Revised Draft/OLSSON/12/13/6

EXECUTIVE OFFICE OF THE PRESIDENT

OFFICE OF TELECOMMUNICATIONS MANAGEMENT

(WORKING PAPER)

STAFF REPORT

THE UNITED STATES OF AMERICA CONTRIBUTIONS TO THE GROWTH OF COMMUNICATIONS SATELLITE TECHNOLOGY AND THE INTERNATIONAL TELECOMMUNICATIONS SATELLITE CONSORTIUM (INTELSAT)

A POLICY OVERVIEW

December 1968

PROLOGUE

PRESIDENT DWIGHT D. EISENHOWER

Through the marvels of scientific advancement, my voice is coming to you from a satellite circling in outer space. Through this unique means, I convey to you and all mankind America's wish for peace on earth and goodwill toward men everywhere.[1]

[1]This message, the first voice from outerspace, was pre-recorded and broadcast from the first successful communications satellite launched from Cape Kennedy, Florida on December 18, 1958.

PREFACE

As the first decade of satellite communications history draws to a close, it is appropriate to summarize the achievements made by the free world in this new and revolutionary technology during the last ten years, particularly since enactment of the Communications Satellite Act of 1962, and to sketch the challenges and opportunities ahead for maintaining United States leadership in fostering world peace and understanding through improved international telecommunications.

The rapid pace of space and communications/electronics technology in the 1960's provided the building blocks for the practical applications of satellite communications. Through the substantial government-industry team efforts, dramatic progress has been made toward establishing a global system since passage of the Communications Satellite Act of 1962 and formation of the International Telecommunications Satellite Consortium (INTELSAT) in 1964.

This paper highlights the significant technological innovations, as well as institutional and management innovations which enabled the nation and in turn INTELSAT to be so successful during the early development period. These achievements in surmounting the substantial impediments (technical, social, political and economic) normally encountered in the introduction of a new technology are a tribute to human creativity and international cooperation.

This paper also helps to illustrate the extensive contributions of the United States of America to the Consortium in the interest of expanded international cooperation. Such United States contributions

are the direct result of implementing the national policy to make available as promptly as possible the vast benefits of the new communications satellite technology to its own people and to the people of all nations.

The fundamental policy issues facing the United States Government during the INTELSAT Conference (February-March 1969) on Definitive Arrangements are discussed as well as the important factors bearing on these issues which should be considered by the United States Government in the formulation of its position.

Finally, this report ooncludes that the United States Government should formulate, without delay, a long-range plan which would contain the National Program for Establishment and Operation of the Global Commercial Communications Satellite System. What is needed is a document containing a forward-looking and broad conceptual (philosophy, principals and doctrine) framework of the Global System applicable to the late 1970's time frame.

Acknowledgement

This report is based upon information and data provided by the following individuals:

NASA - Dr. Water Radius, Mr. Jack Kelleher

COMSAT Corporation - Mr. Stephen Smoke

The report was prepared by Ward T. Olsson, Colonel, USAF, Program Staff Officer, Office of Telecommunications Management.

(Tentative)

OUTLINE

Prologue

Preface

Outline

INTRODUCTION

-- Background

-- The Conceptual Framework

-- The National Aeronautics and Space Act of 1958

-- The Communications Satellite Act of 1962

TECHNOLOGY

-- Evolution of Space and Electronics Technology

-- Communications Satellite Experiments

-- Trends in Communications Satellite Technology

ORGANIZING FOR THE TASKS

-- National Aeronautics and Space Administration

-- Communications Satellite Corporation

-- International Telecommunications Satellite Consortium (INTELSAT)

UNITED STATES CONTRIBUTIONS TO INTERNATIONAL COOPERATION

-- Management Leadership

-- Space Technology, Launch Services and Range Support

-- Technical and Financial Assistance

INTERNATIONAL COOPERATION ACCOMPLISHMENTS

-- NASA International Programs (Research and Development Experiments)

-- Growth of the INTELSAT Enterprise

-- Deployment of the Global Commercial Communications Satellite System

-- Operation of the Global System

-- Benefits for the People of the World

UNITED STATES POLICY

-- Policy Options -- an Overview

-- Space Activities for Peaceful Purposes

-- Promotion of Satellite Communications

  ° Support of a Single Global System

  ° Offers to Extend International Cooperation

-- Definitive Arrangements for INTELSAT

  ° Policy Issues

  ° Factors Bearing on the Issues

SUMMARY AND OUTLOOK

Appendices

Tab A Progress Chart (Milestones Last Ten Years)

Tab B Block Diagram of the Global System (Typical)

Tab C The Space Segment

Tab D Earth Stations

Tab E The System Networks (Maps)

Tab F Membership in INTELSAT

Tab G Membership in Interim Committee

INTRODUCTION

BACKGROUND -- The accelerating growth of international telecommunications is a symbolic feature of twentieth century society. The increased interdependence among the nations of the world places demands for improved international telecommunications services. Furthermore, enhanced international telecommunications capability, brought about by technological innovations, serves as a strong motivating force for creating new mechanisms of international cooperation.

The advent of the space age stimulated the technological innovations which coupled space and communications/electronics techniques into the telecommunications satellite. This remarkable achievement gave birth to a unique capability which will enable man to enhance his international telecommunications as a primary tool for expanded international cooperation.

Timely exploitation of a new technology requires the solution of a wide spectrum of technical, social, political and economic problems. Major institutional arrangements have been devised to cope with the challenges and opportunities offered by space and telecommunication satellite technology. These include the National Aeronautics and Space Administration, the Communications Satellite Corporation and the International Telecommunications Satellite Consortium (INTELSAT).

An appreciation of the positive INTELSAT achievements in a short period of time can be seen in the present status of the evolving single global system. The INTELSAT system presently consists of four operating communications satellites located in geostationary synchronous equatorial orbit which are used to provide intercontinental telecommunications services (telephone, television, telegraph, data and facsimile) between 23 earth stations located in 14 different nations. This spectacular progress of INTELSAT, coupled with its accelerating pace, reflects a dramatic demonstration of a remarkable -- singularly unprecedented -- achievement in international cooperation among a large number of nations throughout the world.

The foundation for this successful international undertaking was provided in large part by the significant contributions of the United States and includes:

- Research and development which provided the basic space technology building blocks (launch facilities, boosters, range facilities).
- Research and development of communications satellite technology.
- Feasibility demonstration experiments of communications satellites.
- Promotion of international cooperation resulting in establishment of INTELSAT.

- Accomplishments of function as Manager for INTELSAT.
- Development and production of operational INTELSAT communications satellites.
- Provided launch and range services for INTELSAT satellites.
- Technical and related assistance to interested nations in construction of earth stations for direct access to the INTELSAT satellites.

Before turning to a resume of the legislative mandates on space and communication satellite activities, an understanding of the conceptual framework for the practical application of telecommunications satellites is desirable.

THE CONCEPTUAL FRAMEWORK -- Creative ideas for the practical use of space began to flow from various sources subsequent to World War II. For instance, Arthur C. Clarke, noted author and scientist, suggested in October, 1945, the possibility of a synchronous satellite system in which radio operators in space manned satellites, 22,300 miles above the equator, would relay messages between points on earth. The concept of "stationary" satellites at synchronous altitudes was novel for its time. In addition, in 1946, under Project RAND a study was made of the feasibility of earth satellites. The study concluded that technology had advanced to the point where it appeared feasible to design a man-made satellite and it also contained a brief description of the use of such a satellite as a communications relay station.

The ability to utilize these concepts in practice required the development of space technology. Steady progress in the development of space booster capability occurred in the 1950's and enabled experimental satellites to be launched by this nation after early 1958.

Several government-industry projects involving experimental communications satellites were undertaken in the early sixties. The successful experimental communications satellites COURIER (1960), TELSTAR (1962) and RELAY (1962) demonstrated the feasibility of using an active repeater satellite containing electronic devices to receive, amplify and transmit signals between earth stations over intercontinental distances. SYNCOM III (1964) successfully demonstrated the feasibility of using an active repeater satellite placed in a synchronous equatorial orbit at an altitude of 22, 300 miles. The spectacular achievement of the rapidly evolving technology -- through the miracles of rocketry and electronics -- made the synchronous satellite the primary candidate and logical choice for practical applications leading to establishment of a global system.

Conceptually, geostationary synchronous equatorial orbit active repeater telecommunications satellites offer a unique transmission media for all types of telecommunications service. Essentially, the synchronous altitude corridor, when active repeater communication satellites are employed, represents a virtual 22, 300 statute mile high ionosphere which can be exploited to extend the horizons of telecommunications capability. The fundamental attributes of this revolutionary

means include an unprecedented degree of versatility and flexibility together with the high capacity that can be achieved at low cost.

- The versatility of satellites is realized by their capability to simultaneously provide telephone, telegraph, data, facsimile and particularly, television service over short as well as intercontinential distances.
- The flexibility of satellites is achieved by the ability to simultaneously interconnect a large number of widely dispersed earth station terminals. A single geostationary synchronous satellite can provide this multiple access (multipoint) service to an area larger than one-third of the globe.
- The capacity of satellites can be increased by a quantum step with a nominal increment in investment.
- The capabilities of satellites enable the global telecommunications network to be improved significantly by the composite diversity of means which create a synergistic enhancement of the total telecommunications system capability.

Historically, the physical telecommunications (plant) centers of the world have been located near population concentrations and have been constrained by geographical realitites. The systems of conventional transmission media of cable and radio evolved in this restricted frame of reference. The inherent ability of locating communications satellite earth stations without regard to geographic constraints, particularly in the interior land masses of developing nations, adds a new dimension to the improving global telecommunication network. This unique capability of the satellite is already reducing the barriers to international information exchange.

The concept of the Global Commercial Communication Satellite System adopted by the INTELSAT Consortium is treated specifically in a later section on Support of a Single Global System.

These unique characteristics and distinct advantages of satellite communications provide a telecommunications media of special value to the developing nations, as well as the more developed nations.

THE NATIONAL AERONAUTICS AND SPACE ACT OF 1958 -- The Space Age began on October 4, 1957 when the Soviet Union successfully launched and orbited the first man-made earth satellite, SPUTNIK I. This dramatic technical achievement followed by SPUTNIK II on November 5, 1957 indicated the extent of Russian competency in rocket technology. Such demonstrated capability was much greater than generally believed by the American public and thereby caused intensive and wide-ranging reactions by the United States. These immediate activities in late 1957 and early 1958 culminated in passage of the National Aeronautics and Space Act of 1958 by both houses of Congress on July 16, 1958.

While the debate was underway in Congress on the proposed legislation for the Act, significant institutional changes were implemented by the Executive Branch with a view toward taking measures to assure that the progres of space-related activities were acclerated. These changes included the establishment of the Special Assistant to the President for Science and Technology and Technology (November 7, 1957) and the establishment

of the Advanced Research Projects Agency in the Department of Defense (February 7, 1958).

Congressional hearings began on November 25, 1957 and continued through January 23, 1958 to inquire into the National Space and Missile Programs by the Preparedness Investigating Subcommittee of the Senate Committee on Armed Forces. Subsequently, special committees were established in both the Senate and House of Representatives to focus on the inquiry into the national policy for the space program. Numerous bills were introduced in the Congress in early 1958, each designed to meet the problems introduced by the SPUTNIK events.

In parallel with the Congressional inquiry, the Administration undertook the task of formulating draft legislation for the national space program. The proposed legislation was sent to Congress on April 2, 1958. At that time there was generally universal concensus among the American public that the United States should have an organized and accelerated national space program. The fundamental policy issue debated throughout the country was the extent of civilian orientation and organization of the space program in light of the national security considerations brought about by the potential threat from the Soviet Union.[1]

---

[1]For a thorough analysis of the National Space Program problems and issues before Congress in late 1957 and early 1958 see: Alison Griffith, The National Aeronautics and Space Act: A Study of the Development of Public Policy, (Washington: Public Affairs Press, 1962). Ch. 6.

The alternatives considered by the Nation included:

-- A coordinated civilian-military orientation and institutional approach, or a

-- Civilian-only orientation and institutional approach, or a

-- Military-only orientation and institutional approach.

The Congress amended the Administration draft legislation and passed the National Aeronautics and Space Act of 1958. President Eisenhower signed the Act (Public Law 85-568) on July 29, 1958. The basic institutional arrangements established by the Act include:

-- The National Aeronautics and Space Council

-- The National Aeronautics and Space Administration

-- Civilian-Military Liaison Committee

The significance of the National Aeronautics and Space Act of 1958 is the fact that this Nation, notwithstanding the Soviet threat to national security, adopted the alternative of establishing a national space program to implement the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind. Manifestations of this policy can be seen in the stark contrast of the "open society" space program approach employed by the United States as opposed to the "closed society" space program approach used by the Soviet Union.

The activities of the National Aeronautics and Space Administration since 1958 have created a broad spectrum of space technological building blocks. These brilliantly successful achievements have fostered international cooperation for the use of such technology in practical applications which are devoted to peaceful purposes for the benefit of all mankind. Among several techniques is that of satellites for telecommunications purposes. Successful feasibility demonstration experiments were conducted after 1958 which indicated the promising potential of communications satellite technology.

The open national policy issue facing the United States in the early sixties was what institutional arrangements (government and private) should be established to promote the use of communications satellites.

THE COMMUNICATIONS SATELLITE ACT OF 1962

President Kennedy on July 24, 1961 in a statement on Communication Satellite Policy declared that:

> "Science and technology have progressed to such a degree that communication through the use of space satellites has become possible. Through this country's leadership, this competence should be developed for global benefit at the earliest practicable time.
>
> To accomplish this practical objective, increased resources must be devoted to the task and a coordinated national policy should guide the use of those resources in the public interest.
>
> I again invite all nations to participate in a communication satellite system, in the interest of world peace and closer brotherhood among peoples throughout the world. [2]

---

[2] President Kennedy's statement to the Congress on Communications Satellite Policy, July 24, 1961.

This enlightened policy objective formulation by the Executive Branch, brought about by the steady progress in space activities since 1958, provided the impetus for Congressional hearings held in August 1961 and the Administration draft legislation submitted to Congress on February 7, 1962.

The Administration's proposal called for the establishment of a privately owned Communications Satellite Corporation. During the Congressional debate, another alternative was considered which would call for establishment of a Communications Satellite Agency as a Government agency. After extensive hearings and debate, the legislation was passed by the Senate and by the House of Representatives after resolving the issue in favor of a commercial enterprise approach.[3]

President Kennedy signed the Communications Satellite Act of 1962 (Public Law 87-624) on August 31, 1962.

From the above one can see that again the United States adopted a forward-looking and enlightened policy for the sharing with other nations the benefits of space technology and, in this case, the sharing of a global commercial communications satellite system.

---

[3]The legislative history of the Communications Satellite Act of 1962 can be derived in part from the following documents

(a) U.S., Congress, , Committee on Commerce, Communications Satellite Act of 1962, Report No. 1584, th Cong., Sess., 19 .

(b) U.S., Congress, House, Committee on Government Operations, 12th Report, Government Operations In Space (Analysis of Civil-Military Roles and Relationships), Report No. , th Cong., Sess., 1964.

The establishment of these legislative mandates provided the basic policy framework for conduct of the national program in satellite communications. A look will now be taken of the basic technological building blocks which can be added to the existing telecommunications facilities (tools) and thereby achieve enhanced service.

TECHNOLOGY

The all-pervasive nature of telecommunications -- its uniqueness in support of basic mission functions at all levels of government and its versatility in support of the fundamental needs of the private sector -- attest to the significance of the role of telecommunications in today's society.

The dominant characteristic of the "communications revolution" is the rapidity with which it is surging ahead in many directions at once. The "explosive" nature of technological growth is illustrated by the spectacular innovations achieved since World War II in electronics (transistors, integrated circuits, computers, lasers, millimeter waveguides) and space (communications satellites).

This section is intended to highlight the principal technological innovations which contribute to communications satellite technique and to project the trends of such technology into the late 1970's.

Evaluation of Space and Electronics Technology -- The decade of the Sixties saw the creation of sophisticated technological innovations which created practical apparatus for use in the non-atmospheric realm of space. This flow of technological building blocks for space involved a wide-ranging spectrum of scientific disciplines on a scale of unprecedented magnitude.

The booster and guidance technology developed in the military rocket and missile efforts of the Fifties provided the basic capability for placing useful payloads into earth orbit.[1] Further development was pursued in the Sixties to increase the weight-carrying capabilities of boosters and to improve the accuracy of guidance systems. Major contributions to the growth of space technology have been made by innovations in materials, turbo-machinery, miniaturized electronic components, computers, sensors and inertial gyros, to mention only a few.

The spectacular pace of electronic technology since World War II has produced a vast number of practical applications which have contributed to benefit society. The growth of electronic technology was brought about by innovations such as transistors, solid state devices, integrated circuitry, hi-speed computers, color television, radar, portable radio-telephone, etc. These achievements enabled equipment

---

[1] An appreciation of the extent of the technical contributions can be seen in an article by: Schwiebert, Ernest C., "USAF's Ballistic Missiles - 1954-1964, A Concise History, "Air Force & Space Digest, XXXXVII, " (May, 1964), 51-176.

to be used for more effective telecommunication, transportation and the conduct of government and private enterprise.[1]

The growth of Space and Electronics technology has been brought about in large measure by the management revolution pioneered by the United States. The systems management technique has enabled large government and private industry organizations to successfully develop and use extremely complex and sophisticated space and electronic systems.[2] The overall state of the art of technology in Space is almost beyond comprehension. A brief review of a recently published encyclopedia helps to give one a composite view of space technology.[3]

Communications Satellite Experiments -- The decade following the December 18, 1958 Project SCORE success was a period of intensive activity in demonstrating the feasibility of using space for telecommunications purposes. Experiments in communications satellite technology prior to the Act of 1962 involved SCORE; COURIER; RELAY 1 and

---

[1]An appreciation of the impact of electronics on the nation can be derived, in part, by a review of the annual report to Congress of the Federal Communications Commission.

