSIS FOR SATELLITE SERVICE

THEREFORE, TOTAL ANNUAL REVENUE REQUIREMENT PER CIRCUIT
FOR EARTH STATION (for 1st-12th year)

For	40	circuit	demand	level	$ 18,600
"	50	"	"	"	14,900
"	60	"	"	"	12,400
"	80	"	"	"	9,300
"	100	"	"	"	7,500
"	200	"	"	"	3,700
"	300	"	"	"	2,500
"	400	"	"	"	1,900
"	500	"	"	"	1,500
"	600	"	"	"	1,200
"	700	"	"	"	1,100

SPACE SEGMENT

Units of Utilization of the satellite power/bandwidth are acquired, as needed, by application to INTELSAT (see pages VII-12 & 13). Therefore, the per circuit annual revenue requirement for satellite service linking the Central American Network with the satellite (i.e. a half circuit to any earth station within the view of the Atlantic Basin satellite) can be derived by adding the unit of utilization charge to the revenue requirement for the earth station.

In that the space segment charge will be declining with time, a specific analysis can only be made when the circuit demand level and year of operation are defined. The "Unit of Utilization" or space segment charge can be reasonable assumed to decline as follows:

1971	-	$10,000	per	unit	
1972	-	9,000	"	"	
1973	-	8,000	"	"	
1974	-	7,000	"	"	
1975	-	6,000	"	"	
1976	-	5,000	"	"	
post 1976	-	2,500	"	"	(rough estimate).

TABLE VII-8

CENTRAL AMERICAN NETWORK "THIRD" EXIT ANNUAL REVENUE REQUIREMENT ANALYSIS
FOR SUBMARINE CABLE SERVICE
(for Circuits between Central America and Florida)
(For 24 year operation)

ANNUAL OPERATING COSTS: (Central American half of cable)	TYPE SD CABLE to 128 cir	TYPE SD with TASI to 256 cir	TYPE SF CABLE to 540 cir
SUBMARINE CABLE & TERMINAL -			
Investment Amortization (Depreciation & Interest) (Equal annuity - 7% interest - no residual or reinvestment capital).			
(SEE Table VII-6 & discussion)			
e.g. For TYPE SD CABLE			
\$5.6M x .087 = \$487,200			
.15M x .126 = 18,900	\$ 506,100		
For TYPE SD CABLE with TASI			
\$5.6M x .087 = \$487,200			
1.0M x .094 = 94,000			
.15M x .126 = 18,900		\$ 600,100	
For TYPE SF CABLE			
\$11.55M x .087 = \$1,004,850			
.15M x .126 = 18,900			\$1,023,750
Terminal Maintenance & Operation**			
Personnel (8 men @\$15K/yr)	120,000	120,000	120,000
Building & Grounds	12,000	12,000	12,000
Training	12,000	12,000	12,000
Spare Parts (10% of \$700,000)	70,000	70,000	70,000
Materials & Supplies	15,000	15,000	15,000
Administration	15,000	15,000	15,000
Services & Utilities (not electric)	20,000	20,000	20,000
Station Electric Power (See note***)			
500,000 KWH/yr @10¢/KWH for SD	50,000	50,000	
600,000 KWH/yr @10¢/KWH for SF			60,000
Sea Cable Maintenance			
This expense estimated at 1% of investment per year	53,000	63,000	112,500
Microwave Link Maintenance & Operation			
This expense estimated at 10% of investment per year	37,500	37,500	37,500
TOTAL CABLE (half circuit) ANNUAL OPERATING COSTS	\$ 910,600	\$1,014,600	\$1,497,750

** & *** (SEE notes on following page)

TABLE VII-8 (continued)
CENTRAL AMERICAN NETWORK "THIRD" EXIT ANNUAL REVENUE REQUIREMENT ANALYSIS FOR SUBMARINE CABLE SERVICE

NOTES: ** These figures based upon Mr. Frank McCutchen's analysis. See page VII-13

*** Re Station Electric Power - The initial investment cost of the cablehead terminal facility did not include capital cost of power generation equipment. Therefore, cost of generation taken at 10¢/KWH to include all costs.

THEREFORE, TOTAL ANNUAL REVENUE REQUIREMENT

IF TYPE SD CABLE selected	
For up to 128 circuits	$ 910,600
IF TYPE SD CABLE selected & TASI added after 4 years	
For up to 256 circuits	$1,014,600
IF TYPE SF CABLE Selected	
For up to 540 circuits	$1,497,750

OR, ANNUAL REVENUE REQUIREMENT PER (half) CIRCUIT

IF TYPE SD CABLE selected:

For	40	circuit	demand	level		$ 22,800
"	50	"	"	"		18,300
"	60	"	"	"		15,200
"	80	"	"	"		11,400
"	100	"	"	"		9,100
"	128	"	"	"	(LIMIT)	7,100

IF TYPE SD CABLE selected and TASI added after 4 years when requirement approaches limit of SD cable capacity:

For	40	circuit	demand	level		$ 22,800	
"	50	"	"	"		18,300	
"	60	"	"	"		15,200	
"	80	"	"	"		11,400	
"	100	"	"	"		9,100	
"	128	"	"	"		7,100	(LIMIT WITHOUT TASI)
"	129	"	"	"		7,900	
"	200	"	"	"		5,100	
"	256	"	"	"	(LIMIT)	4,000	

TABLE VII-8 (continued)
CENTRAL AMERICAN NETWORK "THIRD" EXIT ANNUAL REVENUE REQUIREMENT ANALYSIS
FOR SUBMARINE CABLE SERVICE

ANNUAL REVENUE REQUIREMENT PER (half) CIRCUIT (continued)

IF TYPE SF CABLE selected:

For 40 circuit demand level	$ 37,400
50	30,000
60	25,000
80	18,700
100	15,000
200	7,500
300	5,000
400	3,800
500	3,000
540	(LIMIT) 2,800

FWM/8/1/68

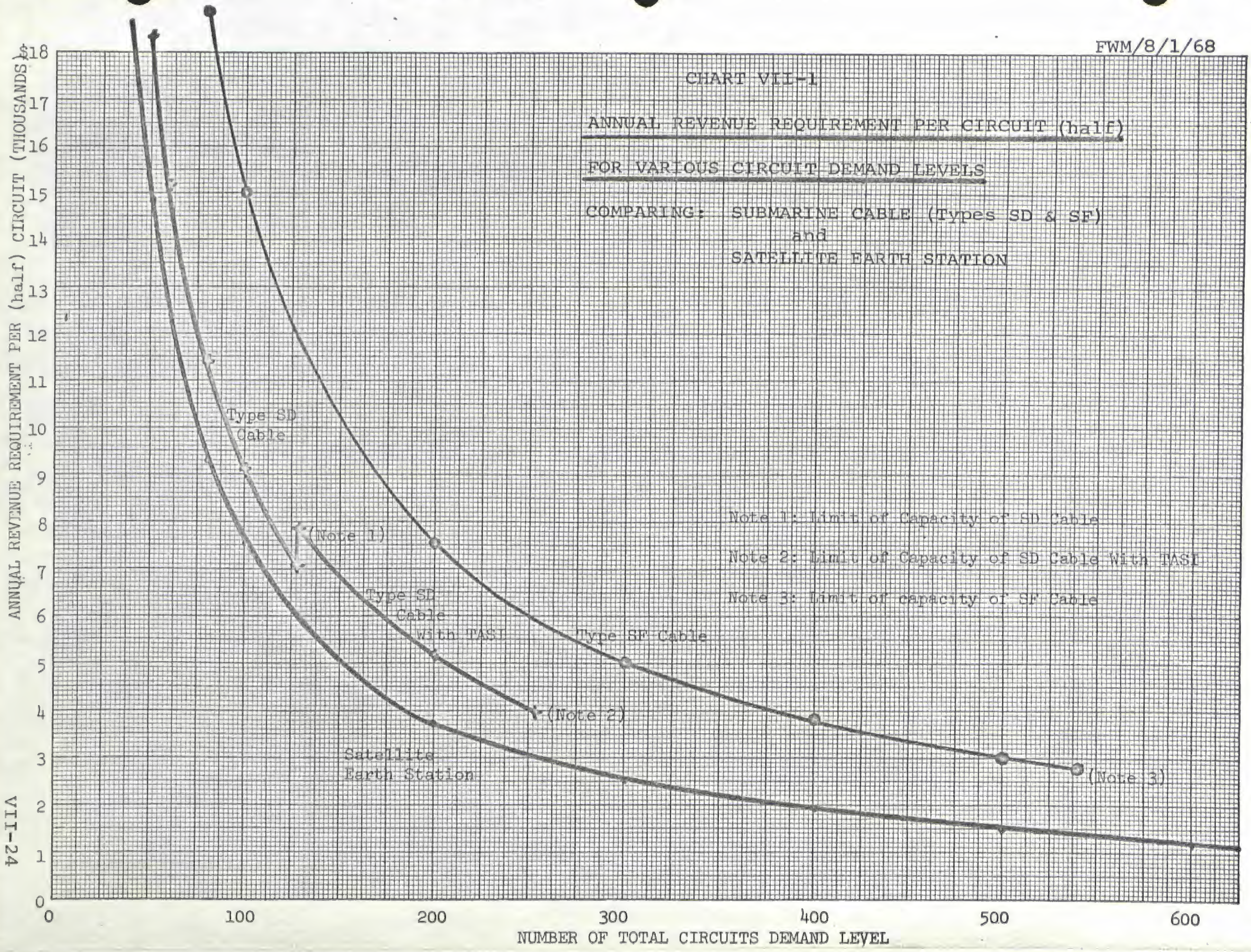
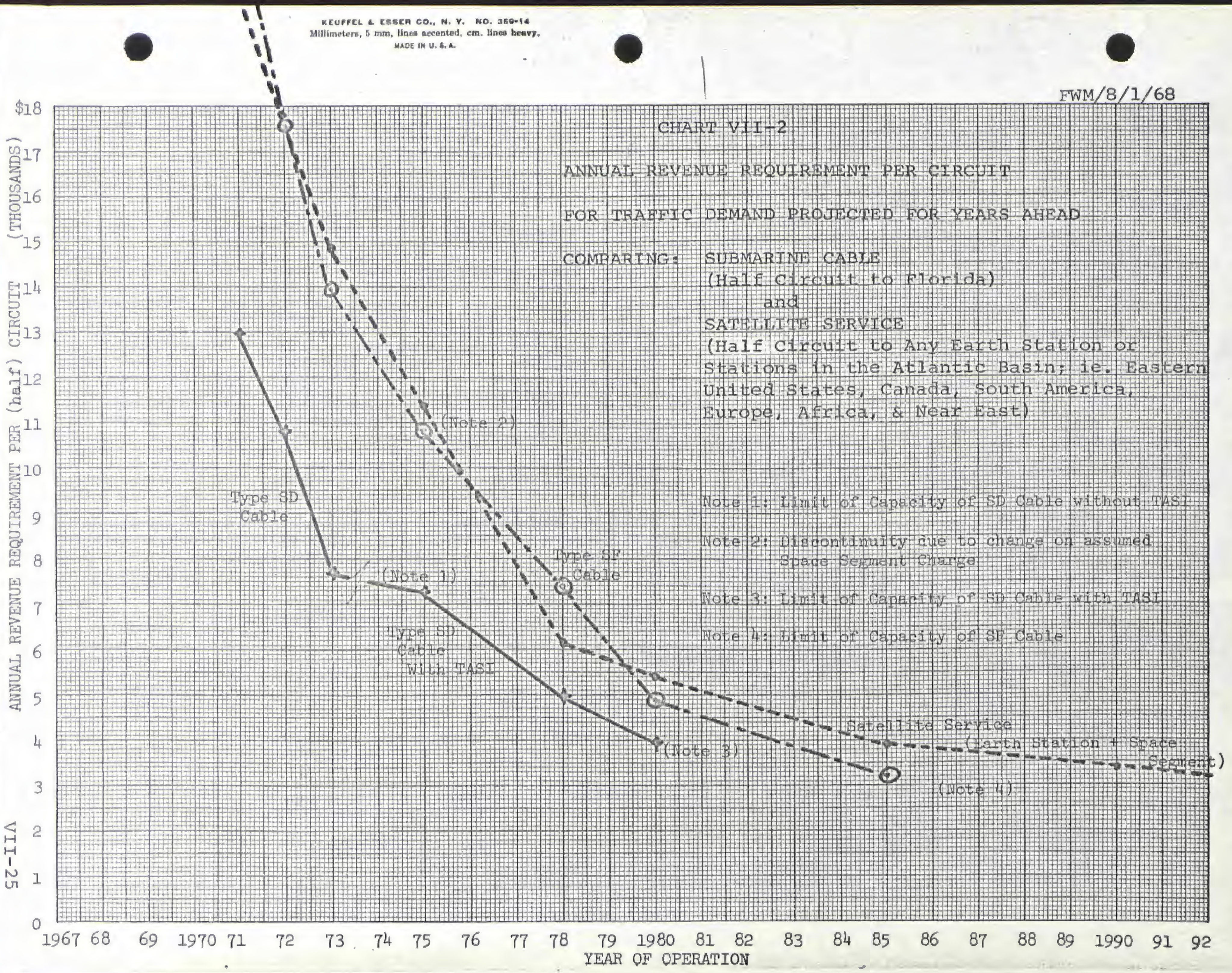