[2]The achievements of the National Aeronautics and Space Program are highlighted yearly in the President's Report to the Congress. See: U. S., President, 1963-69 (Johnson), Report to the Congress from the President of the United States, United States Aeronautics and Space Activities, 1967, 66, 67, Executive Office of the President, National Aeronautics and Space Council, (Washington: U. S. Government Printing Office, 1965, 1966, 1967).

[3](McGraw Hill Encyclopedia on Space)

TELSTAR I Subsequent experiments included RELAY II, TELSTAR II, SYNCOM II and III, Applications Technology Satellite ATS-1 and ATS-3.[1]

The principal technical breakthrough on which the practical applications of communications satellites are presently based include the following satellite building blocks:

-- Conversion of solar energy into power for operating electronic equipment (VANGUARD I)

-- Active (microwave) repeater (TELSTAR, RELAY)

-- Stabilized platform (SYNCOM II)

-- Synchronous Altitude Geostationary orbit (SYNCOM III, ATS-1)

-- High Gain (DESPUN) Antenna (ATS-1 and 3)

The specific telecommunications experiments from the latest NASA satellite ATS-3 include:

(a) Mechanically despun antenna

(b) VHF air-ground communications

(c) VHF electrically despun antenna

(d) SSB/PM multiple-access

(e) TDM multiple-access

---

[1] For a resume of the experiments conducted by NASA, see: America In Space/The First Decade -- Putting Satellites to Work by William R. Corliss, National Aeronautics and Space Administration, 1 October 1968.

Pending experiments by NASA include the ATS-E last of the initial generation ATS series and the second generation series ATS-F & G. ATS-E is a satellite designed to be placed in a geostationary orbit and employs gravity-gradient stabilization with mico-thrusters for station keeping and will contain telecommunications experiments for (a) UHF (L-Band) air to ground Communications (b) four and six GHz, (c) millimeter wave propagation experiment (15.3 & 31.65 GHz), and (d) SSB/PM multiple-access. Tentatively, the ATS-F (1972 launch) will contain telecommunications experiments which include:

(a) Deployment and pointing of large antenna (30 ft.)

(b) Television Broadcast

(c) Communications with many aircraft simultaneously, orbiting spacecraft and small ground terminals

(d) Investigation of radio interference.

The dollar value of the communications satellite experiments conducted by NASA are shown in Table 1.

	RELAY	SYNCOM*	ATS**
Total Cost of Satellite Experiments (No launch vehicle costs)	$33.6	$21.0	$ 25-30.0

($ in Millions)

Table 1
NASA Expenditures

Communications Satellite Experiments

* Does not include ground network provided by DOD
** Pro fate for communications experiments.

Trends in Communications Satellite Technology -- The status of Communications Satellite technology at the close of the first decade (1968) is derived from the composite capability of the actual hardware embodied in the ATS-3, INTELSAT III, and the Standard 97' earth station used in INTELSAT and the Airborne Terminals (VHF) used with the ATS satellites.

The next generation of satellites to be used in the global system INTELSAT IV (1971) represents another significant growth in capability brought about by the increased launch vehicle capability, the use of steerable "spot" beams, increased effective isotropic radiated power (EIRP) and longer lifetime.

Forecasts of communications satellite capability in the post 1975 time period envision larger satellites having multiple "spot" beams, multiple reuse of the allocated frequency band, automatic station keeping, efficient solid state high-powered transponders, and small, medium and large sized earth stations using digital multiple access modulation methods with electronically steered antennas.

A comparison of the capability of communications satellite technology is shown in table 2.

	1965 INTELSAT I	1969 INTELSAT III	1971 INTELSAT IV	Post 1975 INTELSAT X
SIZE	28.4"dia. 23.5 high	56" dia. 41" high	93" dia. 193" high	larger
WEIGHT IN ORBIT	85#	∿280 #	∿ 1050 #	2500 +
STABILIZATION	SPIN	SPIN	SPIN	3 AXIS
PRIME POWER D. C. Watts	33	125	∿ 550	2,000 +
NO. OF TRANSPONDERS	2	2	12	20+
NO. OF SPOT BEAMS	0	0	2	10+
PERFORMANCE				
EIRP (WATTS)	6	?	EC 3000 SPOT 200	EC 10,000+ SPOT 1,000+
BANDWIDTH (MHZ)	2 x 136	2X250	12 x 37	5000(EQUV)
DUPLEX VOICE CIRCUITS	240	1200	5000+	5000+
TV CHANNELS	1	2	12	120
LIFETIME YEARS (EST)	1-1/2	5	7	10+

Table 2

Summary

CHARACTERISTICS OF COMMUNICATIONS SATELLITES

(GROWTH IN CAPABILITY)

ORGANIZING FOR THE TASKS

The National Aeronautics and Space Act of 1958 and the Communications Satellite Act of 1962 specified certain institutional arrangements for the accomplishment of functions required to meet the objectives of the Acts. This section treats the background and evolution of the principal organizations which were subsequently established by the United States including the creation of the unincorporated joint venture, the International Telecommunications Satellite Consortium. These organizations working closely together since 1964 have achieved positive results in establishing the Global Commercial Communications Satellite System.

National Aeronautics and Space Council -- The National Aeronautics and Space Act of 1958 recognized the need for a top-level national space program policy coordinating framework and accordingly directed the establishment of the National Aeronautics and Space Council. The Act, as amended, declares:

> 'SEC 201 (a) There is hereby established, in the Executive Office of the President, the Natinnal Aeronautics and Space Council (hereinafter called the "Council") which shall be composed of --
>
> (1) the Vice President, who shall be Chairman of the Council;
>
> (2) the Secretary of State;
>
> (3) The Secretary of Defense;
>
> (4) the Administrator of the National Aeronautics and Space Administration; and

(5) the Chairman of the Atomic Energy Commission.

(e) It shall be the functinn of the Council to advise and assist the President, as he may request, with respect to the performance of functions in the aeronautics and space field, including the following functions:

(1) survey all significant aeronautical and space activities, including the policies, plans, programs, and accomplishments of all departments and agencies of the United States engaged in such activities;

(2) develop a comprehensive program of aeronautical and space activities to be conducted by departments and agencies of the United States;

(3) designate and fix responsibility for the direction of major aeronautical and space activities;

(4) provide for effective cooperation among all departments and agencies of the United States engaged in aeronautical and space activities, and specify, in any case in which primary responsibility for any category of aeronautical and space activities has been assigned to any department or agency, which of those activities may be carried on concurrently by other departments or agencies; and

(5) resolve differences arising among departments and agencies of the United States with respect to aeronautical and space activities under this Act, including differences as to whether a particular project is an aeronautical and space activity. [1]

---

[1] U. S. Laws, Statutes, etc., National Aeronautics and Space Act of 1958, as amended, Public Law 85-568, 89th Cong., 1st Sess., 1965, p.

National Aeronautics and Space Administration -- The revision of the National Aeronautics and Space Act of 1958 which established the National Aeronautics and Space Administration reads as follows:

> "SEC. 202. (a) There is hereby established the National Aeronautics and Space Administration (hereinafter called the "Administration"). The Administration shall be headed by an Administrator, who shall be appointed from civilian life by the President by and with the advice and consent of the Senate. Under the supervision and direction of the President, the Administrator shall be responsible for the exercise of all powers and the discharge of all duties of the Administration, and shall have authority and control over all personnel and activities thereof."[1]

NASA was established as a government organization in the Executive Branch of the Government and formally began functioning on October 1, 1958.[2] The then existing National Advisory Committee of Aeronautics organization provided the nucleus of the new NASA. Other research and development establishments of the U. S. Navy and U. S. Army were transferred to NASA.

The principal functions of NASA include:

> SEC. 203. (a) The Administration, in order to carry out the purpose of this Act, shall -
>
> (1) plan, direct, and conduct aeronautical and space activities;

---

1 U. S., Congress, National Aeronautics and Space Act of 1958, as Amended, Public Law 85-568, 89th Congress, 1st Sess., 1965, pp. 3, 4.

2 For a treatment of the establishment and early history of NASA see "An Administrative History of NASA, 1958-1963."

(2) arrange for participation by the scientific community in planning scientific measurements and observations to be made through use of aeronautical and space vehicles, and conduct or arrange for the conduct of such measurements and observations; and

(3) provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof.[1]

The early years of NASA were a period of intensive growth in both organization and facilities. In addition to expanding the existing NASA and Army facilities new launch sites, range sites and centers were built. The following organizations comprise the National Aeronautics and Space Administration:

-- Headquarters NASA

-- Ames Research Center

-- Flight Research Center

-- George C. Marshall Space Flight Center

-- Goddard Space Flight Center

-- Jet Propulsion Laboratory

-- Langley Research Center

-- Launch Operations Center

-- Lewis Research Center

-- Manned Spacecraft Center

---

1 U. S., Congress, National Aeronautics and Space Act of 1958, Public Law 85-568, 89th Congress, 1st Session, 1965, p. 4.

-- Pacific Launch Operations Office

-- Wallops Station

-- Electronics Research Center

The scope of NASA's space activities can be seen in the size of the annual budget shown in Table 3.

Manned Space Flight	$3538.5	4210.2	3648.7	3166.0	2993.3
Scientific Investigations	661.6	664.1	673.7	562.5	497.6
Space Applications	89.0	113.6	127.8	135.4	146.6
Space Technology	484.0	435.4	440.4	420.2	425.3
Supporting Operations	261.6	434.6	452.3	408.4	392.4
TOTAL	$5035.0	5857.9	5336.7	4692.0	4455.0
FISCAL YEAR	1965	1966	1967	1968 Est.	1969 Est.

$ in MILLIONS

Table 3

Space Activities Expenditures[1]

National Aeronautics and Space Administration

---

1 U.S., President, 1963-69 (Johnson), Report to the Congress from the President of the United States, United States Aeronautics and Space Activities, 1965, 66, 67, Executive Office of the President, National Aeronautics and Space Council, (Washington: U. S. Government Printing Office, 1967, 1966, 1967).

Communications Satellite Corporation --The Communications Satellite Act of 1962 authorized the creation of "a communications satellite corporation for profit which will not be an agency or establishment of the United States Government."

The functions of the communications satellite corporation identified in the Act include:

> SEC. 305. (a) In order to achieve the objectives and to carry out the purposes of this Act, the corporation is authorized to-
>
> (1) plan, initiate, construct, own, manage, and operate itself or in conjunction with foreign governments or business entities a commercial communications satellite system;
>
> (2) furnish, for hire, channels of communication to United States communications common carriers and to other authorized entities, foreign and domestic; and
>
> (3) own and operate satellite terminal stations when licensed by the Commission under section 201 (c)7 .
>
> (b) Included in the activities authorized to the corporation for accomplishment of the purposes indicated in subsection (a) of this section are, among others not specifically named-
>
> (1) to conduct or contract for research and development related to its mission;
>
> (2) to acquire the physical facilities, equipment and devices necessary to its operations, including communications satellites and associated equipment and facilities, whether by construction, purchase, or gift;
>
> (3) to purchase satellite launching and related services from the United States Government;
>
> (4) to contract with authorized users, including the United States Government, for the services of the communications satellite system; and

(5) to develop plans for the technical specifications of all elements of the communications satellite system.[1]

The Incorporators were appointed by President Kennedy on October 15, 1962, to establish the communications satellite corporation provided for in the Act.

The Communications Satellite Corporation operated and borrowed funds from the time of its incorporation until the first stock issue.

> ... The stock issue consisted of 10 million shares at $10 a share, and net proceeds to the Corporation amounted to approximately $196 million. Under the provisions of the Communications Satellite Act of 1962, half of these shares were sold to approximately 165 authorized communications common carrier companies and the other half of the shares were distributed by a nationwide group of underwriting firms in a manner encouraging the widest distribution to the American public. The result was nearly 140,000 individual shareholders of record.[2]

The COMSAT organization has had a steady growth in size and plant facility since its incorporation in 1963, as shown in Table 4.

No. of Employees	-	138	310	553	770	~1150
Sq. ft. Facilities	--	--	--	104,000	110,000	255,000
	1963	1964	1965	1966	1967	1968

Table 4
EMPLOYEES AND FACILITIES
COMMUNICATIONS SATELLITE CORPORATION

[1] U.S., Congress, Communications Satellite Act of 1962, Public Law 87-624, 87th Cong., 1st Sess., 1962, p. 7.

[2] First Five Years, COMSAT Corporation

International Telecommunications Satellite Consortium (INTELSAT) -- International telecommunications were provided principally by high frequency radio and submarine cable means prior to the arrival of communications satellite technology. The classical institutional framework for such service was by bilateral agreement between nations involving communications common carriers (government or private entities).

The advent of the communications satellite and its potential for enhancing international telecommunications presented a challenge to American ingenuity for organizational innovation. Rather than choosing the alternative to continue the bilateral agreement approach, new international institutional arrangements involving multilateral agreements with a large number of nations was selected as the desirable approach. This approach seemed to be consistent with the profound international implications of a global Communications satellite system.

Shortly after President Kennedy signed the Communications Satellite Act of 1962, discussions began with Canadian and European countries with a view to examining ways to foster international cooperation in establishing the global communications satellite system. Widespread interest was found in the possibilities of scientific and industrial participation in the global system. These discussions intensified in 1963 and early 1964 and were broadened to countries in other regions of the world.

Finally in 1964, the United States concluded negotiations and reached agreements with foreign governments and their designated communications entities which established Interim Arrangements for a Global Commercial Communications Satellite System. The President's Annual Report to Congress for the Year 1964 treated these activities as follows:

> ...As a result of extensive discussions with European countries, Canada, Japan, and Australia, two Agreements establishing a global communication satellite system were concluded at a Conference held in Washington in July 1964. These Agreements came into force on August 20, 1964. One Agreement, intergovernmental in character, is entitled, "Agreement Establishing Interim Arrangements for a Global Commercial Communication Satellite System." It established the principle that a single commercial system should be set up forthwith; that it be expanded to provide world coverage as soon as possible; and that it be available to all nations of the world on a non-discriminatory basis... Each government signatory to the Agreement will participate or designate a communications entity, either governmental or private, to be its participant in this system. The United States has designated the Communications Satellite Corporation as its entity.
>
> The Agreement established an Interim Committee, charged with overall responsibility for the global system, and named the Communications Satellite Corporation as the Manager to run the system on behalf of all participants in the venture.
>
> Each government or its entity will contribute a certain percentage of the capital funds -- its "quota" -- required for the space segment (the satellites and associated ground control environment) of the system. As new countries come in, they will be assigned a quota and the ownership percentage of the existing participants will be reduced pro rata. Each country or group of countries with a quota of 1-1/2 percent or more is entitled to a representative on the Interim Committee.

Any state which is a member of the International Telecommunications Union (ITU) may sign the Agreement within six months of August 20, 1964, on the same terms as the original signatories. After the expiration of the six months' period, any state which is a member of the ITU may accede upon financial conditions determined by the Committee. These features preserve the open-ended character of the Agreement and assure that any state in the ITU which wishes to participate in the ownership of the space segment may do so.

It is not, however, necessary to be a co-owner in order to have access to the system. The Agreements provide for access by non-owners as well.

The Committee has the power of approval of access of ground stations to the satellite system for co-owners as well as for authorized communications entities of countries that wish such access but do not wish to contribute to the capital cost of the space segment. Use of the system by such non-ownership entities will be on an equitable and non-discriminatory basis.

The second Agreement -- the "Special Agreement" -- describes the functions and procedures of the Committee, its operational policies, methods of procurement for the system, and financial arrangements, including charges for satellite use. It describes the relationship between the Committee and the Communications Satellite Corporation which acts as manager of the system. The Special Agreement remains in force so long as the intergovernmental Agreement is in force.

Voting in the Committee will be in proportion to quotas. The United States Communications Satellite Corporation has an initial quota of 61%. As additional participants become signatories to the Special Agreement, this quota, as well as the quota of other signatory countries, will be reduced pro rata as necessary. The quota of the United States Communications Satellite Corporation, however, would not be reduced below 50.6 percent.

> The Act provided that the Committee shall endeavor to act unanimously; failing unanimity, it may act by majority vote except for fourteen categories of decision for which a special voting procedure is required. These special categories involve major decisions in such matters as the choice of type or types of the space segment, procurement, satellite launching budgets, and satellite charges.
>
> These Agreements represent a major accomplishment in the establishment of a global commercial satellite system and are in accord with the declaration of policy and purpose stated in the Communications Act of 1962. They provide for a single commercial satellite system to be established as soon as practicable on a global and non-discriminatory basis. The system will be a part of an improved global communications network which will provide telecommunicatinn service to all areas of the world.[1]

The INTELSAT organization had had a steady growth and presently has sixty-three members. See appendix Tab F for a list of the nations and designated entities. The Interim Communications Satellite Committee (ICSC) has met thirty-five times since the first meeting began on September 29, 1964. See appendix Tab G for a list of the current members of the ICSC.

Coordination of Executive Branch Activities

The provisions of the Communications Satellite Act of 1962 assigned various functions to the President of the United States. President Johnson by Executive Order 11191, January 4, 1965 delegated certain functions to the Director of Telecommunications Management and the Secretary of State in order to promote implementation of the Act.

---

1 U.S., President, 1965-1969 (Johnson) Report by the President of the United States on Activities and Accomplishments Under the Communications Satellite Act of 1962, January 1 - December 31, 1964, (Washington: U. S. Government Printing Office, 1964), pp. 3, 4, & 5.

UNITED STATES CONTRIBUTIONS TO INTERNATIONAL COOPERATION

The public throughout the world is generally uninformed about the United States contributions to the promotion of International Cooperation, particularly in the field of satellite communications. This situation happens because the primary focus and interest in the U.S. and USSR space programs has been directed toward the spectacular achievements in the manned projects and the outer space probes. This section highlights the principal contributions of this nation towards enhanced International Cooperation.

Management Leadership -- The cornerstone of the U.S. contribution is management leadership. The unprecedented advances in communications satellite technology and in implementing the INTELSAT system were realized in large measure by management innovations developed by United States Government and Industry ingenuity and teamwork.

The degree of United States leadership is emplified by the overall achievements of the National Space Program in particular projects MERCURY, GEMINI, APOLLO, SURVEYOR , PIONEER, TIROS, Lunar Orbiter.

A specific example of United States leadership can be seen in the policy established in the National Aeronautics and Space Act of 1958 which established of "cooperation by the United States with other nations, and groups of nations in work done pursuant to this act and

in the peaceful applications of the results thereof". Implementation of this national policy has resulted in a NASA program of international cooperation which involves 73 nations participating in numerous space projects. International cooperation ranges from (a) the provision of launch and range services for the placing in earth orbit various scientific satellites developed by other nations (b) the direct participation by other nations in NASA scientific experiments and (c) the provision of technical personnel exchange.

Another example of United States leadership can be seen in the promotion of communications satellite technology for international telecommunications purposes. In less than five years after the start of the space age (October 1957), the United States promoted the practical use of space by passage of the Communications Satellite Act of 1962. An important management innovation was formulated by the Act in that the establishment of the commercial communications satellite system, as part of the improved global communications network would be accomplished by a private commercial corporation supported by the Government of the United States. The ability of the United States to cope with new and revolutionary technological innovations by creating new and novel institutional arrangements is illustrative of the management leadership of the nation.

The management innovation of creating the Communications Satellite Corporation coupled with the provision of government support, especially by NASA for launch services, provided the framework for accomplishment of the industrial effort needed to establish a global commercial communications satellite system.

The final example of United States leadership relates to its successful efforts to sponsor the creation of the International Telecommunications Satellite Consortium (INTELSAT) in 1964, and its subsequent promotion and support of the organization. At the invitation of the United States, a conference was held in Washington, D. C in _____and August, 1964, during which multilateral negotiations were held with European countries, Canada, Japan and Australia for the purpose of obtaining an agreement on the arrangements to be established for international cooperation in satellite communications.

The agreement between the United States of America and other Governments and the Special Agreement concluded by Certain Governments and Entitites Designated by Governments done in Washington, D. C., August 20, 1964, (TIAS 5646) is a multilateral agreement establishing Interim Arrangements for a Global Commercial Communications Satellite System. These agreements, in large measure formulated by the United States Government and private industry contributions, called for the establishment of an unincorporated joint venture (commercial business) consortium among nations of the world who desired to participate in the establishment and operation of a global commercial communications satellite system.

This exemplary model of industry-government teamwork has provided the leadership for meeting the objectives of the Act in serving the communications needs of the United States and other countries which will contribute to world peace and understanding.

It is interesting to note in a careful reading of the agreement that many of the basic policy objectives adopted by the United States in the Communications Satellite Act of 1962, are also contained in the agreement establishing the Interim Arrangements. The agreement recognized the pre-eminent position of the United States in communications satellite technology by the designation of the Communications Satellite Corporation to act as manager in the design, development, construction, establishment, operation and maintenance of the space segment. The record contained files on the Interim Communications Satellite Committee meetings and provided the basic facts which show the extent of United States Industry/Government team leadership toward the unparalleled success of the INTELSAT organization. The success of the organization toward establishing the global system has been in large part the direct result of the ComSat Corporation and U. S. industry contribution coupled with the support provided by NASA in launching INTELSAT satellites.

Space Technology, Launch Services and Range Support

The second important ingredient of United States contributions to international cooperation is that of providing the means for fostering the use of space in practical applications to benefit mankind. This section identifies some of the specific contributions the nation has made in promoting international cooperation.

o Space Technology

The broad range of space technology which has been developed by the United States is almost beyond comprehension,[1]

The basic growth in space capability has been brought about by the development of a wide range of launch vehicles. These developments have enabled the nation to increase greatly the weight of spacecraft that can be placed in earth orbit.

Paralleling the growth in launch vehicle capability has been the ability to develop more sophisticated spacecraft both manned and unmanned having greater performance and increased reliability. Electronics technology particularly has provided the means for accomplishing more intricate maneuvers in space and the means for the transmission of more information from the spacecraft to the global control network.

---

[1] The vast extent of the technology developed by the nation under the National Space Program can be appreciated by reviewing a recent encyclopedia of space. See The McGraw-Hill Encyclopedia of Space, 1968.

o Launch Services

The United States National Space Program has developed a family of launch vehicles for the orbiting of manned and unmanned spacecraft of a wide variety. Selected launch vehicles of this family have been made available to nations desiring to place research satellites in orbit as a part of the NASA International Programs. Furthermore, the INTELSAT satellites have been launched by launch vehicles developed by the United States.

-- NASA International Program

Under this program NASA has provided launch services for a number of cooperative sate lite projects where research satellites of other nations were placed in orbit by U. S. developed launch vehicles. Some of the typical projects receiving NASA launch assistance are shown in Table _____.

Country	Project	Booster	Date	Location
Canada	Alouette I	Thor-Agena B	Sept. 29, 1962	WTR
Canada	Alouette II	Thor-Agena B	Nov. 29, 1965	WTR
France	FR-1	Scout	Dec. 6, 1965	WTR
Italy	San Marco I	Scout	Dec. 15, 1964	Wallops Island
Italy	San Marco II	Scout	Apr. 26, 1967	Indian Ocean
UK	Ariel I	Delta	Apr. 26, 1962	ETR
UK	Ariel II	Scout	Mar. 27, 1964	Wallops Island
UK	Ariel III	Scout	May 5, 1967	WTR
ESRO*	ESRO I	Scout	(planned	WTR
ESRO	ESRO II	Scout	May 16, 1968	WTR
ESRO	HEOS-A	Delta	Dec. 5, 1968	ETR

* European Space Research Organization

Table _____
Cooperative Satellite Projects
NASA International Programs

-- NASA Launch Services for INTELSAT

NASA provides launch services to COMSAT acting as Manager for INTLESAT. A launch services agreement between NASA and COMSAT was approved by both parties on September 17, 1968. This agreement for INTELSAT III Launch services provides, in part, the following:

NASA Responsibilities -- NASA's responsibilities under the launch services arrangements for INTELSAT III are to procure and test launch vehicles; provide facilities and support for pre-launch integration; assure that the launch vehicles have been thoroughly qualified for flight; schedule and assure that services such as telemetry and tracking data are provided for each launching through injection of the spacecraft into an elliptical transfer orbit; to assure that safety aspects of launchings are considered; provided Baker-Nunn camera coverage of the apogee motor firing, where possible; provide supporting studies and analysis as requested by COMSAT;

COMSAT Responsibilities - COMSAT responsibilities in connection with the INTELSAT III launch, are to provide for the design, development, and test of the INTELSAT spacecraft; perform all spacecraft pre-launch tests at the Eastern Test Range (ETR); notify NASA in writing, prior to launch, that the spacecraft has been successfully tested in accordance with qualification and acceptance test plan; provide and operate U. S. earth stations to meet COMSAT's requirements for communications, tracking, command, polarization measurements, and telemetry reception for use after injection into elliptical orbit; to fire the apogee motor and place the satellite into a circular earth synchronous orbit. COMSAT also determines mandatory launch criteria for the spacecraft and supporting stations.

NASA has provided the launch services for the Early Bird (INTELSAT I) four INTELSAT II's and one INTELSAT III satellite launchings to date. (subject to change)

o Range Facilities

(This section tells about the global network of range facilities and the support provided the NASA International Program and the NASA support for INTELSAT)

Technical and Financial Support

The United States has made available cooperative international programs of NASA, industrial technical services and financial assistance to a large number of communications entities in other nations. This section identifies some of the specific support rendered to other nations in the area of satellite communications.

o Technical Services

-- Communications Satellite Corporation

The Technical Assistance Department of COMSAT has aided almost a dozen countries to date* in earth station planning and procurement under Technical Services Contracts.[1]

Elements of a typical contract include assistance in:

site selection;

preparation of specifications;

technical evaluation of proposals;

contract monitoring and station test and commissioning.

* Thailand, Philippines, Chile, Peru, Colombia, Venezuela, Lebanon, Jordan, Pakistan, China, Yugoslavia.

1 A compilation of COMSAT activities in this area through 1967 is contained in "Comsat's Efforts to Develop a Global Communications Satellite System which will include the Less Developed Countries, November 1967, Communications Satellite Corporation.

Typically, this assistance takes the form of a "break-even" or non-profit contract lasting about two years and providing from 30-36 man-months of engineering time. Total cost, including travel expenses, has ranged from $150 - 200 thousand dollars per country.

COMSAT has, without charge, helped 39 developing nations assess their need for satellite communication by making studies of their traffic potential and of the economic feasibility of an earth station. Such studies have provided the basis for:

(a) further detailed surveys of the economics of telecommunications in these countries;

(b) the decision by a country to build a station or share a regional one;

(c) applications to lending agencies for financial assistance.

In addition, COMSAT has prepared, on request and at no charge, 17 studies of the economics of earth stations and supplied these to the interested countries.

-- Other Industrial Organizations

As an example of technical assistance rendered by other industrial concerns, the services of Page Communications Engineers to Embratel in Brazil are relevant. Page prepared specifications for a Brazilian earth station, evaluated the responses, recommended a contractor and then supervised the performance of the contractor during

construction at _____ located _____ miles from _____. Other Page contracts that aided specific countries in planning for satellite communications include: a Feasibility Study for a National, Integrated Telecommunications Network in Chile for the Chilean Government; and an Economic and Technical Feasibility Study of terrestrial and satellite communications in Brazil for Embratel.

Many American firms have been active in supplying of earth stations around the world. The following list is representative of this activity:

Aerojet-General:	Morocco
GT&E:	Philippines, Thailand and Chile
ITT:	Spain and Indonesia
Page:	Iran, Panama, Lebanon
Philco-Ford:	Spain

These contractors all utilized modern earth station technology, available in the U.S.A., to design and construct these facilities.

-- Conferences on Satellite Technology

a. In May 1966, a "United States Seminar on Communications Satellite Earth Station Technology" was held in Washington. 45 lectures were given over a two-week period to representatives from countries all over the world.

b. In addition to familiarizing the attendees with the state-of-the-art in U. S earth station technology, the Seminar provided information to aid in the planning, design, construction, procurement, operation and maintenance of earth stations.

b. The American Institute of Aeronautics and Astronautics(AIAA) has held two communications satellite conferences. These conferences, the first in Washington in 1967 and the second in San Francisco in 1968, were well attended by U. S. and foreign engineers, executives and managers in the satellite field. Information supplied at these conferences was undoubtedly of great help in the planning of earth stations in other countries.

o Financial Assistance

-- Financed largely by U. S. funds, and studied by U. S. engineering firms and experts, the Inter-American Development Bank has sponsored three studies that included an appraisal of satellite communications -- both internal and international -- for Latin America.

The first was a Satellite Communication Study of South America during 1966. This study had as its purpose, to determine the technical and economic feasibility of using satellite communications to enhance the growth of regional and international telecommunications networks in South America.

This was followed in October 1967 by a report that gave specifications for the Inter-American Telecommunications Network (ITN). While not directed specifically at satellite communications, the requirements set forth are those that must be met by any communications means and hence the Report will be of great utility when satellites are considered as elements of the ITN.

In June 1968, the Bank issued a third report on the subject: "A Feasibility Study for the ITN." This Report specifically considered satellite systems as elements of the ITN, and the impact of space communications on South American requirements and networks.

-- The Export-Import Bank of the United States has financed the construction of earth stations in various countries around the world. The specific countries and the amount of credits authorized for each are given in the following table:

Country	Amount of Credit
Brazil	$2,435,505
Chile	5,362,500
Korea	3,680,000
Morocco	4,200,000
Pakistan (2 stations)	9,000,000
Spain	5,893,430
Spain	1,224,000
Thailand	4,000,000
	$35,795,435

All of the above credits bear interest at the rate of 6% per annum and are repayable in 16 semiannual installments beginning approximately two years after completion of construction of the station with the exception of the Pakistani credit which is payable in 15 semiannual installments and the $1,224,000 Spanish credit which is payable in 10 semiannual installments.

Eximbank also has recently received applications from the Government of Iran for a credit in the amount of $4,450,000 for a satellite station; one from Lebanon in the amount of about $3.1 million; and an application from Thailand for a second antenna in the amount of about $2.7 million.

In addition to the foregoing Eximbank has indicated a willingness to consider applications for earth satellite stations in Malaysia, Venezuela, Greece and Colombia.

INTERNATIONAL COOPERATION ACCOMPLISHMENTS

In the realm of promoting International Cooperation, the United States encouraged the nations of the world to undertake cooperative scientific experiments in space technology within the frame work of the National Aeronautics and Space Act of 1958, and to participate in establishing the global communications satellite system within the guidelines of the Communications Satellite Act of 1962. These collective efforts have achieved brilliant successes in International Cooperation while advancing the state of the art in Space Technology.

NASA INTERNATIONAL PROGRAMS (Research and Development Experiments) -- The National Aeronautics and Space Administration International Programs are intended to implement the United States policy established in the National Aeronautics and Space Act of 1958. The objectives, guidelines and value of the NASA International Programs are as follows:

OBJECTIVES

The International activities of the National Aeronautics and Space Administration are planned to demonstrate the peaceful purposes of space research and exploration by the United States, to provide opportunities for the participation of scientists and agencies of other countries in the task of increasing man's understanding and use of his spatial environment, and to support operating requirements for the launching and observation of space vehicles and craft.

GUIDELINES

NASA's international activities follow guidelines which recognize the interest of U. S. and foreign scientists, establish a basis for sound programs of mutual value, and contribute substantively and literally to the objectives of international cooperation. The guidelines provide for:

(1) Designation by each Participating Government of a central civilian agency for the negotiation and supervision of joint efforts.

(2) Agreement upon specific projects rather than generalized programs.

(3) Acceptance of financial responsibility by each participating country for its own contributions to joint projects.

(4) Projects of scientific validity and mutual interest.

(5) General Publication of scientific results.

VALUES

(1) Stimulation of scientific interest and technical competence abroad.

(2) Enlarged potential for contributions to the art.

(3) Access to foreign areas for measurements of global character or special geographic significance.

(4) Enhancement of satellite experiments by foreign ground-support programs.

(5) Development of cost-sharing and complementary space programs.

(6) Extension of ties among scientific and national communities.[1]

NASA's International Programs Activities falls into the following categories:

-- Cooperative Projects

Flight Projects

Satellites

Experiments on NASA satellites

Sounding Rockets

[1]U. S. National Aeronautics and Space Administration, International Programs, Prepared by the Office of International Affairs (Washington: U. S. Government Printing Office, 1968), p. ii.

Ground-Based Projects for:

Meteorological Satellites

Communications Satellites

Ionospheric Satellites

Geodetic Satellites

-- Operations Support

(Tracking & Data Acquisition Network)

Scientific Satellite (STADAN)

Manned Flight

Deep Space

Optical

Data Acquisition

-- Personnel Exchanges

Resident Research Associateships

International Fellowships

Training at Centers

NASA's International Program of Research and Development experiments using communications satellites have been a significant increment of the cooperative projects. Experiments using Telstar I, Relay I Telstar II, Syncom II, Relay II and Syncom III were conducted in cooperative projgrams.

> Eleven countries have provided ground stations for cooperative programs with the United States in the testing of U. S. experimental communications satellites since 1962. England, France, Italy, and Brazil (first operational 1962); Germany and Japan (1963); Denmark, Norway and Sweden operating a joint receiving facility, and Spain (1964); and Canada (1966). Nearly all stations have conducted experiments involving transmission of telephone, telegraph, and high speed data as well as intercontinental television experiments. [2]

---

[2] Ibid., p. 30

The Applications Technology Satellite project is also used in an International Program to conduct research and development experiments of, in part, SHF and VHF communications among cooperating ground terminals and aircraft terminals.