CHART VII-1
ANNUAL REVENUE REQUIREMENT PER CIRCUIT (half)
FOR VARIOUS CIRCUIT DEMAND LEVELS
COMPARING: SUBMARINE CABLE (Types SD & SF)
and
SATELLITE EARTH STATION
Note 1: Limit of Capacity of SD Cable
Note 2: Limit of Capacity of SD Cable With TASI
Note 3: Limit of capacity of SF Cable
Type SD Cable
(Note 1)
Type SD Cable With TASI
(Note 2)
Type SF Cable
(Note 3)
Satellite Earth Station
ANNUAL REVENUE REQUIREMENT PER (half) CIRCUIT (THOUSANDS) $
$18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0
100
200
300
400
500
600
NUMBER OF TOTAL CIRCUITS DEMAND LEVEL


FWM/8/1/68
CHART VII-2
ANNUAL REVENUE REQUIREMENT PER CIRCUIT
FOR TRAFFIC DEMAND PROJECTED FOR YEARS AHEAD
COMPARING: SUBMARINE CABLE
(Half Circuit to Florida)
and
SATELLITE SERVICE
(Half Circuit to Any Earth Station or Stations in the Atlantic Basin; ie. Eastern United States, Canada, South America, Europe, Africa, & Near East)
Note 1: Limit of Capacity of SD Cable without TASI
Note 2: Discontinuity due to change on assumed Space Segment Charge
Note 3: Limit of Capacity of SD Cable with TASI
Note 4: Limit of Capacity of SF Cable
Type SD Cable
(Note 1)
Type SD Cable With TASI
(Note 2)
Type SF Cable
(Note 3)
Satellite Service
(Earth Station + Space Segment)
(Note 4)
ANNUAL REVENUE REQUIREMENT PER (half) CIRCUIT (THOUSANDS)
$18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1967 68 69 1970 71 72 73 74 75 76 77 78 79 1980 81 82 83 84 85 86 87 88 89 1990 91 92
YEAR OF OPERATION

VIII...CONCLUSIONS AND COMMENTS

The foregoing discussion of international traffic projections, exit and technical alternatives - together with the economic analysis of the alternate choices - leads to a conclusion that an independent "third" international link of the Central American Telecommunications Network could be established and financially supported with a reasonable and realizable revenue requirement from the time the COMTELCA Network is able to carry traffic linking the Central American Republics with the exit.

The per circuit or per chargeable minute revenue requirement variability with choice of physical technical means is not such as to make economic consideration a deciding factor in favor of a choice of submarine cable or satellite service for communications with the United States. However, economic considerations do favor satellite service as the choice when US plus non-US traffic is considered.

The opportunity for the Central American Republics to demonstrate and achieve further unity, integration and independence from foreign control of their international communications - as well as operational and service considerations - makes the selection of the satellite earth station exit as the physical means most desirable.

From a retention of revenue standpoint, the Central American Republics can accrue greater economic benefits by choosing the satellite mode and, thereby, retain the revenue from full half-circuit tariffs to destinations in the Eastern United States and Canada, South America, Europe, Africa and the Near East. They can also benefit by greater retention of revenue from traffic with the rest of the World.

Desirable flexibility of international telecommunications service can be achieved by placing some reliance on the natural links via Mexico and Panama - at either extreme of the COMTELCA Network - and major reliance on a Central American "third" exit at the geographic and traffic center of the network in Honduras. (The limitations encountered during this short duration study did not permit development of a rationale to determine the sensitivity of viability to various traffic division models.)

The ownership and operation of a Central American independent international telecommunications exit can be arranged as a joint venture among the five Central American Republics. By joining together, the countries could justify membership in the

International Telecommunications Satellite Consortium (INTELSAT) and achieve a further mechanism to encourage growth in telecommunications traffic and the resulting stimulation of world trade for their nations. Unilateral action would be discouraged and unified action encouraged.

Detailed consideration should now be given to:

(1) Achieving agreement and proceeding with planning for a satellite earth station joint venture;

(2) Determining a site location and the specifications for the Central American earth station;

(3) Providing for the interconnection by microwave link between the earth station and the COMTELCA Network incident to the award of a contract for the construction of the backbone network;

(4) Preparing detailed traffic projections for the number and destination of circuits in order to permit effective International Telecommunications Union - World Plan Committee coordination and to support the designation of a COMTELCA Network nodal point as a CT-2 Transit Center or switching point;

(5) Planning for and selection of international communications correspondents with whom through-traffic tariffs can then be negotiated; and

(6) Determining service demands in addition to voice and record service (i.e. television, data, facsimile, leased circuits, etc.) that can be developed assuming the new capability afforded by satellite communications is made available to the Central American Republics.

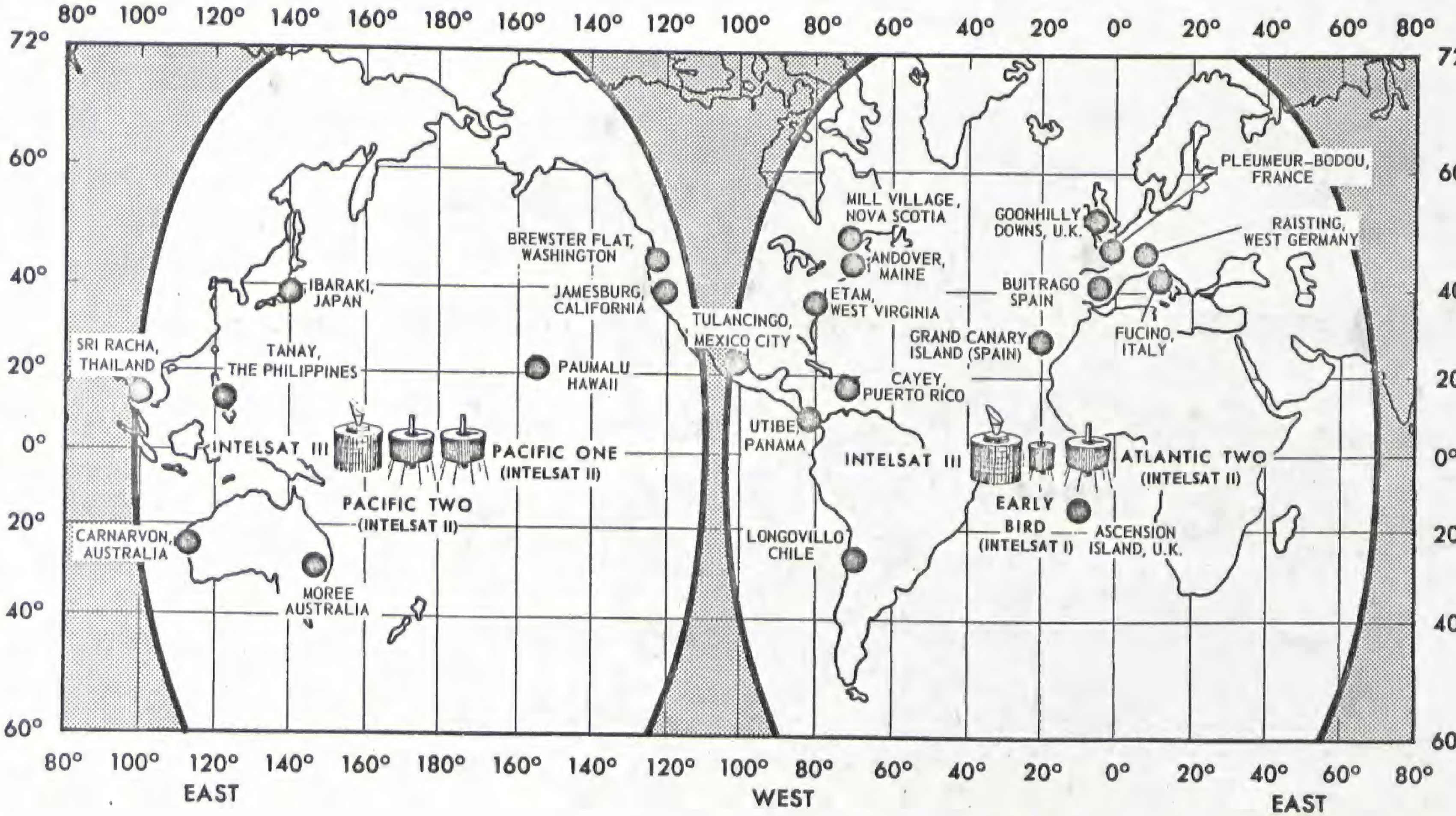
The Inter-American Development Bank and the Central American Bank for Economic Integration are in a unique position to assume the indispensible role of financing and coordinating the overall activities of national and international entities in fostering the planning and execution of Central American international telecommunications.