> The eleven nations mentioned under "communications satellites" above, plus India (which has established a ground station to work with experimental communications satellites), have been invited to participate in the communications experiments on ATS. Due to visibility limitations imposed by ATS-1 location (stationary over central Pacific) Japan currently is the only participant. Australia, through Qantas, is participating in the VHF aeronautical communications experiment using the ATS-1 VHF transponder. Germany is conducting ship experiments using ATS-3. The United Kingdom is initiating VHF aircraft and surface communications experiments using ATS-3.[3]

A table showing the scope of the NASA International Space Activities is summarized in Table 5.

[3]Ibid., p. 31

Selected Cumulative Statistics on NASA International Space Activities		
		To July 1, 1968
Total Countries which have entered into Agreements		
Cooperative Project Agreements	20 Countries **	
Tracking and Data Acquisition Agreements	21 Countries	
Total Countries in which Scientists participate in cooperative Associations		73*
Ground-Based Programs	70 Countries	
Personnel Exchanges	38 Countries **	
Total Countries ** Cooperating in some form with U. S. (NASA)		73*

*Duplications Eliminated

** Includes European Space Research Organization (ESRO)

Table 5

Summary

NASA International Space Activities[4]

[4]Ibid., p. 1

GROWTH OF THE INTELSAT ENTERPRISE -- INTELSAT, the unique International joint business venture has had a successful beginning since its establishment in 1964. The growth of member nations in the Consortium is depicted in Figure 1.

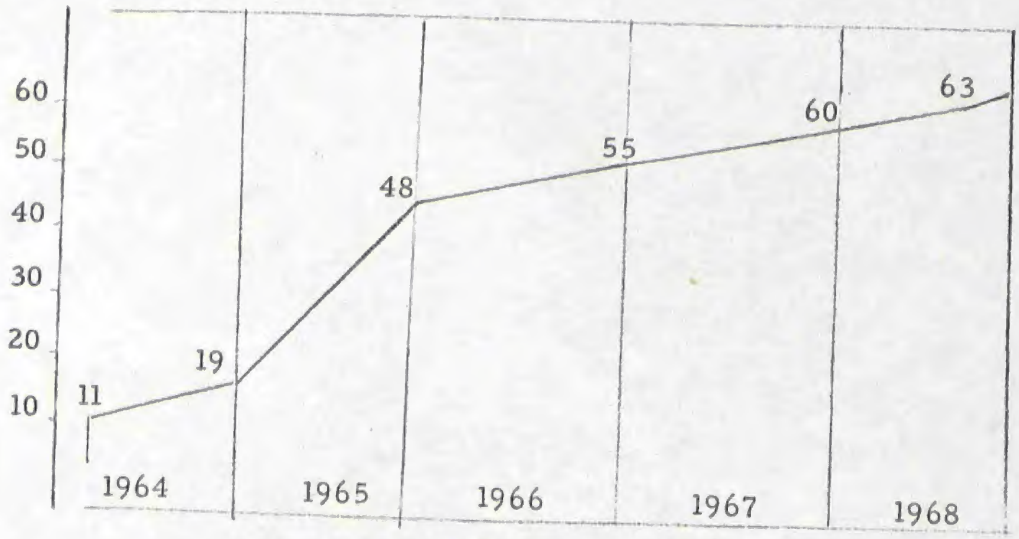

Figure 1

MEMBERSHIP
INTERNATIONAL TELECOMMUNICATIONS SATELLITE CONSORTIUM

Substantial financial investments have been made by the Consortium in capital and operating funds used to establish the space segment of the Global System. The estimated investment by INTELSAT on January 1, 1969 is shown in Table 6.

	Balance 1/1/69
INTELSAT II	$ 33,997
INTELSAT III (6)	
-Satellites	$ 30,157
-Launches	11,621
-Program Costs	1,770
-1st Mo. Incentives	2,250
-Other Incentives	--
TOTAL INTELSAT III	$ 45,798
INTELSAT IV	
- Spacecraft	$ 2,155
- TT&C	8
- Launch Costs	
Non-Recurring	--
Recurring	--
- Program Costs	1,039
- Incentives	--
TOTAL INTELSAT IV	$ 3,202
TT&C AND C&C	
In Service	$ 2,442
INTELSAT III	4,306
TOTAL TT&C AND C&C	$ 6,748
SYSTEM DEVELOPMENT	$ 19,662
TOTAL INVESTMENT	$109,407

Table 6

INTELSAT INVESTMENT (ESTIMATE)

AS OF JANUARY 1, 1969
(Thousands of Dollars)

DEPLOYMENT OF THE GLOBAL COMMERCIAL COMMUNICATIONS SATELLITE SYSTEM

The deployment of the Global Commercial Communications Satellite System by the International Telecommunications Satellite Consortium (INTELSAT) has progressed steadily since 1964. Since the Global Commercial Communications Satellite System would have to compete in the International Telecommunications market with existing submarine cable and high Frequency radio facilities, the availability of a ready market became a prerequisite for initial growth of the system.

The need for global communications capability to support the NASA APOLLO Manned Space Program became a reality in the early sixties. The United States could have taken a unilateral approach to provide a government owned communications satellite system for support of APOLLO Program, but rather offered the INTELSAT Consortium the opportunity to furnish such service on a lease basis. This important service requirement coupled with other U. S. Government requirements as well as private needs for international telecommunications service enabled the INTELSAT Consortium to begin the deployment of the global system much before the schedule contemplated at the time (August 20, 1964) the Interim Arrangements were entered into force. Interim earth stations were deployed in several foreign countries to work with a new generation INTELSAT II satellite. Accordingly, international cooperation was enhanced by the need to deploy a system in support of the APOLLO project operations.

A simplified block diagram of the Global Commercial Communications Satellite System being implemented by the INTELSAT Consortium is depicted in Appendix Tab B.

SPACE SEGMENT

The initial contract by the Communications Satellite Corporation for a communications satellite was awarded to the Hughes Aircraft Company in March 1964. On April 6, 1965, the world's first commercial communications satellite, Early Bird, was launched

from Cape Kennedy into geostationary synchronous orbit 22, 300 statute miles above the Atlantic Ocean. After extensive testing, Early Bird, later designated INTELSAT I, was placed in service on June20, 1965, with a capability of providing 240 Duplex Voice Circuits, has been providing commercial telephone, teletype, facsimile high speed data and television (monochrome and color) service between Europe and North America.

The Interim Committee at is 13th meeting in October, 1965, approved a contract with Hughes Aircraft Company for the procurement of four flight spacecraft of the INTELSAT II series. Each of the INTELSAT II series satellites has a capacity of 240 Duplex Voice Circuits with multiple access from earth stations located in the earth coverage zone of visibility. A record of the Intelsat I and II series launches is shown in Table 7.

SATELLITE	LAUNCH DATE	ORBIT LOCATION	OPERATIONAL SERVICE DATE
INTELSAT I (Early Bird)	April 6, 1965	Atlantic Ocean	June 20, 1965
INTELSAT II (F-1)	Oct. 26, 1966	12 Hour Orbit	Not Operational
INTELSAT II (F-2)	Jan. 11, 1967	Pacific Ocean	Jan. 27, 1967
INTELSAT II (F-3)	Mar. 27, 1967	Atlantic Ocean	April 7, 1967
INTELSAT II (F-4)	Sept. 27, 1967	Pacific Ocean	Dec. 15, 1967

TABLE 7
DEPLOYMENT OF INELSAT
SATELLITES

During the 16th meeting of the ICSC in March 1966, the Committee agreed that synchronous orbit satellites would be used to establish basic global coverage and also recognized that the global system may eventually require augmentation by satellites in other orbits.

The ICSC approved, at the 17th meeting in April,1966, a contract with TRW Systems for procurement of six INTELSAT III satellites and associated equipment to provide global coverage. Each of the INTELSAT III series satellites has a capacity of 1200 Duplex Voice Circuits with multiple access from earth stations located in the earth coverage zone of visibility.

The Committee agreed at its 33rd meeting in July,1968 to a schedule for launchings of INTELSAT III by NASA beginning in the Fall of 1968. The initial INTELSAT III launched on September 26, 1968 was not orbited when the launch vehicle was destroyed after approximately 70 seconds of flight. The current schedule for launch of INTELSAT III satellites is shown in Table 8.

SATELLITE	SCHEDULED LAUNCH DATE	LOCATION	PLANNED OPERATIONAL DATE
INTELSAT III	Dec., 1968	Atlantic	Jan., 1969
INTELSAT III	Jan., 1969	Pacific	Feb., 1969
INTELSAT III	May, 1969	Atlantic	June, 1969
INTELSAT III	July, 1969	Indian Ocean	August, 1969

TABLE 8

SCHEDULED
DEPLOYMENT OF INTELSAT III SATELLITES

Studies of Advanced Communications Satellites were undertaken, by the Manager on behalf of INTELSAT, on December 28, 1965 when international requests for proposals were issued for a feasibility and design study of a multi-purpose synchronous orbit communications satellite. Design study contracts were subsequently negotiated with Lockheed Missiles and Space Company and the Hughes Aircraft Company.

The final reports from these feasibility studies were submitted to the Manager in July-Aug. 1967. In summary, the studies indicated a large satellite with a 5000 Duplex Voice Circuit capacity and 7 years lifetime could be placed in synchronous orbit by mid-1970. In parallel with these studies the INTELSAT Consortium was experiencing a rapid growth of traffic in the Pacific and Atlantic Ocean areas. Projections of traffic indicated that the INTELSAT III satellite capacity would begin to reach satuation in the early 1970's. Accordingly, active planning was initiated in 1967 to determine the general characteristics of the next generation (INTELSAT IV) space segment. Based on these studies and with approval of the ICSC the Manager issued international requests for proposal, on February 8, 1968, for the INTELSAT IV series satellite.

Formal proposals were made by TRW Systems, Hughes Aircraft Company and Lockheed Missiles and Space Company during April 1968 . Subsequent evaluation reduced the field to two contractors HAC & LMSC with whom

the Manager then negotiated a firm contract. The Interim Committee during the 34th meeting in October, 1968, authorized the Manager to award a contract with Hughes Aircraft Company for six flight articles INTELSAT IV's to be delivered beginning 22 months after award of contract (October 18, 1968). A summary of the characteristics of INTELSAT IV is shown in Table 2.

One of the unique features of the INTELSAT IV is the use of stearable "Spot" beams which provide a concentration of satellite power into desired geographical areas.

The award of the contract for INTELSAT IV reflects the forward looking management approach employed by the Interim Committee. In addition, the $72.0 million contract with Hughes Aircraft calls for at least $ 19.4 million of sub-contract for equipment and services from other partners of the Consortium.

A description of each satellite and the TT&C of the INTELSAT space segment is shown in Appendix Tab C.

EARTH STATION SEGMENT --

The INTELSAT network began operations with only four earth stations when the INTELSAT I satellite was placed in commercial operation on June 20, 1965. These earth stations included Andover, Maine, Goonhilly Downs, England, Pleumeur-Bodou, France, and Raisting, West Germany.

Two classes of earth stations are used in the INTELSAT system. One of the class is a transportable 42 foot antenna terminal which has been installed, in some cases, as interim facilities pending completion of a standard earth station. The other class is the standard earth station generally of 85-95 foot antenna size. The characteristics of the earth stations are listed in Appendix Tab D.

The growth in earth station population in shown in Figure 2. As of November 1, 1968, the Interim Committee has approved 39 earth stations in 23 countries for operation with INTELSAT satellites.

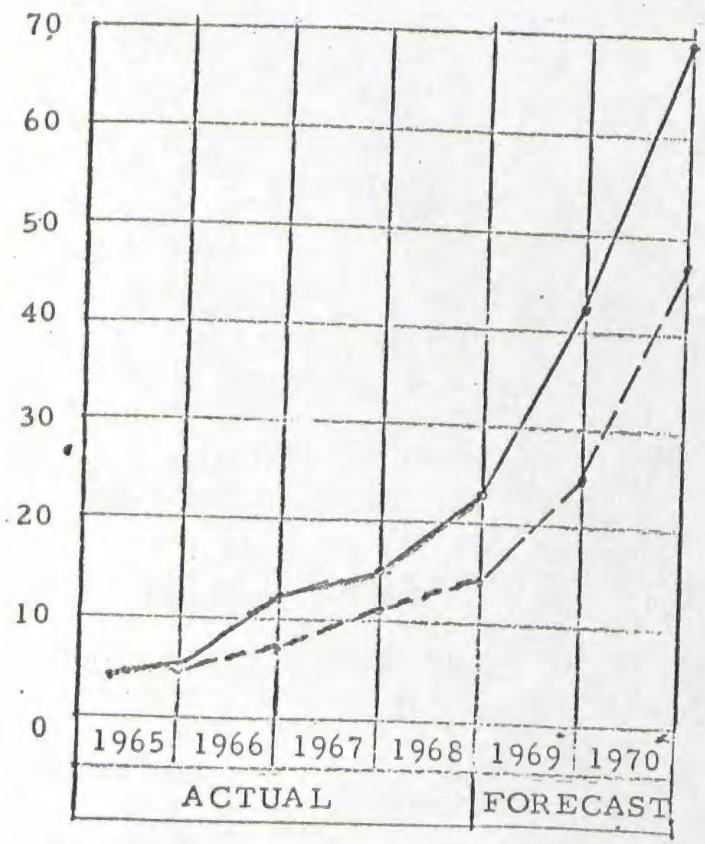

Figure 2
EARTH STATION POPULATION
INTERNATIONAL TELECOMMUNICATIONS SATELLITE CONSORTIUM

Operation of the Global System -- The INTELSAT system has had a steady growth since initial operations began on June 20, 1965. The configuration of the networks of the system has adapted as each new satellite and earth station has been added to the system. Table 9 shows the configuration of the INTELSAT networks as of Nov. 1, 1968.

SATELLITE	-- EARTH STATIONS* -
INTELSAT I EARLY BIRD	Mill Village, Canada Goonhilly Downs, England Pleumeur Bodou, France Raisting, West Germany
INTELSAT II (F-2)	Paumalu, Oahu, Hawaii Tanay, Philippines Sri Racha, Thailand
INTELSAT II (F-3)	Andover, Maine Longrilo, Chile Utibe, Panama Buitrago, Spain Funcino, Italy Grand Canary Island, Spain (42') Ascension Island, UK (42')
INTELSAT II (F-4)	Brewster, Washington Paumalu, Oahu, Hawaii Ibarabi, Japan Carnarvon, Australia (42') Moree, Australia Jamesburg, California

TABLE 9

NETWORKS CONFIGURATIONS
THE INTELSAT SYSTEM

Satellite Utilization -- The growth in satellite utilization is shown in Figure 3.

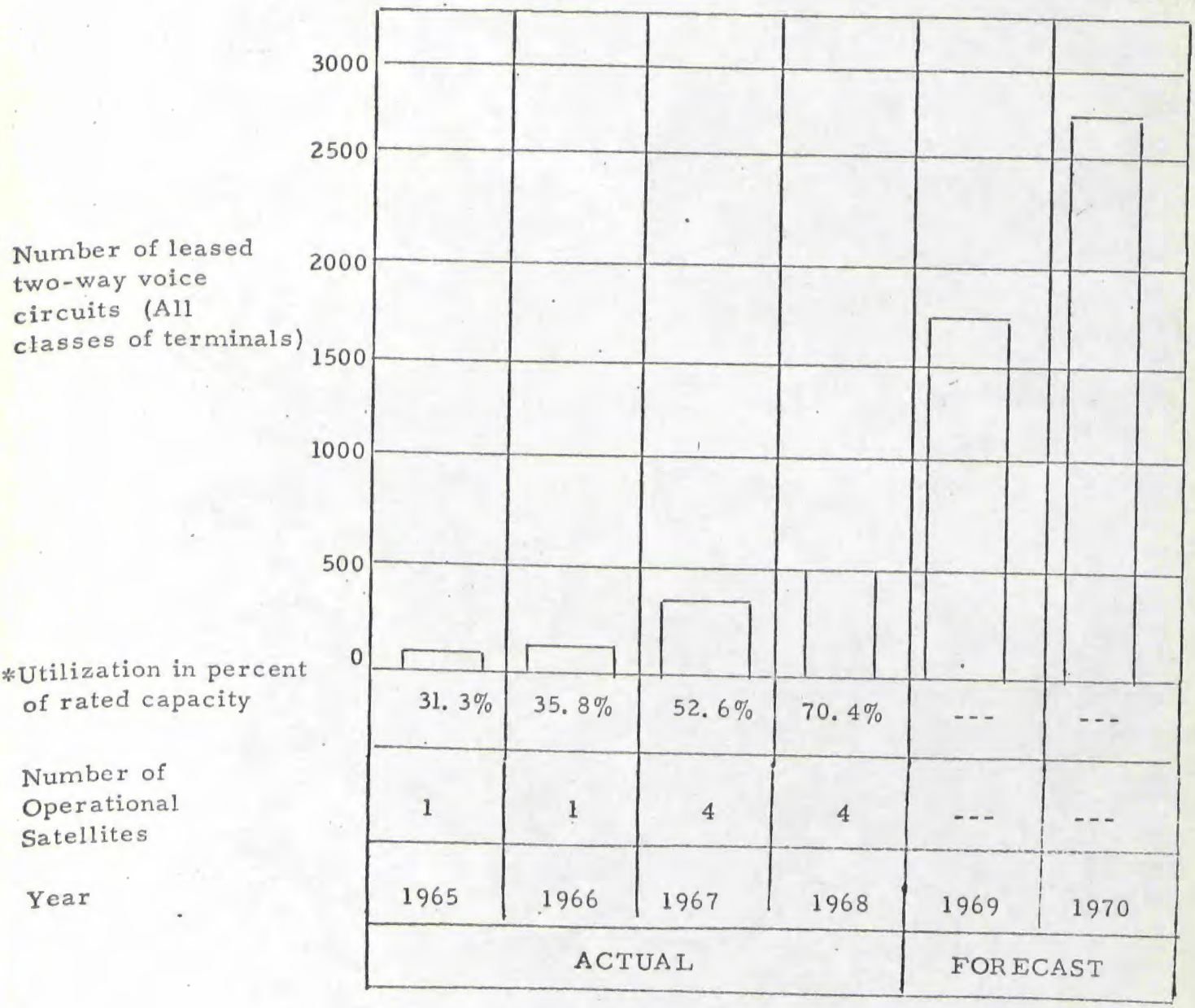

FIGURE 3
GROWTH OF SATELLITE UTILIZATION (VOICE)
THE INTELSAT SYSTEM

*Utilization in percent of rated capacity" figures include the effect that circuits between smaller, non-standard earth stations require more satellite capacity(power).

One of the unique attributes of communications satellites is their capability to relay transoceanic television (monochrome and color) in real time. Starting with the inaugural TV broadcast by INTELSAT I Early Bird between the U. S. and U. K. on May 2, 1965 a steady increased use of TV has taken place. Table 10 depicts the growth of TV traffic since 1965.

	1965	1966	1967	1968
Total Hours Television per year	41	76	225	554*

*As of October 31, 1968

Table 10

GROWTH IN TELEVISION TRAFFIC
THE INTELSAT SYSTEM

Benefits for the People of the World

The value of satellite communications to society has been demonstrated by the dramatic acceptance and broad participation of many nations in the International Telecommunications Satellite Consortium (INTELSAT). This section outlines the principal benefits of this new media.

o Enhanced International Telecommunication Services

The unique features of communications satellite technology, treated in the introduction of this report, combine to make available to both developed and developing nations a new media for international telecommunication. This new transmission means can enhance substantially the capability of existing networks or in some cases make available for the first time an economical method of providing international telecommunications services.

-- Developed Nations

The principal gains in the use of a communications satellite system by a developed nation are the added versatility and assurance of service (reliability) when combined with other transmission media to form the total international telecommunications capability. (Develop specific examples)

-- Developing Nations

Satellite communications offer developing nations a most attractive, economical method of obtaining direct access to the developed nations of the world. The broad coverage of a single geostationary satellite, with multiple access features makes it feasible for a nation to gain access to the Global System by the establishment of a single earth station. (Develop specific examples)

o Economic Trends of International Telecommunications Services.

-- Trends in Charges for Satellite Circuits

The introduction of the communications satellite means in international telecommunications has contributed to the reduction of charges for all circuits regardless of transmission media.

In the INTELSAT system, the Interim Communications Satellite Committee is responsible for establishing the rate of charge for space segment usage "at a level which, as a general rule, shall be sufficient, on the basis of the estimated total use of the space segment, to cover amortization of the capital cost of the space segment, an adequate compensation for use of capital, and the estimated operating, maintenance and administration costs of the space segment." Since costs are relatively fixed, the unit charge for space segment usage will decline as the volume of use increases.

For example, the annual charges made by INTELSAT to the common carriers for a full-time, voice-grade half-circuit from New York to Paris, have decreased from $50,400 in June of 1965 to $45,600 in April of 1967, a reduction of almost 10%. (A half-circuit is a two-way circuit to the midpoint of the connection, whether cable or satellite.)

-- Trends in Charges for International Telecommunications Services

The annual charge for the lease of a half-circuit -- either cable or satellite -- from a common carrier by the final user decreased from $96,000 to $78,000 over the same period, a decrease of almost 20%. The charge was reduced further in October 1968 to $72,000.

These half-circuit charges are not quite half the charge of a whole, two-way circuit. Higher charges overseas for their half-circuit have resulted in a full-circuit charge of about $240,000 per year in effect during November 1965 and about $169,000 in November of 1968. This is almost a 30% reduction.

Further reductions can be expected with the coming into operation of INTELSAT III and IV satellites that offer circuits with a lower in-orbit cost per year.

o Internontinental (transoceanic Television

The advent of satellite communications systems added a new dimension to international communications, namely, the capability to relay transoceanic television broadcasts of events as they take place. For example, during 1968, viewers around the world were able to view in real time the U. S. World Series, the Olympic Games, the APOLLO 7 lift-off and recovery operation, the U. S. presidential elections, and many other events.

Future growth in TV usage is expected to rise sharply. The higher capacity INTELSAT IV satellite will allow exclusive channels to be used for TV service, a capability not possible with earlier satellites because of the high demand for telephone circuits.

The increase exchange of news and cultural TV programs among nations offers a great potential for better understanding throughout the world.

o Non-Discriminatory Access to the Global System

The United States policy regarding participation in an international satellite communications system was first stated in the Communications Act of 1962 as follows:

"The Congress hereby declares that it is the policy of the United States to establish, in conjunction and in cooperation with other countries, as expeditiously as practicable a commercial communications satellite system, ... which will serve the communication needs of the United States and other countries, ..."

"The new and expanded telecommunications services are to be made available as promptly as possible and are to be extended to provide global coverage at the earliest practicable date. In effectuating this program, care and attention will be directed toward providing such services to economically less developed countries and areas as well as those more highly developed, ..."

The above policy was later embodied in the 1964 intergovernmental Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System. This document dated August 20, 1964 states:

"... satellite communications should be organized in such a way as to permit all states to have access to the global system..."

President Johnson reinterated this philosophy in his message of August 14, 1967:

"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."

The continued success of the single global system will depend, to a great extent, on it being available to all countries of the world, without exception.

UNITED STATES POLICY

Telecommunications activities are dynamic and function in an environment of increasing pressure from both the public and private sectors for more timely and productive efforts by the Government. The opportunity and challenge for the United States is to formulate a comprehensive national policy framework which will promote more effective use of Telecommunications in the public and national interest as well as extending international cooperation which will contribute to world peace and understanding.

The all-pervasive nature of telecommunications -- its uniqueness in support of the basic mission functions at all levels of the Government and its availability in support of the functions of other sectors of society coupled with the "explosive" pace of technology growth create a need for strong leadership by the Executive Branch.

The significance of and fundamental dependancy on the role of telecommunications in today's society and its potentials for the future were recognized by the President in his August 14, 1967 message to Congress on Communications Policy, and the subsequent year-long study of the major problems identified in the President's message by the Task Force on Communications Policy. The broad spectrum of major problems involve (a) improving the use of the frequency spectrum, (b) the timely use of technological innovations, (c) strengthening the future role of this nation in the International Telecommunications Satellite Consortium (INTELSAT), (d) improving the management of international telecommunications, and (e)

structuring the government telecommunications management organization.

The President's Task Force Final Report is nearing completion and distribution to the White House. This White Paper does not treat any of the findings and recommendations of the Task Force.

Policy Options - An Overview -- Since the Advent of the "Space Age" in October, 1957, the United States has been faced with making a wise choice in a number of alternative policy options in pursuing the national space program and the national communications satellite program. An overview of the options and the choice selected by the people of this nation is depicted by the "roadmap" diagram in Figure 4.

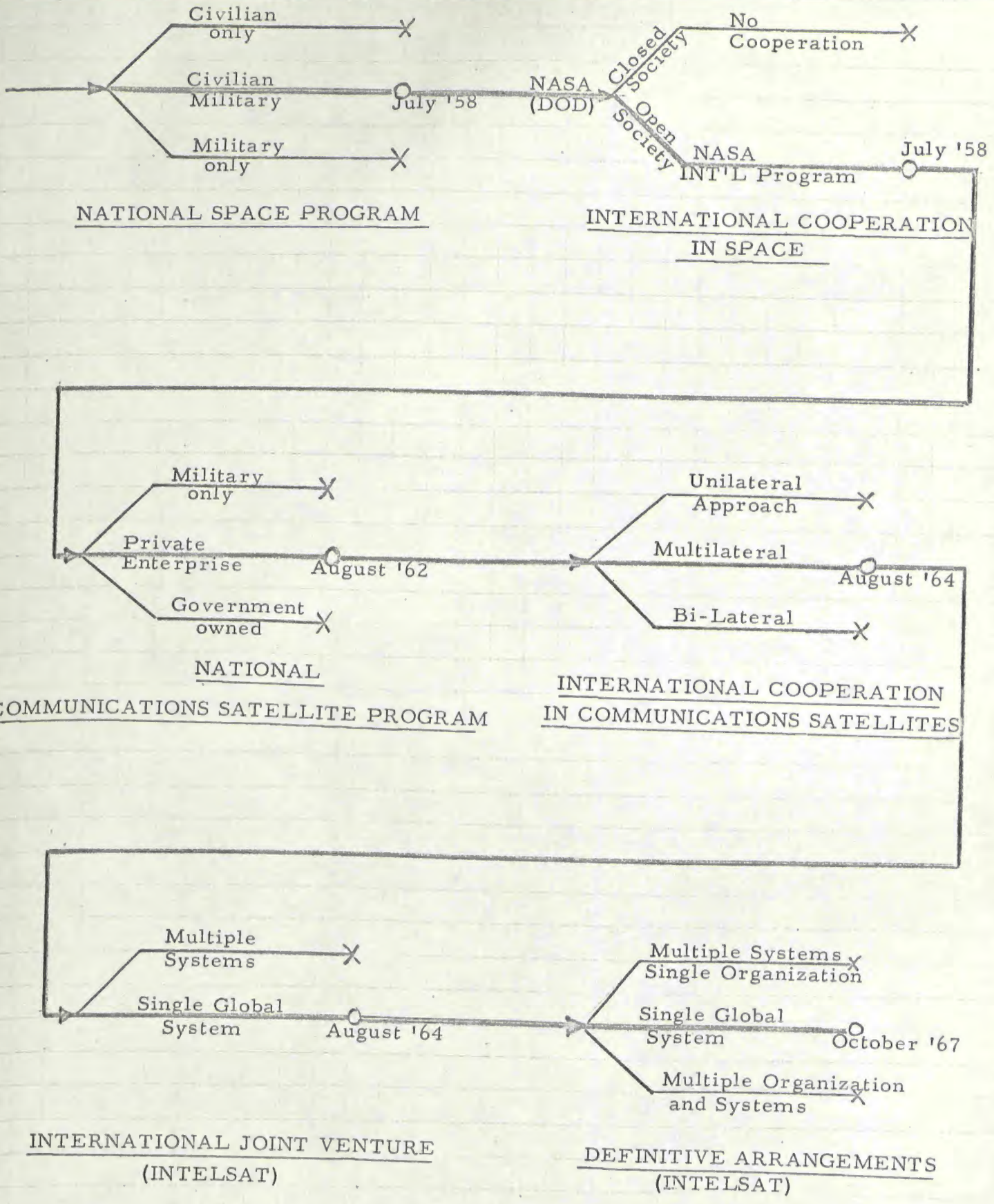

FIGURE 4

POLICY OPTIONS DIAGRAM

UNITED STATES OF AMERICA

Space Activities for Peaceful Purposes -- The United States policy for space activities including exploitation of opportunities for the practical use of space is contained in the National Aeronautics and Space Act of 1958. The Declaration of Policy and Purpose in the Act is as follows:

> Sec. 102. (a) The Congress hereby declares that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind.
>
> (b) The Congress declares that the general welfare and security of the United States require that adequate provision be made for aeronautical and space activities. The Congress further declares that such activities shall be the responsibility of, and shall be directed by, a civilian agency exercising control over aeronautical and space activities sponsored by the United States, except that activities peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the United States (including the research and development necessary to make effective provision for the defense of the United States) shall be the responsibility of, and shall be directed by, the Department of Defense; and that determination as to which such agency has responsibility for and direction of any such activity shall be made by the President in conformity with section 201(e).
>
> (c) The aeronautical and space activities of the United States shall be conducted so as to contribute materially to one or more of the following objectives:
>
> (1) The expansion of human knowledge of phenomena in the atmosphere and space;
>
> (2) The improvement of the usefulness, performance, speed, safety, and efficiency of aeronautical and space vehicles;
>
> (3) The development and operation of vehicles capable of carrying instruments, equipment, supplies, and living organisms through space;

(4) The establishment of long-range studies of the potential benefits to be gained from, the opportunities for, and the problems involved in the utilization of aeronautical and space activities for peaceful and scientific purposes;

(5) The preservation of the role of the United States as a leader in aeronautical and space science and technology and in the application thereof to the conduct of peaceful activities within and outside the atmosphere;

(6) The making available to agencies directly concerned with national defense of discoveries that have military value or significance, and the furnishing by such agencies, to the civilian agency established to direct and control nonmilitary aeronautical and space activities, of information as to discoveries which have value or significance to that agency;

(7) Cooperation by the United States with other nations and groups of nations in work done pursuant to this Act and in the peaceful application of the results thereof; and

(8) The most effective utilization of the scientific and engineering resources of the United States, with close cooperation among all interested agencies of the United States in order to avoid unnecessary duplication of effort, facilities, and equipment.

(d) It is the purpose of this Act to carry out and effectuate the policies declared in subsections (a), (b), and (c).[1]

---

[1] U. S., Congress, National Aeronautics and Space Act of 1958, as amended, Public Law 85-568, 89th Congress, 1st Session, 1965, pp. 3, 4.

Implementation of the conscious choice to pursue international cooperation is contained in the Act as follows:

> -- International Cooperation
>
> Sec. 205. The Administration, under the foreign policy guidance of the President, may engage in a program of international cooperation in work done pursuant to this Act, and in the peaceful application of the results thereof, pursuant to agreements made by the President with the advice and consent of the Senate.[1]

Promotion of Satellite Communications -- The United States has been a vigorous proponent for the development and use of communications satellites for international telecommunications purposes.

President Eisenhower issued a statement on January 1, 1961, which in part said:

---

[1] U. S. Congress, National Aeronautics and Space Act of 1958, as amended, Public Law 85-568, 89th Congress, 1st session, 1965, p. 10.

* *

The commercial application of communication satellites, hopefully within the next several years, will bring all nations of the world closer together in peaceful relationships as a product of this nation's program of space exploration.

The world's requirements for communication facilities will increase several fold during the next decade and communication satellites promise the most economical and effective means of satisfying these requirements.

Increased facilities for overseas telephone, international telegraph, and other forms of long-distance person-to-person communications, as well as new facilities for transoceanic television broadcasts, through the use of man-made satellites, will constitute a very real benefit to all the peoples of the world.

This nation has traditionally followed a policy of conducting international telephone, telegraph and other communications services through private enterprise subject to Governmental licensing and regulation. We have achieved communications facilities second to none among the nations of the world. Accordingly, the government should aggressively encourage private enterprise in the establishment and operation of satellite relays for revenue-producing purposes.

To achieve the early establishment of a communications satellite system which can be used on a commercial basis is a national objective which will require the concerted capabilities and funds of both government and private enterprise and the cooperative participation of communications organizations in foreign countries.[1]

* *

---

[1] White House Press Release, Statement by the President, dated January 1, 1961.

President Kennedy issued a statement on communication satellite policy on July 24, 1961, which in part said:

* *

A. Policy of Ownership and Operation

Private ownership and operation of the U. S. portion of the system is favored provided that such ownership and operation meet the following policy requirements.

1. New and expanded international communications services be made available at the earliest practicable date;

2. Make the system global in coverage as to provide efficient communication service throughout the whole world as soon as technically feasible, including service where individual portions of the coverage are not profitable;

3. Provide opportunities for foreign participation through ownership or otherwise, in the communications satellite system;

4. Non-discriminatory use of and equitable access to the system by present and future authorized communications carriers;

5. Effective competition, such as competitive bidding, in the acquisition of equipment used in the system;

6. Structure of ownership or control which will assure maximum possible competition;

7. Full compliance with antitrust legislation and with the regulatory controls of the government;

8. Development of an economical system, the benefits of which will be reflected in overseas communications rates. [1]

* *

---

1 White House Press Release, "Statement of the President on Communication Satellite Policy," dated July 24, 1961.

The United States policy for the practical use of communications satellites in international communications contained in the Policy and Purpose provision of the Communications Satellite Act of 1962 is as follows:

> SEC. 102 (a) The Congress hereby declares that it is the policy of the United States to establish, in conjunction and in cooperation with other countries, as expeditiously as practicable a commercial communications satellite system, as part of an improved global communications network, which will be responsive to public needs of the United States and other countries, and which will contribute to world peace and understanding.
>
> (b) The new and expanded telecommunication services are to be made available as promptly as possible and are to be extended to provide global coverage at the earliest practicable date. In effectuating this program, care and attention will be directed toward providing such services to economically less developed countries and areas as well as those more highly developed, toward efficient and economical use of the elctromagnetic frequency spectrum, and toward the reflection of the benefits of this new technology in both quality of services and charges for such services.
>
> (c) In order to facilitate this development and to provide for the widest possible participation by private enterprise, United States participation in the global system shall be in the form of a private corporation, subject to appropriate governmental regulation. It is the intent of Congress that all authorized users shall have nondiscriminatory access to the system; that maximum competition be maintained in the provision of equipment and services utilized by the system; that the corporation created under this Act be so organized and operated as to maintain and strengthen competition in the provision of communications services to the public; and that the activities of the corporation created under this Act and of the persons or companies participating in the ownership of the corporation shal l be consistent with the Federal antitrust laws.