STUDY OF INTERNATIONAL INTERCONNECTIONS OF THE CENTRAL AMERICAN REGIONAL TELECOMMUNICATIONS NETWORK

TABLE OF CONTENTS:

APPENDIX A... MAP - GEOMETRIC PARAMETERS FOR INTELSAT SYSTEM
(Earth Stations & Satellites to be operational by 1969)

OPERATIONAL COMMUNICATIONS SATELLITE EARTH STATIONS AND SATELLITE COMMUNICATIONS COVERAGE AREAS



(Courtesy of COMSAT Corp.)

(This map included in lieu of color fold out map provided with original client editions of this report).

APPENDIX B... RELIABILITY OF SUBMARINE CABLE AND SATELLITE SERVICES

ITEM B-1... DISCUSSION

So far as is known, the American Telephone and Telegraph Company has never made public an analysis of submarine cable interruptions which could be used for comparison of relative reliability between cable facilities and communications satellites. ITEM B-2 in this Appendix sets forth information furnished by AT&T to the US FCC during the TAT-5 deliberations. Discussion concerning this subject may be in order and of interest here.

RE SATELLITE SYSTEM RELIABILITY: For the seven month period for which information was requested by the FCC, AT&T's response indicated that - insofar as they were concerned - the satellite system (satellites and ground stations) functioned at a level of 99.42% reliability. In comparing this percentage with Communications Satellite Corporation records, substantive validation was obtained.

RE SUBMARINE CABLE RELIABILITY: AT&T, in response to the FCC question, submitted data to the effect that during the same period, cable reliability from terminal to terminal was 99.87%. The derivation of this percentage is shown in the first part of ATTACHMENT I (i.e. .1252%). Close scrutiny of the AT&T presentations indicates that they have taken the position that cable circuits are not considered interrupted if, upon a cable break or interruption, they are reinstated via satellite. COMSAT records indicate that during the period in question COMSAT was asked to furnish cable interruption service to US international carriers on three occasions and for a total of 19,798 circuit hours. It seems perfectly reasonable to include this service with the outages admitted by AT&T which, presumably, were not reinstated via satellite, and <u>this computation results in a reliability level for cables of 98.8%</u> (in the Atlantic). This is far lower than that indicated for the satellite service. In the absense of additional data from AT&T, satellite service provided as a result of cable interruptions was determined from COMSAT records for the period through April 1968, subsequent to the seven months under study (See ATTACHMENT II). During these nine months, such service was provided on four separate occasions, for a total of 19,344 circuit hours. Average cable circuits in service during this period totaled an estimated 380. Application of these figures results in a raw reliability level of cables for this period of 99.2%. This does not take into consideration the probability that some cable circuits were not reinstated via satellite, and, had the experience indicated by AT&T for the seven month period used in response to the FCC question been realized during the subsequent period, cable reliability would have been as low as 99.07%. COMSAT records indicate that during the same period satellite system reliability was in excess of 99.5%.

Period - 1/1/67 to 7/31/67

I. Cable Outages not Reinstated Via Satellite Facilities:

	Average No. of Circuits in Service	Circuit Hours of Outage	Circuit Hours of Availability	% Outage of Total Availability
Underseas	360	2,258.6	1,814,400	.1245
Terminal	360	13.5	1,814,400	.0007
	360	2,272.1	1,814,400	.1252%

Source: AT&T response to FCC of 10/30/67 to Commission Letter of 10/4/67 - item (m).

II. Temporary Satellite Service Furnished During Cable Outages Rendered at Cable Interruption Rates - TATs 1-4 Only:

	Date	Circuit Hours	Circuit Hours of Availability	
	1/10/67	14,614	1,814,400	.8054%
	7/ 7/67	1,584	1,814,400	.0873%
	7/14/67	3,600	1,814,400	.1984%
Total I & II				1.2156%
Reliability				98.7844%

ATTACHMENT I TO ITEM B-1

Period August 1, 1967 to April 30, 1968

Temporary Satellite Service Provided During Cable Outages
Rendered at Cable Interruption Rates - TATs 1-4 Only
Assume Average Cable Circuits - 380

Date	Circuit Hours	Circuit Hours of Availability	% Outage of Total Available	Reliability Excluding Non-reinstated Circuits
2/10/68	10,752	2,462,400	.4366	
3/20/68	4,800	2,462,400	.1949	
3/24/68	2,304	2,462,400	.0936	
4/23/68	1,488	2,462,400	.0604	
	19,344	2,462,400	.7856%	99.2144%

ATTACHMENT II TO ITEM B-1

ITEM B-2... CABLE RELIABILITY (FCC/AT&T DATA)

The following data was furnished to the US Federal Communications Commission by the American Telephone & Telegraph Company incident to a request for information during the consideration of the application for permission to construct and to lay the TAT-5 Transatlantic Telephone Cable:

The FCC information requested -

"(m) State the number and duration of all European circuit outages experienced during the period January 1, 1967 through July 31, 1967, and the specific causes therefor."

AT&T Response -

"CIRCUIT OUTAGES - CABLE*
JANUARY 1 - JULY 31, 1967

	Number of Circuits in Service (Average)	Circuit Outages Number	Circuit Outages Duration (Minutes)	% Outage of Service Hours	Outages Per Circuit Per 24 Service Hours
TOTAL	360	12,428	1,235,761	1.22	.176
Cause of Outage by Segments					
Cable					
Underseas	360	264	135,518	.13	.004
Terminal	360	6	809	.00	.000
Other					
European	360	5,131	677,442	.67	.072
North American	360	2,312	222,712	.22	.033
Not Found	360	4,715	199,280	.20	.067"

*NOTE: Cables TAT-1, 2, 3, and 4, ICECAN and CANTAT, Does not include outages in landline linking cablehead with terrestrial switching interconnect.

ITEM B-3.. SATELLITE COMMUNICATION SYSTEM OPERATING RELIABILITY

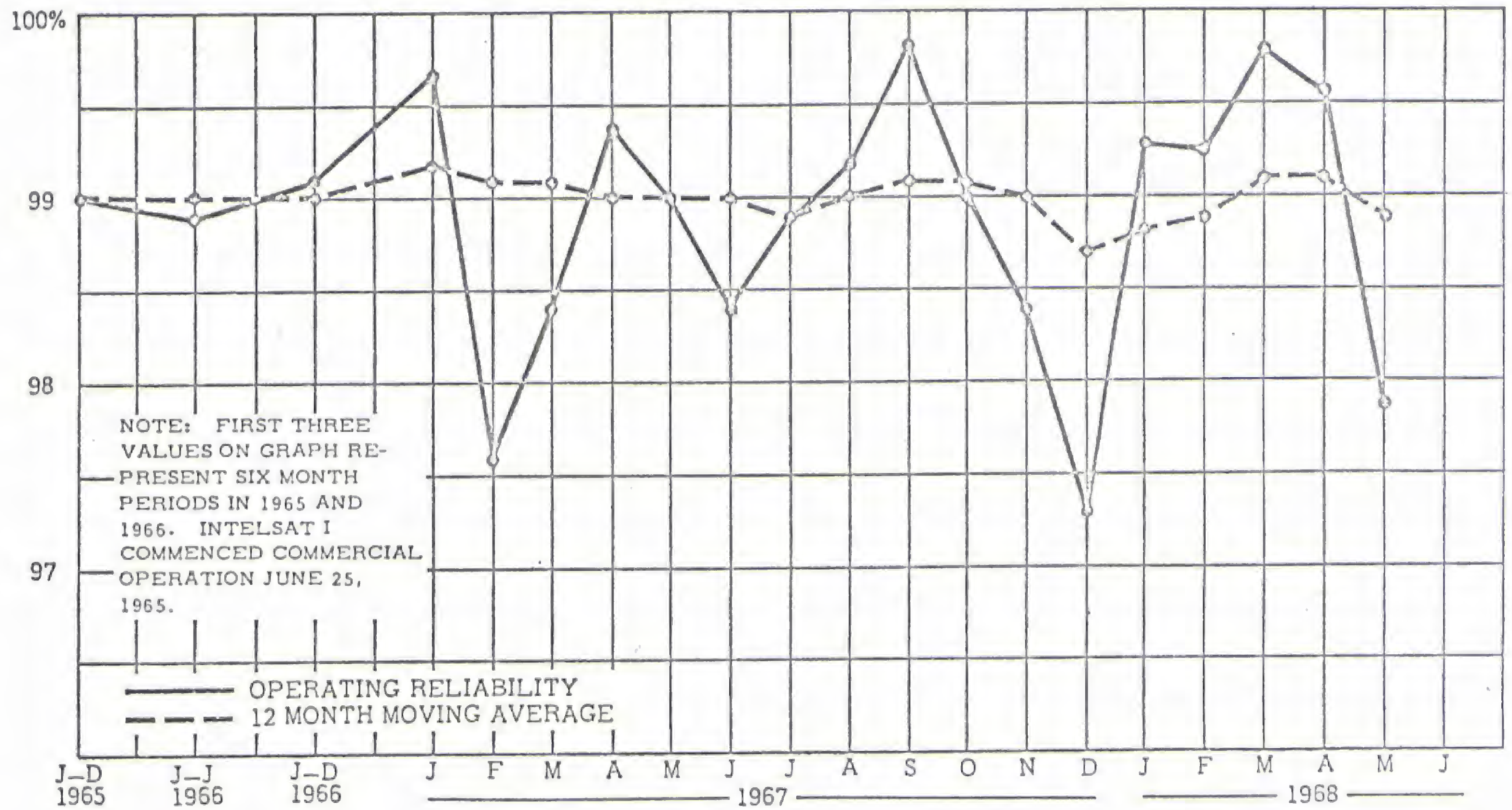
The following figures show the operating reliability of the satellite communications system, in total, and by the components of the system on a month-by-month basis to May 1968 for the satellite links in operation utilizing the INTELSAT I, II (F-2), II (F-3), and II (F-4) satellites, respectively.

Since the operation of the total system - i.e. space segment, landlines and earth stations - is contingent upon components working successfully and concurrently, the total system reliability will always be less than or at most equal to the component reliabilities. The satellite system reliability, therefore, is based on the number of unit hour outages for the system and the total number of operating unit hours.

In considering these data in comparison with those for cable, the impact of land lines reliability should be disregarded as land line reliability was not considered in reporting the circuit outages by cable in

This information was furnished by COMSAT incident to their reporting as Manager to the Interim Communications Satellite Committee of INTELSAT.