(d) It is not the intent of Congress by this Act to preclude the use of the communications satellite system for domestic communication services where consistent with the provisions of this Act nor to preclude the creation of additional communications satellite systems, if required to meet unique governmental needs or if otherwise required in the national interest.[1]

United States promotion of satellite communications has been the key ingredient in the successful progress made by the International Telecommunications Satellite Consortium toward establishing the global system. This achievement reflecting U. S leadership in and promotion of satellite communication was brought about by the creative Government-private industry partnership fostered by the Communications Satellite Act of 1962. The ability of the United States' "chosen instrument," the Communications Satellite Corporation, to be capable of establishing elements of the global system has been the commitment of the U. S. Government (NASA) to render necessary support in the form of launching services for placing COMSAT procured satellites in earth orbit. Thus one can see that the U. S. Government support of commercial communications satellite activities is both real and substantial.

---

[1] U.S., Congress, Communications Satellite Act of 1962, Public Law 87-624, 87th Cong., 1st Sess., 1962, p. 1.

o Support of a Single Global System -- International telecommunications have historically required mutual agreement to effect cooperation among nations. The formation of the International Telecommunications Union more than a century ago represents the recognition by member nations of the importance in cooperation and coordination in international telecommunicatinns activities.

Under the public law established by the Communications Satellite Act of 1962, the United States adopted a policy to support the concept of "a commercial communications satellite system, as part of an improved global communications network."

As a result of United States initiative, this concept was subsequently made operative in the preamble and articles of the August 1964 agreement establishing interim arrangements for a global commercial communications satellite system.

President Johnson in his message on Communications Policy to the Congress on August 14, 1967, said, "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." He further stated:

...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 electromagnetic 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 those developing nations more expensive and of lower quality.

...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.[1]

---

[1] U. S., President, 1963-1969 (Johnson), Message on Communications Policy, August 14, 1967. (Washington: Office of the White House Press Secretary, 1967), pp. 5-6.

The conceptual framework of a Global Commercial Communications Satellite System should be understood in order to appreciate more fully the reasons behind the strong United States effort towards promotion of this basic approach for the provision of modern international telecommunications services. The logic of a single global system and its value to society are irrefutable.

The revolution of satellite communications, particularly the geostationary synchronous orbit satellite has provided a new transmission media of unprecedented capability and versatility. Such satellites have by their very nature an extensive geographic coverage pattern which can be truly characterized as international in scope and global in context. Ideally, the objectives of a global system would achieve (a) unduplicated communications facilities in the space segment (b) economical service to individual nations and (c) optimum utilization of frequency spectrum and satellite orbital space. Fortunately, these objectives can be met in a design concept of a single global system composed of a few high capacity geostationary satellites, positioned to be consistent with the demands for international telecommunications services. An important consideration in this concept is the idea that since a given earth station antenna can work with only one satellite at a time, costs to individual nations can be minimized by a system of few satellites having characteristics which maximize efficiency of transmission working

through a single satellite. Costs of international telecommunications services to individual nations can be also minimized by orbiting satellites having high capacity capability coupled with broad coverage area from individual satellites.

The "single global system" concept depends on fundamental institutional considerations which may be described as follows:

1. A single management and ownership of all space segments for all commercial satellite communications (including both domestic and international services), by a joint international consortium such as INTELSAT.

2. Admission to the Consortium open to all nations . . . (who are members of the ITU).

3. All space segments operated on a cost sharing basis to all participating members of the Consortium in accordance with their usage of the space segments.

4. All earth station facilities owned and operated by the individual user nations (both domestic and international facilities.)

5. Design and positioning of each space segment satellite optimized for specific intended application, as determined jointly by the Consortium and prospective users, Consortium having final authority.[1]

The design of the Global Commercial Communications System under INTELSAT has evolved into a global system configuration based on a concept which placed priority on the provision of service along the high traffic routes used in international telecommunications. This concept calls for selection of the longitudinal positions of the geostationary INTELSAT satellites so as to optimize the intercontinental

[1] U. S., Executive Office of the President, Office of Telecommunications Management, Staff Memorandum, A Single Global System for Commercial Satellite Communications, March 10, 1967.

transoceanic coverage requirements in the Atlantic Ocean Basin, Pacific Ocean Basin and Indian Ocean areas. Broadly viewed, particularly in a Mercator map projection of the globe this system serves to create a "Global Commercial Communications Satellite System" essentially as a east-west oriented beltline addition to the global terrestrial plant. However, a global system limited to three high capacity satellites and positioned to optimize the major east-west axis of international telecommunications is limited in versatility, particularly in providing optimum support of international telecommunications flowing in different traffic routes. Accordingly, it is safe to predict that the concept of the design of the Global System will need to be expanded in light of the trends in international telecommunications.

In view of the projected growth of the nations in the Southern Hemisphere, it is safe to assume that a large growth in international telecommunications traffic will occur along the principal North-South axis of communications. These North-South axis of communications include (a) European-African (b) Asian (Japan-Australia) and (c) American (North America-South America). To meet these growing needs for modern telecommunications services in the future, the design of the global (INTELSAT) system will need to be supplemented to accommodate the requirements by orbiting additional INTELSAT satellites positioned longitudinally to optimize the North-South

axis of communications. The added versatility of the global system would go a long way toward satisfying the need, expressed by various developed nations, for commercial "regional satellites" but within the framework of the INTELSAT Consortium.

The vast potential of modern communications satellites provides almost unlimited opportunities for the nations of the world to develop, install and operate a family of satellites which would be configured and located in a way to best meet the global needs for improved and new telecommunications.

However, it would be wrong to close the discussion of the concept of a Global System on such an optimistic note. Unfortunately, there is no document which formulates a long-range plan depicting the conceptual framework for the INTELSAT system, particularly beyond the early 1970's. Possibly, the reason the Consortium has had trouble internally over such issues as "regional satellites" is that deficiencies do exist in the current documentation available to the Interim Committee. The Manager's (ICSC 34-18, September 10, 1968) titled "Configuration and Philosophy of the Global System Using INTELSAT Satellites" provides a launch and orbit schedule through second quarter 1974 which covers the four flight articles under procurement and further states consideration should be given to an in-orbit space and a second Atlantic Ocean satellite in 1976. The document identifies various pertinate questions raised by the United Kingdom (ICSC 33-43 July 8, 1968) related to the conceptual framework which are unanswered in the Manager's Contribution.

Furthermore, the Manager recognizes the need for additional study to develop more fully the philosophy (concept) of the Global System. In short, the Manager's Contribution falls far short in the scope of treatment of the conceptual framework from that needed to depict a meaningful long-range plan.

The following outline provides a check list of subjects relating to the conceptual framework (philosophy, principals and doctrine) which should be included in a comprehensive Long-Range Plan for the INTELSAT system:

OUTLINE

INTRODUCTION

BACKGROUND

TERMINOLOGY

PURPOSE OF THE INTELSAT ORGANIZATION

CHARACTER OF SATELLITE TELECOMMUNICATIONS

TELECOMMUNICATIONS OBJECTIVES

-- Primary Objective of the Global System

-- Scope of Services (Type, Geographic Coverage, Class of user)

-- Performance (Circuit Quality - Continuity of Service)

-- Interconnection with Terrestrial Network

CONCEPTUAL FRAMEWORK OF THE GLOBAL SYSTEM

-- The System Elements

-- Fundamental Premises (The Single Global System)

-- Participation in the INTELSAT Organization

- Management

- Space Segment Ownership

- Earth Station Ownership

-- Technical Objectives
(See Telecommunications Objectives)

-- Establishment of the System

-- Operation of the System

GENERAL CONFIGURATION OF THE GLOBAL SYSTEM

(Time Phased)

-- Space Segment Network

- Satellite Positioning

- Earth Coverage Pattern

-- Earth Station Locations

-- Network Connectivety

-- Tracking, Telemetry and Control Network

o Offers to Extend International Cooperation -- United States established policy objectives of encouraging international cooperation in the National Aeronautical and Space Act of 1958 and the Communications Satellite Act of 1962. The United States initiative in creating the International Telecommunications Satellite Consortium is a further illustration of the positive policy of the United States to extend international cooperation in the communications satellite field of activity.

The United States Government issued an internal document, NSAM 342, "U. S. Assistance in the Early Establishment of Communications Satellite Service for Less-Developed Nations" on March 4, 1966. This National Security Action Memorandum provided policy guidance for certain Departments and agencies and included:

> ...In carrying out his responsibilities under the Communications Satellite Act of 1962, the President has directed that the United States Government take active steps to encourage the construction of earth-station links to the worldwide communications satellite system in selected less-developed countries.[1]

President Johnson again extended an offer to other nations to join the International Telecommunications Satellite Consortium in his message to Congress in August, 1967. Specifically, he said: "I urge the Soviet Union and the nations of Eastern Europe to join with the United States and our fifty-seven partners as members of INTELSAT."[2]

---

[1] NSAM 342

[2] U.S., President, 1963-69 (Johnson), Message on Communications Policy to the Congress of the United States, Washington, D.C., Aug. 14., 1967, (Washington: Office of the White House Press Secretary, 1967), p 11.

Definitive Arrangements for INTELSAT -- A vital factor in developing future international telecommunications policy for the United States is the International Telecommunications Satellite Consortium (INTELSAT), the sixty-three member satellite consortium that owns and operates the space segment of the Global Commercial Communications Satellite System. A review of United States policies regarding INTELSAT is important since "Definitive Arrangements" to replace the "Interim Arrangements" under which the consortium now operates are to be developed during an INTELSAT conference scheduled to begin in Washington, D. C. on February 24, 1969.

The 1964 intergovernmental Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System provides in Article IX that the governing body -- the Interim Communications Satellite Committee (ICSC) -- shall render a report not later than January 1, 1969, containing the Interim Committee's recommendations concerning the Definitive Arrangements for an international global system which shall supersede the Interim Arrangements. This report is to follow the principles found in the Preamble of the present Interim Agreement, which incorporates the principle (set forth in Resolution 1721 of the XVI United Nations General Assembly) "that communications by means of satellites should be available to the nations of the world as soon as practicable on a global and non-discriminatory basis."

In October 1967, a U. S. Government proposal (ICSC 28-40) was tabled in the Interim Committee which envisions Definitive Arrangements for INTELSAT patterned substantially on the Interim Arrangements. The firm U. S. position for use in negotiating the Definitive Arrangements is currently under preparation by the United States Government.

In formulating the United States' position, recognition should be of the significant contributions made by the United States Government-industry team in accomplishing the establishment and operation of the Global Commercial
/Communications Satellite System which will contribute to world peace and understanding. This spectacular success embodied in the 63 nation International Telecommunications Satellite Consortium (INTELSAT) is an achievement of unprecedented character.

Accordingly, it appears the overall objective of the United States' position to guide the delegation at the INTELSAT Conference in February should be:

- The maintenance of the forward progress attained by the International Telecommunications Satellite Consortium under the Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System.

- o The development of meaningful Definitive Arrangements, in conjunction with other interested countries, which will promote international cooperation and ensure the timely establishment of the Single Global Commercial Communications Satellite System, which will serve the communications needs of the United States and other countries, and which will contribute to world peace and understanding.
- o Continue support of the INTELSAT enterprise by making available the significant United States competency in Communications Satellite technology which can contribute to enhanced international telecommunications.
- o In meeting the objectives outlined above, the United States will sponsor the adoption of institutional arrangements which will enable the Consortium members to benefit from the substantial United States competency in communications satellite technology, consistent with the commercial international telecommunications service needs of the nation.

These objectives are structured to implement the United States policy expressed in President Johnson's message to the Congress on Communications Policy of August 14, 1967. Specifically, he said:

"We support the continuation of INTELSAT... We will urge the continuation of the Consortium 1969. The present arrangements offer a firm foundation on which a permanent structure can be built... We seek no domination of satellite communications to the exclusion of any other nation -- or any group of nations -- I urge the Soviet Union and the nations of Eastern Europe to Join with the United States and our 57 (now 62) partners as members of INTELSAT."

° Key Policy Issues -- Based upon the Office of Telecommunications Management's continuous and close association with the day-to-day activities of the Communications Satellite Corporation and the International Telecommunications Satellite Consortium, it is obvious that the United States Government faces difficult negotiations during the forthcoming INTELSAT conference. In addition, the conflicts which arose during the 34th and 35th meetings of the Interim Communications Satellite Committee (ICSC) add weight to the conclusion that the United States should focus its attention on the really vital and crucial policy issues.

In this connection a list of the most important policy issues has been developed as an aid in focusing attention on the fundamental issues. The United States Delegation should be prepared to address these issues forthrightly during the conference. Furthermore, since these issues are so crucial to the continued viability of INTELSAT as a successful international commercial enterprise, the United States Government should develop hard U. S. positions on these policy issues without delay. The list of issues follows:

INTELSAT Policy Issues [1]

-- Fundamental Policy Issues

- o What is the Purpose of the Organization to be Established by the Definitive Arrangements?
- o What should be the Objectives of the Parties to the Definitive Arrangements?
- o What should be the Scope of Services to be Provided Under the Definitive Arrangements?
  - (a) Type of Services?
  - (b) Geographic Areas of Services?

-- Important Policy Issues

- o What should be the Legal Status of the Organization to be Established by the Definitive Arrangements?
- o What should be the Structure and Functions of the Organization to be Established by the Definitive Arrangements?

---

[1] These issues use terms contained in ICSC documentation related to Definitive Arrangements. (ICSC 35-5E W/11/68, 8 Nov 68)

- o Who should perform the Management Body functions under the Definitive Arrange ments?
- o What formula should apply for determining Investment Shares of members and what formula should apply for Allocation of Satellite Capacity to Users?
- o What should be the Rights and Obligations of the Parties to the Definitive Arrangements?

In developing the United States position for these key policy issues we should first develop the long term conceptual framework (philosophy, principals and doctrine) and a general configuratinn of the Global Commercial Telecommunications Satellite System. This concept paper should help to answer the questions.

Is the current published concept of a three satellite system using INTELSAT IV type satellites a viable near-term approach for the Global System? and What should be the conceptual framework and general configuration of the Global System in the long-range time frame?

INTELSAT Conference

Notwithstanding the past milestones in meeting the objections of the Communications Satellite Act of 1962, the U. S. Government in getting ready for the Definitive Arrangement negotiations beginning February 1969 will adopt one of two broad negotiating approaches.

Either the U. S. Government will sponsor the negotiating approach which is suggested in the U. S. contribution paper of October 3, 1967 whereby the Definitive Arrangements are essentially an updating of the Interim Arrangements with additions to cover a broader functional scope not envisioned in 1964, or the U. S. Government will sponsor a more dynamic approach which would promote more enlightened management concepts needed: (a) to cope with the revolutionary aspects of the telecommunications satellite technological breakthrough and (b) to create innovative international joint venture institutional arrangements which would contribute to enhanced international cooperation during the 1970's.

-- Approach A

Pursuing the first conceptual approach would seem to be particularly fitted to meeting the objectives of the INTELSAT Consortium in the near-term time frame. It avoids really tough international decisions and further perpetuates the working (albeit, difficult) relationship between the Governing Body and the COMSAT Corporation serving as Manager for INTELSAT as well as the United States designated communications entity. This aspect, when coupled with U. S. views on voting, financing and the established rate-making practice, tends to make the U. S. Government position to have appearances of "domination" in the eyes of other nations. The U. S. Government position in this approach could be viewed by the large number of developing nations as "status quo" so as to preserve the developed nations domination of the Consortium's activities.

-- Approach B

On the other hand, following the second approach would seem to be in keeping with meeting the long-term objectives of Congress as expressed in the Communications Satellite Act of 1962 as well as the long-term objectives of the INTELSAT Consortium contained in the Interim Arrangements. Such an approach would have, providing creative international management mechanisms can be designed, a broad-based appeal to the nations of the world and would show the desire

on the part of the United States to face and treat the "domination" issue in a forthright manner. In addition, this approach is specifically covered in the Interim Arrangements.[1] Furthermore, this approach in the final analysis could well be forced upon the U. S. Government at some time in the near-term by either of two outside pressures. One of these could come from the other strong partners of INTELSAT who have a genuine desire to change the degree of dependence on the United States for future communications satellite technology. This desire is also promoted by the U. S. aerospace and electronics industry in their efforts to obtain contracts from foreign countries. Another pressure, if the USSR's INTERSPUTNIK approach were to become an active threat to INTELSAT, would require concerted action by the proponents of the INTELSAT Consortium to avoid friendly nations leaving the enterprise.

---

[1] See Article IX (a) Having regard to the program outlined in Article i of this Agreement, within one year after the initial global system becomes operational and in any case not later than 1st January 1969, the Committee shall render a report to each Party to this Agreement containing the Committee's recommendations concerning the definitive arrangements for an international global system which shall supersede the interim arrangements established by this Agreement. This report, which shall be fully representative of all shades of opinion, shall consider, among other things whether the interim arrangements should be continued on a permanent basis or whether a permanent international organization with a General Conference and an international administrative and technical staff should be established.

o Factors Bearing on the Issue -- This paper is not intended to treat in detail each of the policy issues above or develop a range of alternative options open to the United States. Rather, this section identifies some important factors which relate to the policy issues and need to be given careful consideration in development of the United States position for use by the delegation during the INTELSAT conference in 1969.