TOTAL SYSTEM OPERATING RELIABILITY – INTELSAT I
UNIT HOURS OF OPERATION VS ALL OUTAGES FROM IMC TO IMC



	JUL 1967	AUG 1967	SEP 1967	OCT 1967	NOV 1967	DEC 1967	JAN 1968	FEB 1968	MAR 1968	APR 1968	MAY 1968	JUN 1968
TOTAL SYSTEM	98.94%	99.22%	99.83%	99.00%	98.43%	97.25%	99.29%	99.27%	99.74%	99.55%	97.83%	
EARTH STATIONS	99.39	99.40	99.92	99.72	98.82	97.90	99.79	99.87	99.93	99.98	98.29	
LAND LINES	99.55	99.82	99.91	99.28	99.61	99.35	99.50	99.40	99.81	99.56	99.54	
SPACE SEGMENT	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	

TOTAL SYSTEM OPERATING RELIABILITY – INTELSAT I

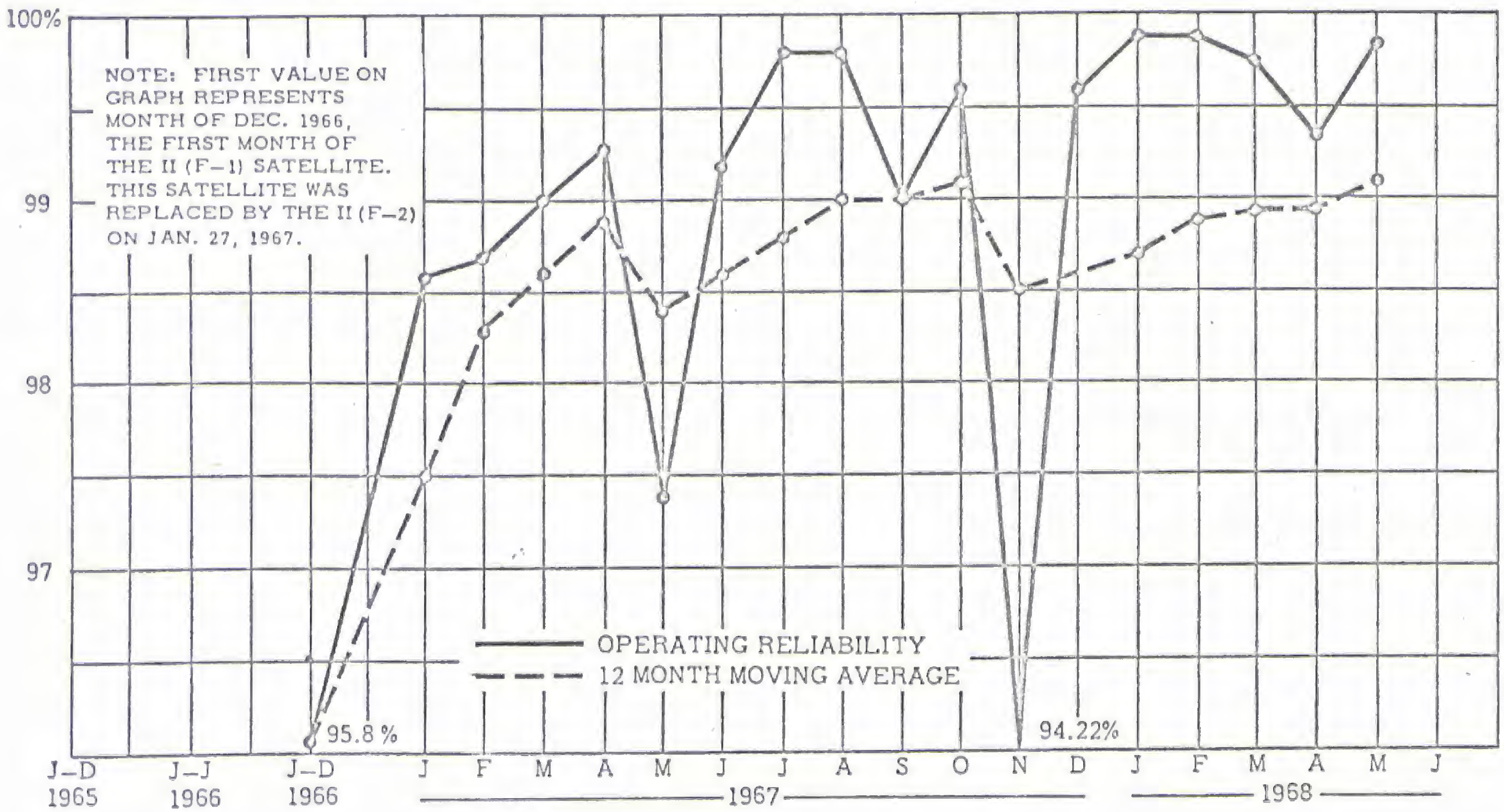
ATTACHMENT I TO ITEM B-3

INTELSAT

TOTAL SYSTEM OPERATING RELIABILITY - INTELSAT II (F-2)

B-8

TOTAL SYSTEM OPERATING RELIABILITY – INTELSAT II (F–2) INCLUDING NASCOM
UNIT HOURS OF OPERATION VS ALL OUTAGES FROM IMC TO IMC

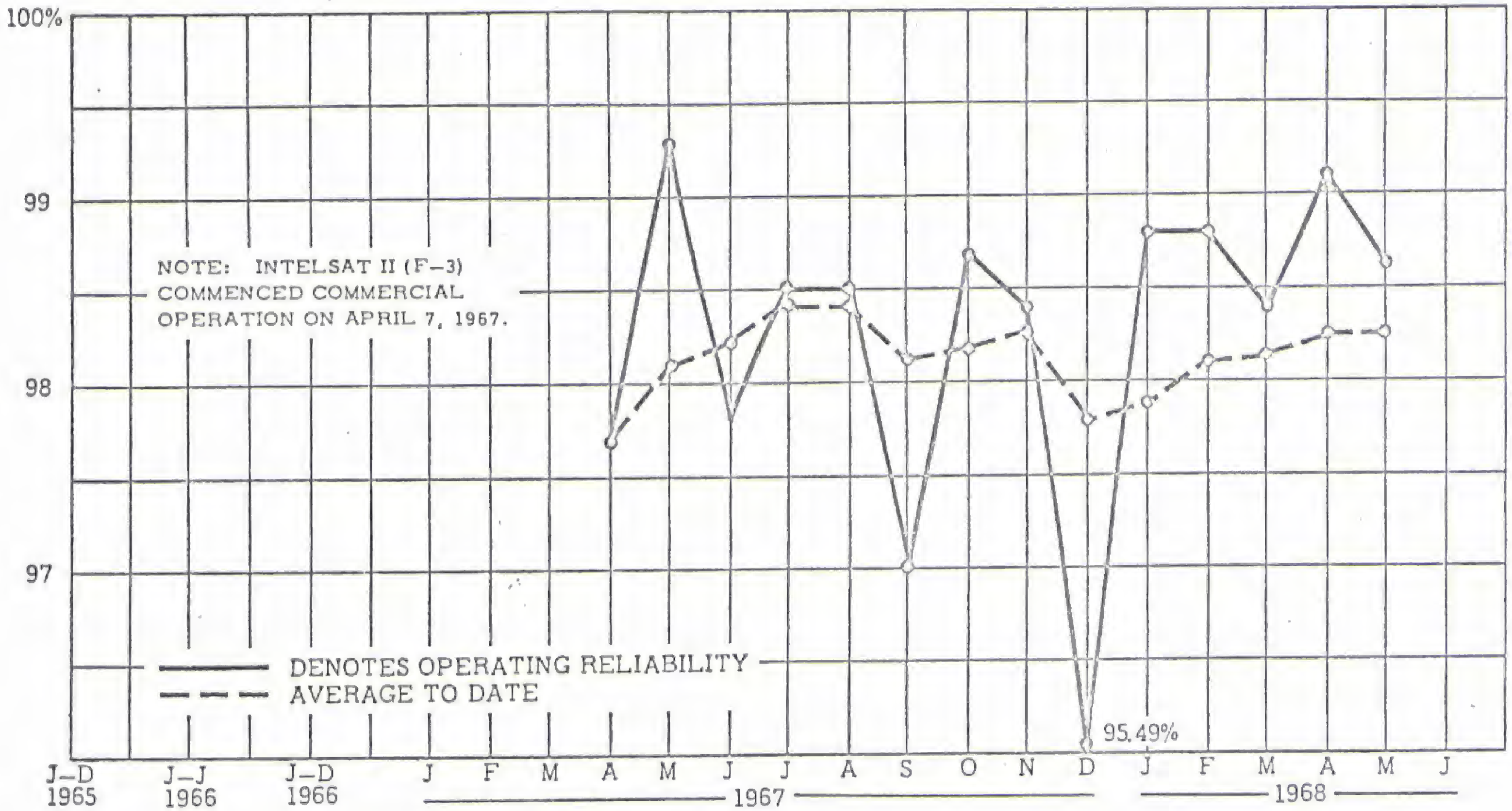


	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
	1967						1968					
TOTAL SYSTEM	99.83%	99.76%	98.99%	99.64%	94.22%	99.57%	99.89%	99.87%	99.73%	99.36%	99.84%	
EARTH STATIONS	99.89	99.89	99.18	99.79	99.53	99.85	99.94	99.95	99.78	99.91	99.89	
LAND LINES	99.94	99.87	99.81	99.85	94.69	99.73	99.95	99.92	99.95	99.45	99.95	
SPACE SEGMENT	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	

ATTACHMENT II TO ITEM B-3

TOTAL SYSTEM OPERATING RELIABILITY – INTELSAT II (F–3)

TOTAL SYSTEM OPERATING RELIABILITY – INTELSAT II (F–3) INCLUDING NASCOM
UNIT HOURS OF OPERATION VS ALL OUTAGES FROM IMC TO IMC



	1967 JUL	AUG	SEP	OCT	NOV	DEC	1968 JAN	FEB	MAR	APR	MAY	JUN
TOTAL SYSTEM	98.52%	98.48%	96.95%	98.70%	98.42%	95.49%	98.83%	98.80%	98.42%	99.08%	98.65%	
EARTH STATIONS	99.50%	98.71	97.86	98.96	98.74	96.08	99.02	99.21	98.83	99.19	99.02	
LAND LINES	99.02	99.78	99.09	99.74	99.68	99.41	99.81	99.60	99.59	99.89	99.63	
SPACE SEGMENT	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	