-- The Objective and Purpose of the Joint Venture

The position the U. S. has taken in its contribution to the ICSC (ICSC 28-40) with regard to the objectives and purposes of the the joint venture organization under the Definitive Arrangements represents a practical extension of the basic goals established by the Interim Arrangements. Basically, the Internatinnal Telecommunications Satellite Consortium is an institutional arrangement created to do commercial business in a joint venture form. It is not a political organization, it is a business venture to provide international telecommunications services. Its goals include the provision of such international telecommunications services at the lowest possible cost, not the subsidy of a single nation's industrial technology for narrow,nationalistic purposes. The U. S objective recognizes the inherent benefits to all nations in the concept of a Single Global Commercial Communications Satellite System managed in an integrated manner.

The above comments are particularly applicable to the policy issues concerning the following areas:

-- Objectives of the Parties to the Definitive Arrangements.

-- Purpose of the Organization to be Established.

-- Rights and obligations of the Parties to the Definitive Arrangements.

-- The Concept of the Global Commercial Communications Satellite System

INTELSAT, the international business partnership of government and private entities, has undertaken the establishment of the Global Commercial Communications Satellite System in accordance with the Agreement Establishing the Interim Arrangements.

The United States contribution to the ICSC subject: Definitive Arrangements for INTELSAT ICSC-28-40E W/9/67, October 3, 1967, submitted the United States proposal containing an outline of the Definitive Arrangements. This U. S position paper sets forth definitive arrangements embodying the basic concept of a Global Commercial Communications Satellite System consistent with the Interim Arrangements and as restated by President Johnson in his message on Communications Policy to the Congress on August 14, 1967.

The spectacular success of INTELSAT during the short period of only four years lends credence to the concept of the global system which was treated above, beginning on page 70.

Various proposals, particularly by European countries, have suggested that the concept of a global system should be abandoned and replaced by a series of "regional satellite systems." This scheme of ill-defined "regional" satellites would be tied together by some kind of coordinating body acting as a loose confederation. Furthermore, the concept of competitive "regional" satellites, established outside INTELSAT, does not stand rigorous conceptual analysis or the basic test of economic viability in the marketplace.

No conceptual approach for the INTELSAT system has been agreed-to by the Interim Committee beyond the INTELSAT III generation of satellites. In fact, the French Contribution (ICSC 33-20 June 20, 1968) and the United Kingdom Contribution (ICSC 33-43 July 8, 1968) contained ideas and philosophies which conflict sharply with the specific near-term concepts developed by the Manager. Unfortunately, the INTELSAT Conference will be attempting to structure permanent Definitive Arrangements without the benefit of a comprehensive Long-Range Plan for the Global System nor an agreed-to near-term plan for the use of INTELSAT IV. In light of this situation, it appears that the United States Government has an obligation to the Consortium to formulate and present for consideration at the Conference its ideas on the conceptual framework of the Single Global System.

Since the United States is firmly committed to support of the concept of a Global System, the development of U. S. position papers before and during the conference should be consistent with this fundamental principle of a single Global System contained in the Interim Arrangements

The discussion above is particularly applicable to the policy issues concerning the following areas:

-- Objectives of the Parties to the Definitive Arrangements

-- Purpose of the Organization to be established.

-- Scope of Services (Type and Geographic area) to be provided under the Definitive Arrangements

-- Structure and Functions of the Organization to be established by the Definitive Arrangements.

-- Rights and Obligations of the Parties to the Definitive Arrangements.

-- The Competent Entity to Perform the Management Body function.

The United States Government signed the Multilateral Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System on August 14, 1964 and designated the Communicatinns Satellite Corporation as the communications entity to represent the United States in the Special Agreement. In addition, the Agreement Establishing the Interim Arrangements (Article VIII) called for the Communications Satellite Corporation to also act as Manager in the design, development, construction, establishment, operation and maintenance of the space segment.

The spectacular success of the INTELSAT Consortium toward implementing the Global System has been the direct result of United States leadership in the activities of the joint venture. The United States contribution by both Government and private organizations have been the principal contribution which made possible the progress reflected in the current inbeing operating system. These organizational contributions include: (a) the NASA launching and placing in transfer orbit of INTELSAT satellites; (b) U. S. industry firms as suppliers of hardware and services; (c) the Communications Satellite Corporation as the U. S. designated communications entity; (d) the Comsat Corporation as Manager for INTELSAT.

The contribution of COMSAT to the INTELSAT Consortium has been substantial in all of the functions performed as Manager for INTELSAT. In particular, COMSAT initiated numerous positive proposals which when approved by the Interim Communications Satellite Committee (ICSC) were then implemented by COMSAT and resulted in the rapid introduction of International Telecommunications Satellite Services available today to the partners in the organization. The unprecedented growth of the INTELSAT organization has been brought about by U.S. Government/COMSAT cooperative efforts toward promotion of the use of Satellite Communications. It is interesting to observe that a review of ICSC documentation relating to important financial resource decisions as well as other major and minor program actions indicates that the substantive proposals for such actions emanated from the Manager (COMSAT). These actions are the ones which resulted in successful design, development, construction, establishment, operations and maintenance of the space segment in being today, and planned through the 1973 time period.

The stature of INTELSAT around the world is in large measure the result of outstanding leadership performance by the United

States Government-Industry team devoted to the INTELSAT enterprise.

The above comments are particularly applicable to the policy issues concerning the following areas:

-- Legal status of the Organization to be established by the Definitive Arrangements.

-- Structure and Functions of the Organization to be established by the Definitive Arrangements.

-- Who should Perform the Management Body functions?

-- Rights and Obligations of the Parties to the Definitive Arrangements.

SUMMARY AND OUTLOOK

Conclusions

The quality of the enlightened United States policy embodied in the National Aeronautics and Space Act of 1958, and the Communications Satellite Act of 1962, has been demonstrated by the successful achievements of the nation during the last ten years. These accomplishments in summary include the following:

-- Demonstrations of the feasibility of satellite communications for practical uses;

-- Incorporation of the Communications Satellite Corporation;

-- Creation of the Unique International Telecommunications Satellite Consortium (INTELSAT);

-- Establishment and operation of the initial increments of the Global Commercial Communications Satellite System.

These results verify the economic viability of communications satellite technology for practical applications by an international telecommunication business enterprise. The accelerating growth of international communications traffic and lower costs provide the demonstration of economic viability. Furthermore, the growth in the number of INTELSAT member nations provides an additional measure of the benefit of this new transmission media to the peoples of the world. The community of nations has been brought closer together by

the achievement of intercontinental (transoceanic) television made feasible by the unique attributes of satellite communications.

The unprecedented progress achieved by the International Telecommunications Satellite Consortium (INTELSAT) was made possible by international cooperation and the significant contributions of the United States. The leadership of the United States Government-industry team was demonstrated frequently by its management capability and technical competence which produced significant achievements.

The success of the INTELSAT joint venture also validates the efficacy of United States sponsorship of the Single Global System approach. This concept will be seriously challenged by other partners of INTELSAT during the INTELSAT conference scheduled to begin in February 1969. Unfortunately, no meaningful full-term conceptual framework for the INTELSAT system has been formulated, let alone agreed to by the members of INTELSAT. Accordingly, the fundamental policy issues facing the Consortium involve the areas of:

- o What is the Purpose of the Organization to be Established by the Definitive Arrangements?
- o What should be the Objectives of the Parties to the Definitive Arrangements?
- o What should be the Scope of Services to be Provided under the Definitive Arrangements?
  - (a) Type of Services
  - (b) Geographic Area of Services

More specifically, the INTELSAT conference will be required to address these questions:

Is the current published concept (ICSC 34-18, 10 Sept 68) of a three satellite system using INTELSAT IV type satellites a viable near-term approach for the Global System? and what should be the conceptual framework and general configuration of the Global System in the long-range time frame?

The overall objectives of the United States in the use of satellite communications for commercial telecommunications purposes are outlined in general guidelines in the Communications Satellite Act of 1962. Unfortunately, these objectives have not been translated into a more comprehensive time-phased treatment for use by the Government and COMSAT in planning their near-term and long-term actions toward establishing and operating the Global System. Accordingly, there are no established bench marks for measuring the Corporation's or, in turn, the Nation's performance against established and agreed-to specific objectives. For instance, the absence of a National program precludes the establishment of meaningful development objectives by NASA in their support of projects designed to enhance communications satellite technology.

In light of this situation, it appears there is an urgent requirement for the United States Government to formulate a comprehensive document

which presents the conceptual framework and general configuration of the Global System and a packaged program of evolutionary phases through the late 1970's. This document should take the form of a Long-Range Plan containing, in part, the information as outlined in the list shown on pages 75A and 75B.

Outlook

The pace of communications satellite technology has continued unabated during the last ten years and the prospects for its continued growth are bright. The spectacular achievements in the National Space Program provided the continued growth in communications satellite technology. The NASA Advanced Technology Satellite experiments in the early 1970's will help to demonstrate the feasibility of broader applications of satellite communications as well as experimenting with techniques to expand the capability of this unique media.

These modern tools of communications satellite technology create a wide spectrum of opportunities for the United States to achieve results beyond the general guidelines contained in the policy objectives of the Communications Satellite Act of 1962. Opportunities are presented for the United States Government-Industry team to make meaningful contributions toward enhancing national and international telecommunications services.

Challenge

The challenges for the United States during the 1970's in the field of satellite communications include:

-- Maintaining the momentum of the pace of communications satellite technology.

-- Developing and articulating meaningful roles for the practical applications of and realistic scenarios (conceptual framework) for the employment on an economically viable basis of advanced communications satellite technology.

-- Formulating management (institutional) innovations necessary to cope with the technical, social, political and economic factors facing modern society in meeting the needs of mankind.

-- Implementing the National Program for the Global Commercial Communications Satellite System toward meeting the objectives of the Communications Satellite Act of 1962.

-- Formulating meaningful national and international policy in meeting the opportunities offered by satellite communications technology.

The ability of the United States in meeting these challenges in the 1970's toward an expanded Global Commercial Communications Satellite System is limited only by the imagination and resources applied to the task.

Actions

The following list of actions identifies the principal tasks that the United States Government should take in the next year to insure the continued growth of satellite communications:

-- The United States long-term policy objectives for commercial communications satellites need to be evaluated and revised, if required, in light of the trends in technology, the findings of the President's Task Force on Communications Policy and the results of the forthcoming INTELSAT Conference.

-- The Executive Branch should implement the recommendations of the Director of Telecommunications Management provided to the Bureau of the Budget concerning need for strengthened telecommunications management capability.

-- End --

A

TAB A

Progress Chart (Milestones Last Ten Years)

PROGRESS CHART

SATELLITE COMMUNICATIONS

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
KEY MILESTONES	→ THE SPACE AGE															
COMMUNICATIONS SATELLITE TECHNOLOGY (EXPERIMENTS & DEMONSTRATIONS)	SPUTNIK	SCORE		COURIER		TELSTAR I RELAY I	SYNCOM II RELAY II	SYNCOM III	SYNCOM BIRD	ATS-1 INTELSAT II (F-2)	ATS-3	INTELSAT III	ATS-E		INTELSAT IV	ATS-F
NASA PROGRAMS		NASA ESTABLISHED PL 85-563														
• SYNCOM						SATELLITE CONTRACT (HAC)	SYNCOM II LAUNCH	SYNCOM III LAUNCH SATELLITE CONTRACT (HAC)								
• APPLICATIONS TECHNOLOGY SATELLITE										ATS-1	ATS-3		ATS-E			ATS-F
INTELSAT (COMSAT) PROGRAMS						PL 87-624	COMSAT CORP INCORPORATED									
• INT I/II								SATELLITE CONTRACT (HAC)	LAUNCH (HAC)	INT II (CONTRACT)	INT II LAUNCHES					
• INT III										SATELLITE CONTRACT (TRW)			LAUNCH			
• INT IV												SATELLITE CONTRACT (HAC)			LAUNCH	
EARTH STATIONS (LOCATIONS)																
• UNITED STATES									1	3	3	6				
• OTHER COUNTRIES									3	9	11	16				

TAB B

B

Block Diagram of the Global System (Typical)

(Not included)

TAB C

The Space Segment

C

INTELSAT I (Early Bird)

Launch Vehicle:	Thor Delta
Shape:	Cylindrical; 28.4 inches in diameter; 47.1 inches long from the tip of the microwave antenna to the apogee motor nozzle
Weight:	149 pounds at launch and 87 pounds after apogee motor burnout
Stabilization:	Spin Stabilization
Antenna System:	Transmitting antenna consists of coaxial slot array in the spin axis. The antenna beam in conical, and is about 11 degrees wide.
Antenna Gain:	9 dB
Number of Transponders:	Two
Transponder Bandwidth:	136 MHz
Minimum ERP/Transponder:	+7.8 dBW (6W)
Multiple Access Capability:	No
Type of Modulation:	FDM/FM
Capacity in Telephone Circuits:	240
Electrical Power:	6,000 nickel on platinum solar cells. Two nickel - cadmium rechargeable batteries and voltage regulators. The system is designed to supply 40 watts in normal operation when the satellite is not in eclipse, and the batteries provide storage of power for use during launch and eclipse.
Design Lifetime:	18 Months

INTELSAT II

Launch Vehicle:	Thor Delta
Shape:	Cylindrical, 56" in diameter, 26 1/2" long, excluding apogee motor nozzle and antenna; over-all length, 60"
Weight:	357 pounds at launch and 192 pounds after apogee motor firing
Stabilization:	Spin Stabilization
Antenna System:	Combined transmit-receive antenna of fixed nonfolding type with toriodal patterns about spin axis. Transmitting antenna is vertically polarized four horn biconical array
Antenna Gain:	Receive, 4 dB; Transmit, 5.5 dB at $\pm 6^{\circ}$
Number of Transponders:	Two
Transponder Bandwidth:	126 MHz
Minimum ERP/Transponder:	+ 14.0 dBW (25W) with 2 TWT's + 15.4 dBW (35 W) with 2 TWT's
Multiple Access Capability:	Yes
Type of Modulation:	FDM/FM
Capacity in Telephone Circuits:	240
Electrical Power:	Over 85 watts from the solar cell array at $\pm 23^{\circ}$ sun angle. Two rechargeable nickel-cadmium batteries of 4.5 amperes each, sufficient to power 3 TWT's and repeaters through eclipse.
Design Lifetime:	3 years

INTELSAT III

Launch Vehicle:	Long Tank Thrust Augmented Delta
Shape:	Cylindrical, 56 inches in diameter, 41 inches long excluding apogee motor nozzle and antennas; over-all length, 78 inches
Weight:	608 pounds at launch and 270 pounds after apogee motor firing
Stabilization:	Spin stabilization
Antenna System:	Mechanically despun antenna for communications and two omni antennas for command and telemetry
Antenna Gain:	13.5 dB at earth's edge
Number of Transponders:	Two
Transponder Bandwidth:	225 MHz
Minimum ERP/Transponder:	21.8 dBW (150 watts)
Multiple Access Capability:	Yes
Type of Modulation:	FDM/FM
Capacity in Telephone Circuits:	1200
Electrical Power:	More than 125 watts from storage battery and the solar cell array for five years
Date of Service:	N/A
Design Lifetime:	5 years

INTELSAT IV

Launch Vehicle:	Titan IIIB or Atlas/Centaur
Shape:	Cylindrical, 93 inches in diameter; solar drum height, 108 inches; over-all length including antennas, 193 inches
Weight:	2452 pounds at launch and 1225 pounds after apogee motor firing
Stabilization:	Spin stabilization
Antenna System:	Earth Coverage antennas are square pyramidal type horns. Spot beam antennas are horn fed parabolic reflectors which are capable of in-orbit beam steering
Antenna Gain:	Earth Coverage, 16.8 dB over a 17° beamwidth; Spot Coverage, 28.5 dB over a 4.5° beamwidth
Number of Transponders:	Twelve
Transponder Bandwidth:	35 - 40 MHz
Minimum ERP/Transponder:	Earth Coverage + 23.0 dBW (200 watts); Spot Coverage + 34.7 dBW (2950 watts)
Nultiple Access Capability	Yes
Type of Modulation:	FDM/FM, (possibly some TDM)
Capacity in Telephone Circuits:	5000 - 8000
Electrical Power:	Over 400 watts from storage battery and solar cell array
Design Lifetime:	7 years

TAB D

Earth Stations

D

INTELSAT EARTH STATIONS

General standards, or operating characteristics, for earth stations in the commercial satellite system have been established by the governing body of INTELSAT. A standard station is considered as one having an antenna 85 feet in diameter, or larger, and meeting certain other technical specifications. The principal specifications are shown in Table D-1.