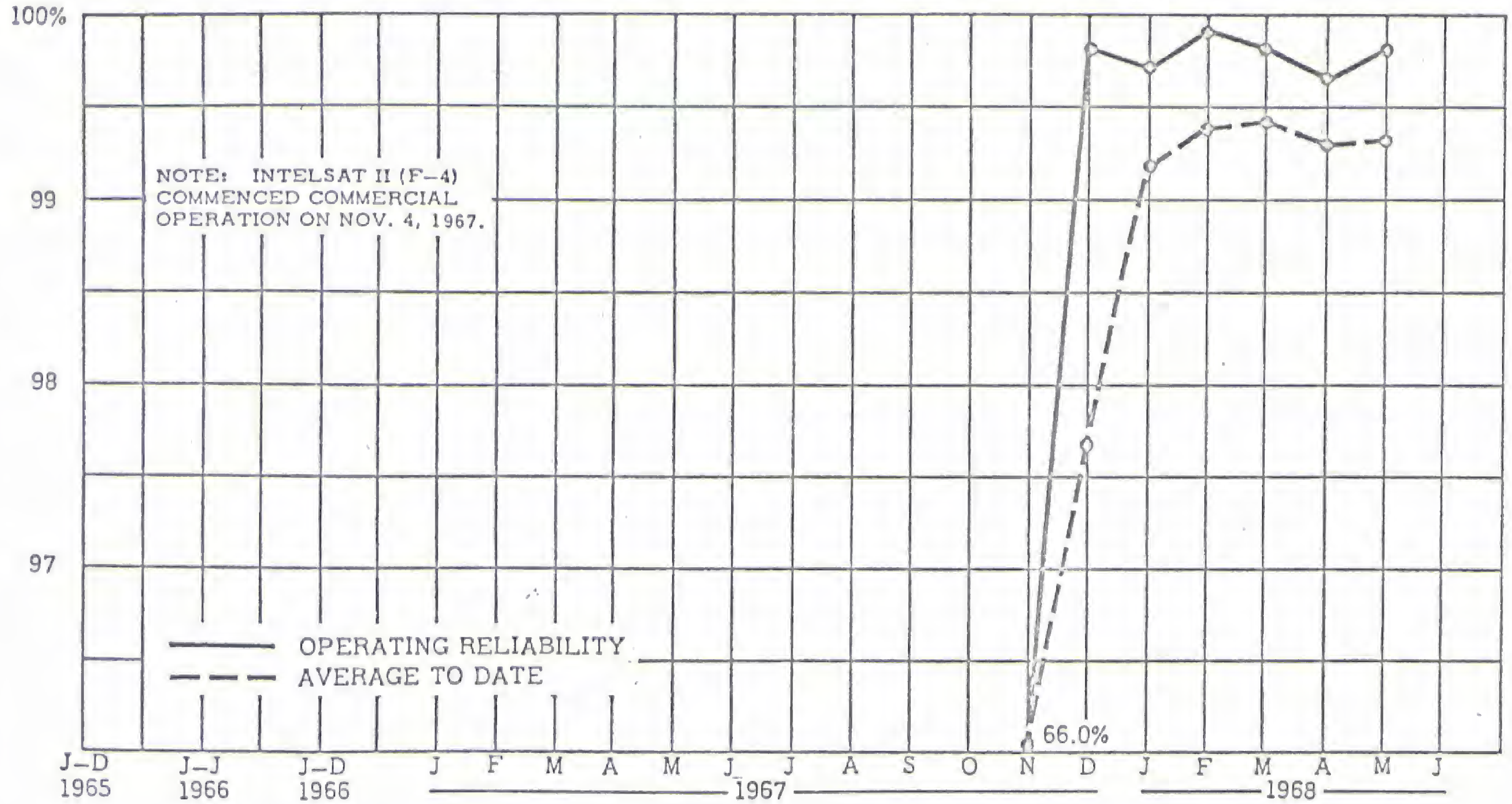
ATTACHMENT III TO ITEM B-3

INTELSAT

TOTAL SYSTEM OPERATING RELIABILITY - INTELSAT II (F-4)

B-10

TOTAL SYSTEM OPERATING RELIABILITY – INTELSAT II (F–4)
UNIT HOURS OF OPERATION VS ALL OUTAGES FROM IMC TO IMC



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
	1967						1968					
TOTAL SYSTEM					66.00%	99.82%	99.73%	99.96%	99.82%	99.70%	99.79%	
EARTH STATIONS					99.91	99.88	99.83	99.94	99.88	99.79	99.88	
LAND LINES					66.08	99.94	99.90	99.78	99.94	99.91	99.91	
SPACE SEGMENT					100.00	100.00	100.00	100.00	100.00	100.00	100.00	

ITEM B-4...SATELLITE SERVICE TEMPORARILY REQUIRED DURING CABLE OUTAGES IN THE ATLANTIC

While no detailed information is available from the US international carriers (or apparently maintained) concerning the operating reliability of cable communications, the following listing of temporary satellite service provided during cable outages for the period January 1 to July 10, 1968 is an indicator of the extended periods when one or more cables have been out of service in the Atlantic and where restoration by satellite was essential. This information was provided by the Manager of INTELSAT.

"TEMPORARY SATELLITE SERVICE PROVIDED DURING CABLE OUTAGES FOR THE PERIOD JANUARY 1 - JULY 10, 1968

Date	No. of Ckts.	No. of Days	Ckt. Hours	Carrier	Cable
Jan. 12	2	25	1200	COTC	ICECAN
Feb. 7	5	1	120	COTC	CANTAT-B
"	1	2	48	COTC	CANTAT-B
Feb. 10	14	7	2352	AT&T	TAT-3 & TAT-4
	3	5	360	"	
	11	3	792	"	
	1	2	48	"	
	83	1	1992	"	
	4	7	672	RCAC	
	4	5	480	"	
	10	1	240	"	
	11	7	1848	ITT	
	1	5	120	"	
	6	3	432	"	
	5	1	120	"	
	1	5	120	F.C.	
	1	4	96	"	
	1	1	24	"	
	3	7	504	WUI	
	3	5	360	"	
	1	3	72	"	
	4	1	96	"	
March 20	18	9	3888	AT&T	TAT-1 & TAT-2
	7	6	1008	"	
	6	2	288	"	
	1	9	216	ITT	
	3	4	288	"	
	2	9	432	RCAC	
	1	4	96	"	

Date	No. of Ckts.	No. of Days	Ckt. Hours	Carrier	Cable
March 20	1	9	216	WUI	TAT-1 & TAT-2
	1	4	96	"	
	1	4	96	F.C.	
	9	6	1296	COTC	
April 8	7	2	336	COTC	COTC TASI Machine Failure
April 10	5	1	120	"	SCOTICE
April 11	7	9	1512	"	"
April 23	7	2	336	AT&T	TAT-1
	12	1	288	"	
	1	2	48	ITT	
	2	2	96	RCAC	
	1	2	48	WUI	
	8	2	384	COTC	
June 16	2	1	48	COTC	ICECAN
	3	20	1440	"	"
June 22	49	7	8232	U.S.(?)	TAT-3
June 23	1	6	144	COTC	
	4	5	480	COTC	
	2	7	336	AT&T	
July 3	2	2	96	COTC	ICECAN
"	1	in service	168	COTC	"
July 9	5	in service	120	"	"
July 10	2	in service		"	"

TOTAL:	346 ckts.	238 days	34,248 ckt. hrs.

APPENDIX C... **International Telecommunications Satellite Consortium**

Participants and Their Ownership Interests (Quotas)

(as of December 31, 1967)

Country	*Entity*	*Entry Into Effect of Interim Agreement*	*Quota*
ALGERIA	Ministry of Posts and Telecommunications	February 19, 1965	00.547628%
ARGENTINA	Secretaría de Estado de Comunicaciones	May 19, 1965	01.424774%
AUSTRALIA	Australian Overseas Telecommunications Commission	August 24, 1964	02.410236%
AUSTRIA	Bundesministerium für Verkehr und Elektrizitätswirtschaft, Generaldirektion für die Post- und Telegraphenverwaltung	May 6, 1965	00.175290%
BELGIUM	Régie des Télégraphes et Téléphones	February 10, 1965	00.964094%
BRAZIL	National Telecommunications Council	May 17, 1965	01.424774%
CANADA	Canadian Overseas Telecommunication Corporation	August 20, 1964	03.286685%
CEYLON	Permanent Secretary in charge of Ministry of Posts and Telecommunications of Ceylon	February 17, 1965	00.045636%
CHILE	Empresa Nacional de Telecomunicaciones S.A.	May 18, 1965	00.284955%
CHINA	Directorate General of Telecommunications of the Republic of China	February 17, 1965	00.091271%
COLOMBIA	Government of Colombia	February 19, 1965	00.547628%
DENMARK	Generaldirektoratet for Post og Telegrafvesenet	March 3, 1965	00.350580%
ETHIOPIA	Government of Ethiopia	February 19, 1965	00.073017%
FRANCE	Government of the French Republic	January 18, 1965	05.346341%
GERMANY	Deutsche Bundespost	September 21, 1964	05.346341%
GREECE	Greek Ministry of Communications Directorate General of Telecommunications	May 19, 1965	00.094985%
INDIA	Government of India	May 17, 1965	00.474925%
INDONESIA	Dewan Telekomunikasi	February 19, 1965	00.273814%
IRAQ	Ministry of Communications of Iraq	February 17, 1965	00.009127%

Country	*Entity*	*Entry Into Effect of Interim Agreement*	*Quota*
IRELAND	An Roinn Poist Agus Telegrafa	October 5, 1964	00.306757%
ISRAEL	Ministry of Posts State of Israel	November 30, 1964	00.573419%
ITALY	Società Telespazio	March 10, 1965	01.928189%
JAPAN	Kokusai Denshin Denwa Company, Ltd. (KDD)	August 20, 1964	01.752899%
JORDAN	Ministry of Communi-cations, Hashemite King-dom of Jordan	February 12, 1965	00.045636%
KENYA	East African External Telecommunications Co., Ltd.	October 11, 1967	00.050000%
KOREA	Ministry of Communications of the Republic of Korea	February 24, 1967	00.049680%
KUWAIT	Ministry of Posts, Tele-graphs, and Telephones of Kuwait	February 12, 1965	00.045636%
LEBANON	Government of Lebanon	February 12, 1965	00.073017%
LIBYA	Government of the Kingdom of Libya	February 12, 1965	00.027381%
LIECHTENSTEIN	Government of the Prin-cipality of Liechtenstein	July 29, 1966	00.048666%
MALAYSIA	Director General, Tele-communications Department, Government of Malaysia	May 25, 1966	00.242236%
MEXICO	Department of Communica-tions and Transportation of the Government of Mexico	October 25, 1966	01.482214%
MONACO	Government of the Princi-pality of Monaco	February 28, 1965	00.004564%
MOROCCO	Government of Morocco	June 22, 1966	00.291850%
THE NETHERLANDS	Government of the Kingdom of the Netherlands	August 20, 1964	00.876449%
NEW ZEALAND	Postmaster General of New Zealand	February 12, 1965	00.410721%
NIGERIA	Federal Republic of Nigeria	December 8, 1965	00.337943%
NORWAY	Telegrafstyret	August 31, 1964	00.350580%
PAKISTAN	Government of Pakistan	June 30, 1965	00.238129%
PANAMA	Intercontinental de Comunicaciones Por Satélites, S.A.	October 20, 1967	00.040000%
PERU	Junta Permanente Nacional de Telecomunicaciones	June 9, 1967	00.499550%

Country	Entity	Entry Into Effect of Interim Agreement	Quota
THE PHILIPPINES	Philippine Communications Satellite Corporation (PHILCOMSAT)	November 30, 1966	00.496554%
PORTUGAL	Administração Geral dos Correios, Telégrafos e Teléfones	January 14, 1965	00.350580%
SAUDI ARABIA	Ministry of Communications	February 19, 1965	00.045636%
SINGAPORE	Government of Singapore	June 3, 1966	00.097283%
SOUTH AFRICA	Department of Posts and Telegraphs of the Republic of South Africa	February 8, 1965	00.273814%
SPAIN	Government of the State of Spain	August 20, 1964	00.964094%
SUDAN	Department of Posts and Telegraphs of the Government of the Republic of the Sudan	April 5, 1965	00.009128%
SWEDEN	Kungl. Telestyrelsen	January 18, 1965	00.613515%
SWITZERLAND	Direction Généræl des PTT	September 16, 1964	01.752899%
SYRIA	Ministry of Communications of the Syrian Arab Republic	February 12, 1965	00.036509%
TANZANIA	East African External Telecommunications Co., Ltd.	June 16, 1967	00.049955%
THAILAND	Kingdom of Thailand	May 12, 1966	00.046894%
TUNISIA	Secretariat of State for Posts, Telegraph and Telephone of Tunisia	February 19, 1965	00.182543%
UNITED ARAB REPUBLIC	Government of the United Arab Republic	February 19, 1965	00.319450%
UNITED KINGDOM	Her Britannic Majesty's Postmaster General	August 20, 1964	07.362174%
UNITED STATES	Communications Satellite Corporation (COMSAT)	August 20, 1964	53.463408%
VATICAN CITY	Government of the Vatican City State	August 20, 1964	00.043822%
VENEZUELA	Ministry of Communications of Venezuela	December 30, 1965	00.965551%
YEMEN	Yemen Arab Republic Ministry of Communications	June 29, 1965	00.028575%
TOTAL			100.000001%

APPENDIX D... LISTING - SATELLITE EARTH STATION SCHEDULE
(Atlantic Basin and World Wide)

ITEM D-1... LIST OF EXISTING AND PROPOSED EARTH STATIONS IN ATLANTIC * BASIN

COUNTRY	DATE OF OPERATION
1. ALGERIA	1972
2. ARGENTINA	1969 (2nd Q)
3. BRAZIL	1969 (1st Q)
4. CAMEROON	1970
5. CANADA	
Mill Village #1	Operational
Mill Village #2	1969 (1st Q)
6. CHILE*	1968 (3rd Q)
7. COLOMBIA	1970
8. ECUADOR	1970
9. ETHIOPIA	1970
10. FRANCE	
Pleumeur-Bodou #1	Operational
Pleumeur-Bodou #2	1969 (2nd Q)
11. GERMANY	
Raisting #1	Operational
12. GREECE	1970
13. IRAN	1969 (3rd Q)
14. ISRAEL	1972
15. ITALY	
Fucino #1	Operational
16. IVORY COAST	1969
17. JORDAN	1970
18. LEBANON	1970
19. MEXICO	1968 (3rd Q)
20. MOROCCO	1969
21. NIGERIA	1969
22. PANAMA	1968 (3rd Q)
23. PERU	1969 (2nd Q)
24. SAUDI ARABIA	1970
25. SENEGAL	1969
26. SPAIN	
(Canary Island)**	Operational
Buitrago #1	Operational
27. SUDAN	1970
28. SWEDEN	1971
29. SWITZERLAND	1972
30. TURKEY	1972
31. UNITED ARAB REP.	1971
32. UNITED KINGDOM	
Ascension Island**	Operational
Goonhilly #1	Operational
Goonhilly #2	1968 (3rd Q)
33. UNITED STATES	
Andover	Operational
Etam, West Virginia	1968 (4th Q)
Puerto Rico	1968 (4th Q)
34. VENEZUELA	1969

* As of 1 June 1968
** Non Standard Earth Station

ITEM D-2... LIST OF EXISTING AND PROPOSED EARTH STATIONS - WORLDWIDE *

Country	Standard Station Unless Otherwise Indicated	Location of Satellite Used	Estimated Date of Operation
1. Algeria		Atlantic	1972
2. Argentina		Atlantic	1969
3. Australia			
—Carnarvon*	Non-standard	Pacific	Operational
—Moree*		Pacific	1968
—Ceduna, S. A.		Indian	1969
4. Bahrein*		Indian	1969
5. Brazil*		Atlantic	1969
6. Cameroon		Atlantic	1970
7. Canada			
—Mill Village No. 1*	**	Atlantic	Operational
—Mill Village No. 2*		Atlantic	1968
8. Ceylon		Indian	1970
9. Chile*		Atlantic	1968
10. China (Republic of)		Pacific	1969
11. Colombia		Atlantic	1969
12. East Africa (Kenya)		Indian	1970
13. Ecuador		Atlantic	1969
14. Ethiopia		Atlantic	1970
15. France			
—Pleumeur-Bodou No. 1*		Atlantic	Operational
—Pleumeur-Bodou No. 2		Atlantic	1969
16. Germany			
—Raisting No. 1*		Atlantic	Operational
—Raisting No. 2		Indian	1969
17. Greece		Atlantic	1970
18. Hong Kong No. 1*		Pacific	1969
No. 2		Indian	1969
19. India*		Indian	1969
20. Indonesia No. 1*		Indian	1969
No. 2		Pacific	1971
21. Iran		Atlantic	1969
22. Israel		Atlantic	1972
23. Italy			
—Fucino No. 1*		Atlantic	Operational
—Fucino No. 2		Indian	1969
24. Ivory Coast		Atlantic	1969
25. Japan			
—Ibaraki No. 1*	**	Pacific	Operational
—Ibaraki No. 2*		Pacific	1968
—Yamaguchi*		Indian	1968

Country	Standard Station Unless Otherwise Indicated	Location of Satellite Used	Estimated Date of Operation
26. Korea		Pacific	1970
27. Kuwait		Indian	1969
28. Lebanon		Atlantic	1970
29. Malaysia		Indian	1969
30. Mexico*		Atlantic	1968
31. Morocco		Atlantic	1969
32. New Zealand		Pacific	1970
33. Nigeria No. 1		Atlantic	1969
No. 2		Indian	1972
34. Pakistan, East		Indian	1969
35. Pakistan, West		Indian	1969
36. Panama*		Atlantic	1968
37. Peru		Atlantic	1969
38. Philippines*	Non-standard**	Pacific	Operational
—Tanay No. 1*		Pacific	1968
—Tanay No. 2		Indian	1970
39. Saudi Arabia		Atlantic	1970
40. Senegal		Atlantic	1969
41. Singapore		Indian	1970
42. South Africa		Indian	1971
43. Spain			
—Canary Islands*	Non-standard**	Atlantic	Operational
—Buitrago No. 1*		Atlantic	Operational
—Buitrago No. 2		Indian	1970
44. Sudan		Atlantic	1970
45. Thailand*	Non-standard**	Pacific	Operational
—Si Racha No. 1*		Pacific	1968
—Si Racha No. 2		Indian	1970
46. Turkey		Atlantic	1972
47. United Arab Republic		Atlantic	1971
48. United Kingdom			
—Ascension Island*	Non-standard	Atlantic	Operational
—Goonhilly No. 1*		Atlantic	Operational
—Goonhilly No. 2*		Indian	1969
49. United States			
—Andover*		Atlantic	Operational
—Etam, West Va.		Atlantic	1968
—Puerto Rico		Atlantic	1968
—Brewster*		Pacific	Operational
—Jamesburg, Calif.		Pacific	1968
—Paumalu*	Non-standard**	Pacific	Operational
No. 1*		Pacific	Operational
No. 2		Pacific	1968
50. Venezuela		Atlantic	1969
51. Zambia		Indian	1971

* Approved by the ICSC.
** These antennas will be removed from operation upon implementation of new antennas.

*AS OF WINTER 1968

APPENDIX E... SATELLITE EARTH STATION COSTS

ITEM E-1... EARTH STATION PRICE ANALYSIS

The following tabulation discloses the average contract price for the "generations" of satellite earth stations that have been, or are being installed around the World.

In summary:

	Average Contract Price
First Generation Earth Stations (1961-63)	$12.8M
Second Generation Earth Stations (1966-67)	5.2M
Third Generation Earth Stations (1967-68)	3.8M

EARTH STATION PRICE ANALYSIS

18 April 1968

Country	Bid Spread Low $	Bid Spread Contract Price (M) $	Bid Spread High $	EDN (1) Qtr/Year	REMARKS
Andover		13.00		/1961	ATT
Pleumer Bodou		13.00		/1961	ATT
Raisting		11.1		/1962	Siemens
Mill Village		14.3		/1963	RCA
Average First Generation		12.8			

(1) Effective Date of Notification

EARTH STATION PRICE ANALYSIS

Country	Bid Spread Low $	Contract Price (M) $	Bid Spread High $	EDN Qtr/Year	REMARKS		Finance
Spain		7.1		2/66	ITT	85'	
Australia	2.9	2.9	5.0	4/66	Collins	(?) Note: Collins bid same station concept to Thailand for $5.5M	Contractor
Thailand	4.6	5.6	7.2	1/67	GTE	5 receive 1 trans fully redundant and TV receive	Ex-Im 1/ Bank
Philippines		5.7		1/67	GTE	5 receive 1 trans fully redundant and TV T&R	Contractor at 7% approx. 6 years
Chile	3.4	4.5	8.0	2/67	GTE	8 receive 2 trans fully redundant and TV T/R UPS	Ex-Im 1/ Bank
Canada #2	4.2	4.3	7.0	2/67	RCAV	97'	Cash
Panama		3.2		2/67	Page	3,400 ft^2 bldg. fully steerable (ownership involved)	Page + equity
U.S. (Average of 4 new sta.)		5.9		3/67	P-F; REL; NEC; GT&EI		Cash
Mexico		6.5 (P)		3/67	NEC/Mitsubishi	105' 8 rec carriers Tx TV T/R	Japanese Ex-Im Bank + NEC + Mitsubish
Indonesia		7.2 (P)		3/67	ITT	90' (ownership involved)	AID 50% ITT 50% revenue + OM - long term
Average Second Generation	3.8	5.2	6.8				

1/ See page 4; footnote

EARTH STATION PRICE ANALYSIS

Country	Bid Spread Low	Bid Spread Contract Price (M)	Bid Spread High	EDN Qtr/Year	REMARKS	Finance
	$	$	$			
Argentina	3.4	(3.4)	6.0	4/67	STS	Italian Government
Brazil		(3.8)		4/67	Hughes LTV 97'	Ex-Im Bank + Contractor
Hong Kong	3.4	3.7	5.5	4/67	Marconi 90' (?)	C & W
Bahrein	3.4	3.7	5.5	4/67	Marconi 90' (?)	
Morocco		5.0		4/67	Space General, 97' (Ownership involved)	Ex-Im 1/
Peru	3.82 (3.0)	3.82 (3.0)	7.0 (6.0)	1/68	8 carriers fully redundant & TV T/R 2 kw PA 100' UPS	Japanese Ex-Im + NEC
Kuwait	4.9 (4.0)	4.9 (4.0)	5.9 (5.0)	1/68	NEC, 97' 6 Rec 2 trans & TV fully redundant UPS and good buildings	Kuwait Government
India		(?)		1/68	RCAV 50 yr. financing (Canada)	Canada Gov., 10 yrs grace + 40 yrs @ 2%
Taiwan	4.3 (3.5)	4.3 (3.5)	8.3 (7.0)	1/68	10 carrier, fully redundant, TV, civil works, dual tracking rec. NEC UPS & 2-750 kva	(Japanese Ex-Im + NEC)
Average Third Generation	(3.45)	(3.8)	(5.8)			