Standard stations are capable of handling and processing all forms of overseas traffic -- multi-channel telephone, telegraph, facsimile, data, both color and black-and-white television. Communication signals transmitted by a station, after passing through a high-power amplifier, are concentrated by the antenna into extremely accurate, narrow beams. In turn, faint incoming signals, a mere fraction of a watt in power by the time they reach earth, are simultaneously received by sensitive equipment, and boosted billions of times in power for further processing. The stations transmit in the six gigacycle range (six billion cycles per

Table D-1

Standard Earth Stations

Gain-to-Noise Temperature (G/T):	≥ 40.7 dB at a 5° elevation angle
Antenna Gain:	≥ 57 dB (4 GHz)
Antenna Steering:	Antenna steerability shall be compatible with: (a) quasi-stationary satellites at earth sation elevation angles not less than 5° with up to 10° orbit inclination and ≥ 10° longitudinal drift; or, if earth station owners so desire. (b) quasi-stationary satellites as is (a) and medium - altitude systems down to 6-hour orbits at any inclination.
Equivalent Isotropically Radiated Power (EIRP):	For INTELSAT II per voice channel +68 dbB for TV transmission from 90 to 95 db For INTELSAT III per voice channel + 61 dBW for TV transmission from 85 to 89dbB

second) on the uplink, and receive at the same time in the four gigacycle range on the downlink.

Although communications signals travel vast distances through space, and are processed through many stages in the stations, the operations are measured in milliseconds, or millionths of a second. The voice quality of an individual telephone call sent via the commercial satellite system is as clear as though the call were made from next door. Television, telegraph messages, or other general communications are of high quality, meeting or exceeding international standards.

The closely coordinated communications system, composed of space stations and earth stations, has an inherent flexibility: working through the same satellite, one earth station can establish communications of all types with another -- or many stations can talk to each other at the same time, linking together by sight and sound the peoples of many countries.

New stations have been built, others are under construction or planned, and some older stations have been adapted or enlarged to meet greater demands. The following is a list of earth station information compiled from the latest sources available:

	Country	Date of Operation
1.	Algeria	1972
2.	Argentina	1969 (2nd Quarter)

Country	Date of Operation
3. Australia	1. Carnarvon: transportable station with 42-foot antenna located at Carnarvon north of Perth, began operation in February, 1967. 2. Moree: new station with 90-foot antenna, located near Moree north of Sydney, began commercial operation May, 1968. 3. Ceduna: proposed new station in South Australia 1969 (3rd Q). All these stations are owned and operated by the Australian OTC (Overseas Telecommunications Commission).
4. Bahrain	1969 (3rd Q)
5. Brazil	1969 (1st Q)
6. Cameroon	1970
7. Canada	1. Mill Village No. 1: station has an 85-foot antenna, located at Mill Village in Nova Scotia, began commercial service October, 1966. 2. Mill Village No. 2: a second antenna 90-feet in diameter is being built on the same site, expected to go in service about first quarter of 1969 as a replacement for No. 1. Station is operated by COTC (Canadian Overseas Telecommunication Corp.)
8. Ceylon	1970
9. Chile	Longovilo: new station with 97$\not$0-foot antenna, located south of Santiago, began commercial service July, 1968 -- the first in Latin America. It is owned and operated by Empresa Nacional de Telecomunicaciones (ENTEL).

	Country	Date of Operation
10.	China (Formosa)	1969 (4th Q)
11.	Colombia	1970
12.	East Africa (Kenya)	1970
13.	Ecuador	1970
14.	Ethiopia	1970
15.	France	1. Pleumeur-Bodou: pioneering station has horn antenna, located in Brittany between the towns of Perros-Guirrec and Lannion, one of the first five stations that began operations via Early Bird in June, 1965. 2. Pleumeur-Bodou: a new standard antenna is planned for construction at the same site, 1969 (2nd Q).
16.	Germany	1. Raisting: a pioneering station with an 82-ft. antenna located in Bavaria about 20 miles southwest of Munich; one of the first five stations that began service via Early Bird in June, 1965. 2. Raisting: a new antenna for use with an Indian Ocean satellite is proposed for third quarter of 1969. The station is operated by the Deutsche Bundespost.
17.	Greece	1970
18.	Hong Kong	1. 1969 (3rd Q) Pacific service 2. 1970, a second antenna for Indian Ocean service. Operators: Cable & Wireless, Ltd.
19.	India	1969 (4th Q)

	Country	Date of Operation
20.	Indonesia	1. Djatiluhur: a standard station for use with the Indian Ocean satellite, project under contract, 1969 (2nd Q). 2. Djatiluhur: a second antenna for use with the Pacific satellite, 1971.
21.	Iran	1970
22.	Israel	1972
23.	Italy	1. Fucino: new antenna 90 feet in diameter, located at site at Fucino about 80 miles east of Rome, began commercial service August, 1967. It replaced a pioneering 42-foot antenna system that started service via Early Bird in summer of 1965. Operator of the station is Societa Telespazio. 2. New antenna for Indian Ocean service, 1969 (4th Q).
24.	Ivory Coast	1969 or 1970
25.	Jamaica	1970
26.	Japan	1. Ibaraki: new antenna 90-feet in diameter replaced smaller antenna that first began service January, 1967. New antenna at Ibaraki, located about 90 miles north of Tokyo, started commercial service in March of 1968. 2. Yamaguchi: new station to begin service upon availability of Indian Ocean satellite. Both stations are owned and operated by Kokusai Denshin Denwa Co., Ltd.
27.	Jordan	1970
28.	Korea	1970

	Country	Date of Operation
29.	Kuwait	1969 (3rd Q)
30.	Lebanon	1970
31.	Malaysia	1969 (4th Q)
32.	Mexico	1. Tulancingo: a new station with 105-foot antenna, located about 80 miles from Mexico City is due to go operational October, 1968. Department of Communications and Transportation operates the station.
33.	Morocco	1969
34.	New Zealand	1970
35.	Nigeria	1. 1969 or 1970, working with Atlantic satellite. 2. 1971, a second antenna for use with Indian Ocean satellite.
36.	Pakistan, East	1970
37.	Pakistan, West	1970
38.	Panama	Utibe: new station with 97-foot antenna, located about 30 miles north of Panama City, operational September, 1968. Page Communications Engineers, Inc. operates the station for Intercomsa.
39.	Peru	1969 (2nd Q)
40.	Philippines	Tanay: a new station with 97-foot antenna at Tanay, about 30 miles east of Manila, went into operation with Pacific satellite April, 1968, replacing older 42-foot antenna that first opened service April, 1967. It is owned by PhilComsat.
41.	Saudi Arabia	1970

	Country	Date of Operation
42.	Senegal	1969 or 1970
43.	Singapore	1970
44.	Spain	1. Grand Canary Island: twin 42-foot antennas, located near Maspalomas, used primarily for NASA support service, went in operation April, 1967. 2. Buitrago: large station with 85-foot antenna, located about 50 miles north of Madrid, began operations via INTELSAT II satellite January, 1968. Compania Telefonica Nacional de Espana operates the station. 3. Buitrago: new antenna for Indian Ocean service, 1970.
45.	Sudan	1970
46.	Sweden	1971
47.	Switzerland	1972
48.	Thailand	1. Sri Racha: new station with 97-foot antenna, located about 50 miles from Bangkok, became operational across Pacific April, 1968. It replaced a transportable facility at same site that had been in service since May, 1967. Post and Telegraph Department of Kingdom of Thailand operates the station. 2. Second antenna at Sri Racha for Indian Ocean service, 1969 (4th Q).
49.	Turkey	1972
50.	United Arab Republic	1971

	Country	Date of Operation
51.	United Kingdom	1. Goonhilly Downs No. 1: pioneering station, located in Cornwall, England, one of first stations that began commercial service via Early Bird satellite in June, 1965. The Government Post Office operates the station. 2. Goonhilly Downs No. 2: a second large aerial is under construction that will permit the station to communicate West and East, via Atlantic or Indian Ocean satellites, planned for 1969 (2nd Q). 3. Ascension Island: a smaller station with 42-foot antenna, located on Donkey Plain, primarily for NASA support service, but also handles other commercial channels, began operations April, 1967. Cable & Wireless, Ltd. operates the station.
52.	Venezuela	1969 or 1970
53.	Viet Nam, South	1969
54.	Zambia	1971
55.	United States	1. Andover, Maine: pioneering station with horn antenna, one of first stations that began commercial service via Early Bird satellite in June of 1965. 2. Brewster Flat, Washington: located about halfway between Seattle and Spokane, began service December, 1966, via Pacific INTELSAT II satellite. 3. Paumalu, Hawaii: site on island of Oahu, about 40 miles north of Honolulu. Largest station of its kind with three antennas, including new 97-foot antenna. Station began service in Pacific, December, 1966.

Country	Date of Operation
United States (Cont'd)	4. Etam, West Virginia: new station with 97-foot antenna due to start commercial operations September or October of 1968. A sister station to those in Puerto Rico and California.
	5. Cayey, Puerto Rico: similar construction, a sister station to West Virginia and California stations. It is located about 35 miles south of San Juan; due to start commercial operations in Atlantic fall of 1968.
	6. Jamesburg, California: sister to the above two stations, located in Upper Carmel Valley about 35 miles southeast of Monterey in Central California. Due to start Pacific commercial operations November or December, 1968.

TAB E

The System Networks (Maps)

E

The INTELSAT System

DECEMBER 31, 1968

A GLOBAL COMMERCIAL COMMUNICATIONS SATELLITE SYSTEM

● *OPERATIONAL EARTH STATIONS* ▲ *NEW EARTH STATIONS (1969)*

ARCTIC OCEAN

UNION OF SOVIET SOCIALIST REPUBLICS

UNITED STATES

CANADA

GREENLAND

NORTH ATLANTIC OCEAN

NORTH PACIFIC OCEAN

INDIAN OCEAN

CHINA

INDIA

AUSTRALIA

BREWSTER FLAT

MILL VILLAGE #1

MILL VILLAGE #2

ANDOVER

ETAM

JAMESBURG

IBARAKI

YAMAGUCHI

TAIPEI

STANLEY PENINSULA

POONA

SRI RACHA #1

SRI RACHA #2

TANAY #1

KUANTAN

CARNARVON #1

CARNARVON #2

CEDUNA

MOREE

PAUMALU #1 & #2

PLANNED

TULANCINGO

CAYEY

UTIBE

LURIN

TANGUA

LONGOVILO

BALCARCE

GOONHILLY DOWNS #2

GOONHILLY DOWNS #1

PLEUMEUR-BODOU #1

PLEUMEUR-BODOU #2

RAISTING #1

RAISTING #2

FUCINO #1

FUCINO #2

BUITRAGO #1

AIN-EL-AOUDA

GRAND CANARY ISLAND

ASCENSION ISLAND

ABANIYEH

ASADABAD

JAHRA

ROS ABU JARJUR

PLANNED

TRACKING, TELEMETRY, AND CONTROL STATIONS
ANDOVER, MAINE
PAUMALU, HAWAII
FUCINO, ITALY
CARNARVON, AUSTRALIA (#1) (1969)

INTELSAT I

INTELSAT II

INTELSAT III

NETWORKS CONFIGURATION

SATELLITE	EARTH STATIONS
INTELSAT II (F-2)	PAUMALU, OAHU, HAWAII TANAY, PHILIPPINES SRI RACHA, THILAND
INTELSAT II (F-4)	BREWSTER, WASHINGTON PAUMALU, OAHU, HAWAII IBARAKI, JAPAN CARNARVON, AUSTRALIA (42°) MOREE, AUSTRALIA JAMESBURG, CALIFORNIA

NETWORKS CONFIGURATION*

SATELLITE	EARTH STATIONS
INTELSAT I EARLY BIRD	MILL VILLAGE, CANADA GOONHILLY DOWNS, ENGLAND PLEUMEUR BODOU, FRANCE RAISTING, WEST GERMANY
INTELSAT II (F-3)	ANDOVER, MAINE LONGOVILO, CHILE UTIBE, PANAMA BUITRAGO, SPAIN FUCINO, ITALY GRAND CANARY ISLAND, SPAIN (42°) ASCENSION ISLAND, UK (42°)

*Note: The network configuration will change when INTELSAT III (F-2) (Atlantic) becomes operational. The following stations will then be added to the network: Etam, West Virginia; Cayey, Puerto Rico and Tulancingo, Mexico.

TAB F

Membership in INTELSAT

F

Members of INTELSAT, Then Designated Entities, and Quotas

Country	Entity	Quotas
ALGERIA	Ministry of Posts and Telecommunications	00.543256
ARGENTINA	Secretaria de Estado De Communicaciones	01.413399
AUSTRALIA	Overseas Telecommunications Commission	02.390993
AUSTRIA	Bundesministerium für Verkehr und Elektrizitätswirtschaft, General-direktion für die Post-und Telegraphenverwaltung	00.173890
BELGIUM	Régie des Télégraphes et Téléphones	00.956397
BRAZIL	National Telecommunications Council	01.413399
CANADA	Canadian Overseas Telecommunication Corporation	03.260445
CEYLON	Permanent Secretary in charge of Ministry of Posts and Telecommunications of Ceylon	00.045271
CHILE	Empresa Nacional de Telecomunicaciones S.A.	00.282680
CHINA	Directorate General of Telecommunications of the Republic of China	00.090543
COLOMBIA	Government of Colombia	00.543256
DENMARK	Generaldirektoratet for Post og Telegrafvesenet	00.347781
ETHIOPIA	Government of Ethiopia	00.072434
FRANCE	Government of the French Republic	05.303657

Country	Entity	Quotas
GERMANY	Deutsche Bundespost	05.303657
GREECE	Greek Ministry of Communications Directorate General of Telecommunications	00.094227
INDIA	Government of India	00.471133
INDONESIA	Dewan Telekomunikasi	00.271628
IRAN	Ministry of Post, Telegraph and Telephone	00.250000
IRAQ	Ministry of Communications of Iraq	00.009054
IRELAND	An Roinn Poist Agus Telegrafa	00.304308
ISRAEL	Ministry of Posts State of Israel	00.568841
ITALY	Societa Telespazio	01.912794
JAPAN	Kokusai Denshin Denwa Company, Ltd.	01.738904
JORDAN	Ministry of Communications of the Hashemite Kingdom of Jordan	00.045271
KENYA	East African External Telecommunications Company, Ltd.	00.049601
KOREA	Ministry of Communications of the Republic of Korea	00.049284
KUWAIT	Ministry of Posts, Telegraphs, and Telephones of Kuwait	00.045721
LEBANON	Government of Lebanon	00.072434
LIBYA	Government of the Kingdom of Libya	00.027163
LIECHTENSTEIN	Government of the Principality of Liechtenstein	00.048277

Country	Entity	Quotas
MALAYSIA	Director General of the Telecommunications Department, Government of Malaysia	00.240302
MEXICO	Department of Communications and Transportation of the Government of Mexico	01.470380
MONACO	Government of the Principality of Monaco	00.004527
MOROCCO	Government of Morocco	00.289520
THE NETHERLANDS	Government of the Kingdom of the Netherlands	00.869452
NEW ZEALAND	Postmaster General of New Zealand	00.407442
NIGERIA	Federal Republic of Nigeria	00.335245
NORWAY	Telegrafstyret	00.347781
PAKISTAN	Government of Pakistan	00.236228
PANAMA	Intercontinental de Comunicaciones Por Satelites, S.A.	00.039681
PERU	Junta Permanente Nacional de Telecomunicaciones	00.495562
PHILIPPINES	Philippine Communications Satellite Corporation	00.492590
PORTUGAL	Administracao Geral dos Correios, Telegrafos e Telefones	00.347781
SAUDI ARABIA	Ministry of Communications	00.045271
SINGAPORE	Government of Singapore	00.096507
SOUTH AFRICA	Department of Posts and Telegraphs of the Republic of South Africa	00.271628
SPAIN	Government of the State of Spain	00.956397

Country	Entity	Quotas
SUDAN	Department of Posts and Telegraphs of the Government of the Republic of the Sudan	00.009055
SWEDEN	Kungl. Telestyrelsen	00.608616
SWITZERLAND	Direction Generals des PTT	01.738904
SYRIA	Ministry of Communications of the Syrian Arab Republic	00.036217
TANZANIA	East African External Telecommunications Company Ltd.	00.049556
THAILAND	Kingdom of Thailand	00.096121
TUNISIA	Secretariat of State for Post, Telegraph and Telephone of Tunisia	00.181085
TURKEY	Government of the Republic of Turkey	00.498750
UGANDA	East African External Telecommunications Company, Ltd.	00.049626
UNITED ARAB REPUBLIC	Government of the United Arab Republic	00.316899
UNITED KINGDOM	Her Britannic Majesty's Postmaster General	07.303396
UNITED STATES	Communications Satellite Corporation	53.036570
VATICAN CITY	Government of the Vatican City State	00.043473
VENEZUELA	Ministry of Communications of Venezuela	00.957842
YEMEN	Yemen Arab Republic Ministry of Communications	00.028347
	TOTAL	99.999999

TAB G

Membership in Interim Committee

G

INTERIM COMMUNICATIONS SATELLITE COMMITTEE

Arab Group (Algeria/Iraq/Jordan/Kuwait/Lebanon/Libya/Morocco/Saudi Arabia/Sudan/Syria/Tunisia/United Arab Republic/Yemen)

Argentina

Asia-Pacific Group (The Philippines/Ceylon/India/Indonesia/Malaysia/New Zealand/Singapore/Thailand)

Australia

Brazil

Canada

France/Monaco

Germany

Italy/Vatican City

Japan

Mexico

Netherlands/Belgium

Spain/Portugal

Sweden/Denmark/Norway

Switzerland/Austria/Liechtenstein

United Kingdom/Ireland

United States

Venezuela/Chile/Colombia