1/ See page 4, footnote

(UPS = no-break service)

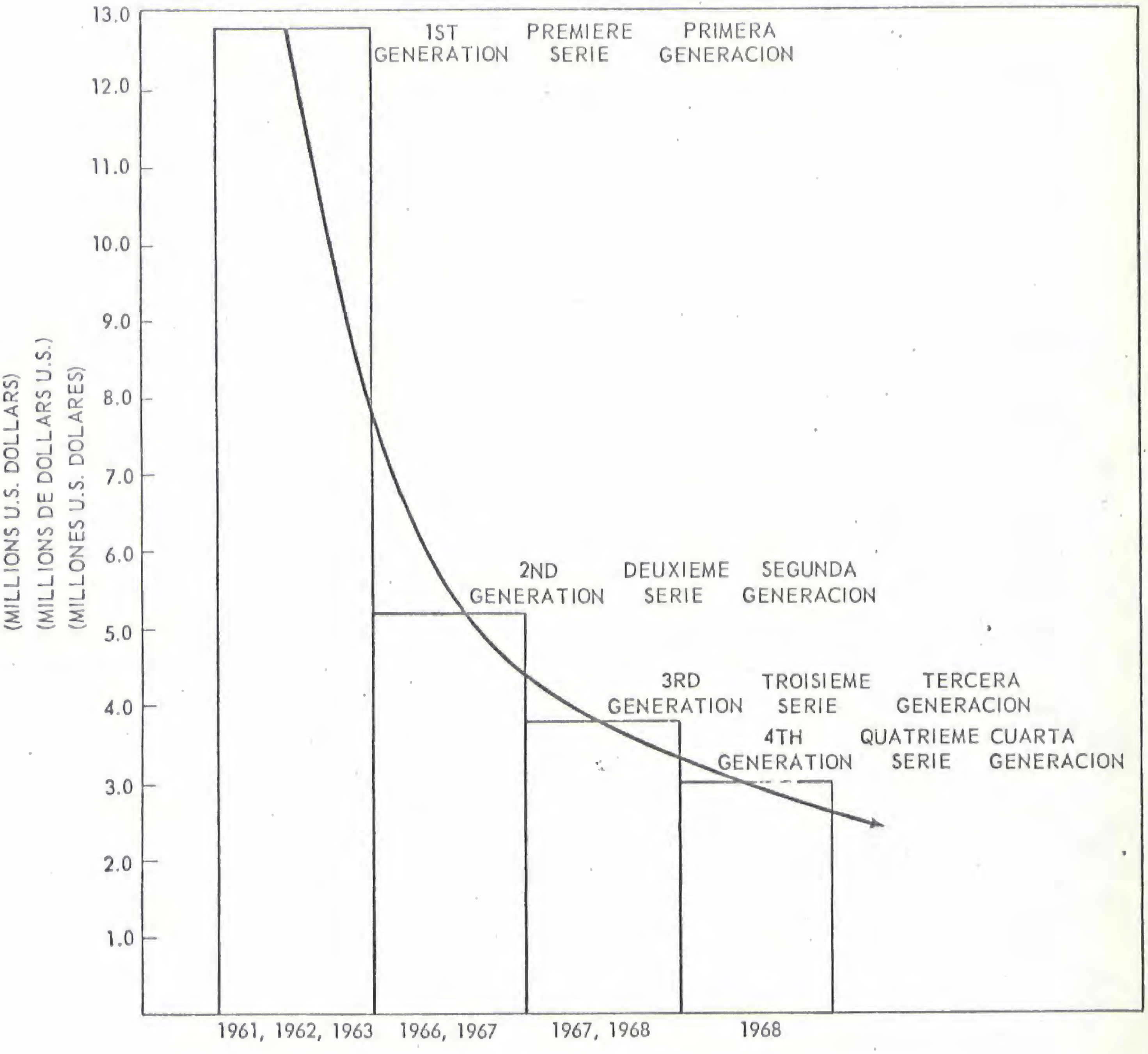
EARTH STATION PRICE ANALYSIS

Country	Bid Spread: Low	Bid Spread: Contract Price (M)	Bid Spread: High	EDN Qtr/Year	REMARKS	Finance
	$	$	$			
Greece	2.3		3.95	3/68	Bids opened April 16, 1968. No award, no buildings or civil works	No award
Lebanon		(?)				No award
Pakistan		(?)				No award
Korea		(?)				No award

() Estimated cost of earth station only including civil works installation and test

(P) Publicized price

1/ Standard requirements of Ex-Im Bank for a direct loan to a given government include cash payment of 10% by the respective administration and 10% by the contractor. Repayment in not more than 16 equal semi-annual installments, the first of which is due not more than 6 months after completion of the station. Standard interest rates which are now in effect are 6% per annum and a commitment fee of 1/2% on undispersed funds. Ex-Im Bank will finance the rest of the 80%.



EARTH STATION PRICE ANALYSIS

ANALYSE DU PRIX DE REVIENT D'UNE STATION TERRIENNE

ANALISIS DEL COSTO DE LA ESTACION TERRENA

(Courtesy: COMSAT Corp.)

ITEM E-2... EARTH STATION PRICE ANALYSIS EXAMPLE - GOVERNMENT & PRIVATE TENDERS FOR GREEK GOVERNMENT SATELLITE EARTH STATION

The following is the text of a US Department of State AIRGRAM disclosing the results of the bidding in response to a bid solicitation for the design and construction of a satellite earth station in Greece (April 1968).

DEPARTMENT OF STATE

AIRGRAM

44

TP 15-1

FOR RM USE ONLY

COM-10

RM/R	REF	AF
	1	5
ARA	EUR	FE
NEA	CU	INR
7		
E	P	IO
4		
L	FBO	AID
AGR	COM	FRB
		3
INT	LAB	TAR
TR	XMB	AIR
4	4	
ARMY	CIA	NAVY
	2	
OSD	USIA	NSA

A-561
NO.

UNCLASSIFIED

HANDLING INDICATOR

RECEIVED

APR 26 11 11 AM 1968

TO : DEPARTMENT OF STATE

INFO : AmEmbassy NAIROBI

FROM : AmEmbassy ATHENS

DATE: April 25, 1968

SUBJECT : EXPORT PROMOTION (1) - Government and Private Tenders Satcom Earth Station (for the Greek Government)

REF : CERP - Section D; T.O. 63, 12/5/67; Emb's A-396, 1/30/68; O.M. dated 1/30/68; Athens 3675, 2/23/68; and previous communications.

FOR COMMERCE

A total of four United States and four foreign firms submitted bidding proposals before the 10:00 hours deadline, April 16, 1968, stipulated in the bid invitation for supply and installation of an earth station in Greece for communication via satellite. The bidding proposal of another American firm, ITT, was presented by its local agent almost two hours later, when reading and announcement of prices and payment terms was already in progress. The Embassy cannot tell whether ITT's bid will be considered.

Bids were received by an ad hoc committee set up for conducting the tender, evaluating the bids and submitting its recommendations to the management of the quasi-governmental Hellenic Telecommunications Organization, Ltd. (OTE).

Prices of all bids were at least $1 million below the issuing agency's estimate of $5 million. Attached to this airgram are tabulations of the prices and payment terms as read by the chairman of the evaluation committee. However, these prices are just indications giving a rough idea of the comparative position of each bidder, since some of them include certain

1968 APR 26 PM 2 58

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costs not included in other. It will be the task of the evaluation committee to reduce the bids to a common denominator and this is expected to take some time. As new data become available, the Embassy will transmit them to the Department.

McCLELLAND

Enclosures: Table 1 (Prices)
Table 2 (Remarks and other terms)

cc: Foreign Communications Division,
Office of Foreign Commercial Services

TABLE #1 (*)

PRICES

			C & F	Local Transportation	Installation	Total
1.	Marconi		$2,018,356	$ 5,738	$ 286,176	$2,528,016
2.	S T S	(a)	2,549,597	n.a. (1)	330,887	2,880,484
		(b)	2,559,758	n.a. (1)	334,758	2,894,516
3.	Philco/Ford		2,360,400	50,000	501,900	2,912,900
4.	Pags	(a)	2,288,088	n.a. (1)	836,097	3,124,185
		(b)	2,301,599	n.a. (1)	819,564	3,121,163
5.	Siemens	(a)	2,647,264	16,505	643,165	3,306,934
		(b)	n.a.	n.a.	n.a.	3,318,732
6.	G T & E	(a)	2,907,632	15,222	608,946	3,531,800
		(b)	2,923,392	15,222	610,446	3,549,060
		(c)	n.a.	n.a.	n.a.	3,409,816
		(d)	n.a.	n.a.	n.a.	3,473,879
7.	GESPA	(a)	3,378,095	8,312	485,634	3,872,041
		(b)	n.a.	n.a.	n.a.	3,821,760
8.	Aerojet	(a)	3,281,453	32,677	636,746	3,950,876
		(b)	n.a.	n.a.	n.a.	3,975,271
9.	I T T		2,647,762	11,752	415,486	3,075,000

(*) For full names of firms, explanations, remarks, delivery and payment terms, see Table #2.

TABLE #2

REMARKS, DELIVERY AND PAYMENT TERMS

General Note: In the case of foreign firms, figures are dollar equivalents. Conversions have been made at following rates: $1=DM4=FF4.92=£1/2.40

1. Marconi (U.K.)

There must be a figure representing a cost of $217,745 not mentioned by chairman of bid committee.

a. Delivery of the earth station, in 15 months

b. Payment terms: 10% of value against shipping documents; 90% in 9 years and 3 months, in semi-annual installments, beginning 21 months from signature of contract. Interest rate, 5.5%. The interest has been given by the firm as £221,624($531,898).

2. S T S (Italian Consortium for Systems of Communication via Satellite. It comprises G T & E, SIT-Siemens and Sirti).

Firm has offered fully steerable antenna.

Total prices do not include local transportation expenses which are quoted on a unit (per kilometer) basis.

a. Delivery of the earth station, in 14 months.

b. Payment terms: (a) Value of equipment, against shipping documents.

(b) Installation expenses, 95% with progress of works, 5% upon final acceptance. Firm has applied for Italian Government credit and it is awaiting approval.

3. Philco/Ford Corporation (U.S.)

Firm has offered fully steerable antenna.

a. Delivery of earth station, in 54 weeks.

b. Payment terms: ExImBank financing of 90% of value, payable in 16 semi-annual installments, beginning 2 years from signature of contract, at 6% interest. The 10% balance will be financed by the Ford Motor Credit Co. or other source.

4. Page Communications Engineers (U.S.)

Equipment offered by this firm includes ITT carrier systems, Lanquart (G T & E) microwaves and LTV antenna.

Total prices do not include local transportation expenses, which are quoted on a unit (per kilometer) basis.

First price (a) pertains to station with an antenna of limited steerability and the second (b) a station with a fully steerable antenna.

a. Delivery of earth station, in 54 weeks

b. Payment terms: ExImBank financing of 90% of value, payable in 16 semi-annual installments, beginning 6 months from original acceptance, at 7% interest. The 10% balance, upon original acceptance.

5. Siemens/Telefunken/AEG/MAN (W. Germany)

a. Delivery of earth station, in 15 months.

b. Payment terms: 90% of value in 8 years, beginning 6 months from delivery of earth station in operating condition, at an interest 2.75% above the official discount rate (now 3%); 5% upon signature of contract and 5% upon completion.

6. General Telephone & Electronics International (U.S.)

a. Delivery of earth station, in 12 months

b. Payment terms: (a) 90% against shipping documents; 10% upon original acceptance.

(b) ExImBank financing of 90% of value of equipment and services payable in 16 semi-annual installments at 6%; 10% from G T & E's own funds at 6.5%.

7. Compagnie Generale des Systemes et des Projets Avancees (France)

First price (a) pertains to earth station with an antenna of limited steerability and the second (b) a station with a fully steerable antenna.

a. Delivery of earth station, in 15 months

b. Payment terms: (a) Value of equipment, against shipping documents. (b) Installation costs: 10% of each delivery against shipping documents; 90% in 16 semi-annual installments, beginning 6 months from original acceptance, at 5.52% interest.

8. Aerojet General Corporation, Space Division (U.S.)

First price (a) pertains to earth station with antenna with limited steerability and the second (b) a station with fully steerable antenna.

a. Delivery of earth station, in 12 months

b. Payment terms: ExImBank financing of 90% of value of equipment at 6%, 10% against shipping documents. Local costs are not financed.

9. International Telephone and Telegraph Corp. (U.S.)

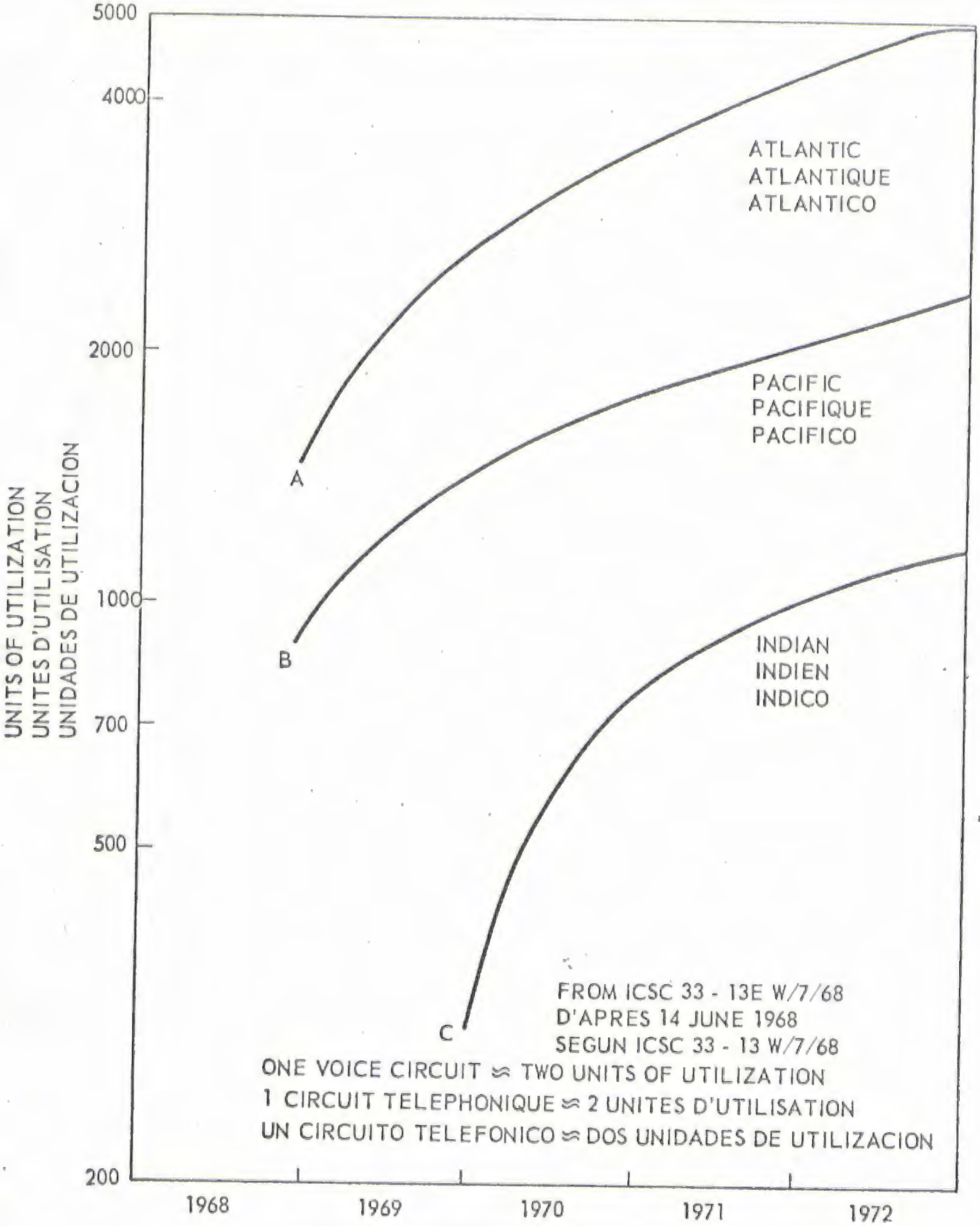
The bid of this firm was presented by its local agent almost two hours after the stipulated deadline. The local agent claims that he has been promised consideration of the bid since delay was not deliberate.

Total price should probably be increased by $171,000 to reflect "financial charges" (not interest). Firm offers a 4.5% discount if paid in cash.

Firm offered fully steerable antenna.

Delivery of earth station, in 13 months

Payment terms: ExImBank financing at 7% interest.



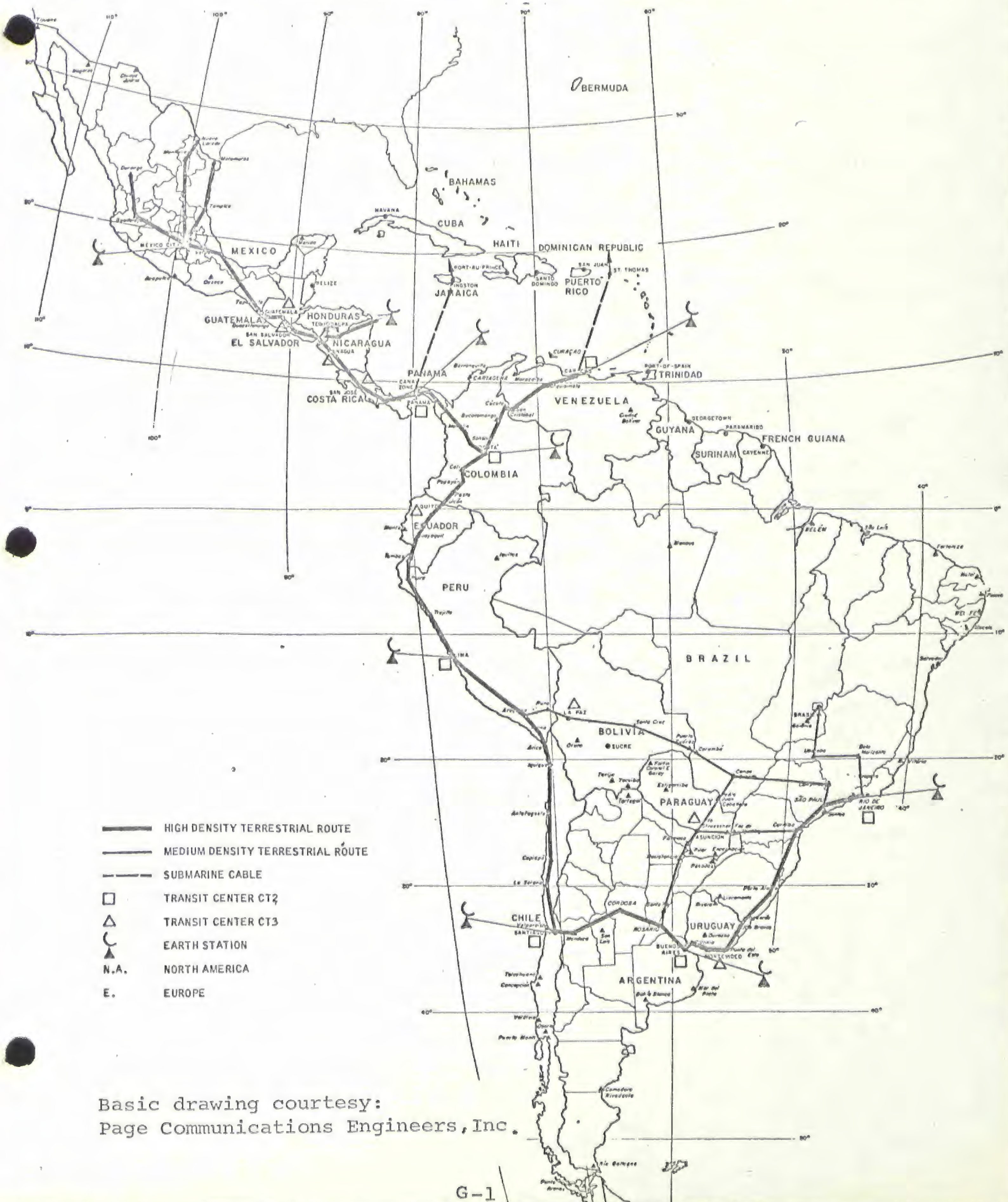
SATELLITE SYSTEM REQUIREMENTS FORECAST

PREVISIONS DES BESOINS DU SYSTEME A SATELLITES

PRONOSTICO RELATIVO A LAS NECESIDADES DEL SISTEMA DE SATELITES

(Courtesy: COMSAT Corp.)

APPENDIX G... CONFIGURATION OF THE INTERAMERICAN TELECOMMUNICATIONS NETWORK (with addition of a COMTELCA SATELLITE EARTH STATION AND CT-2 TRANSIT CENTER under consideration)



Basic drawing courtesy:
Page Communications Engineers, Inc.