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Communications Satellites— Progress and the Road Ahead

*Bernard G. Segal**

The development of satellites for intercontinental communications is a rapidly expanding field. The author here presents the basio technology of communications satellites, applicable legislation, and international problems involved in order to provide a background with which to understand future developments. The author explains the Communications Satellite Act of 1962 which made possible the Communications Satellite Corporation, a "partnership" of government and private enterprise, and destined to play a major role in a global communications system. Finally, the author reviews the recent international agreements under which the system will operate initially.

I. INTRODUCTION

The declared policy of the United States is the establishment of a global system of communications satellites which will serve our needs and those of other countries, which will permit the participation of all nations, and which will contribute to world peace and understanding.[1] Such a system, President Kennedy stated, is a vital element in the march of civilization.[2]

For lawyers to have a meaningful understanding of the developments in this new and important endeavor requires some understanding of the basic technology of communications satellites, of applicable

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1. See Senate Comm. on Aeronautical and Space Sciences, *Documents on International Aspects of the Exploration and Use of Outer Space, 1954-1962*, S. Doc. No. 18, 88th Cong., 1st Sess. 14, 206, 208, 261-63 (1963) [hereinafter cited as *Documents on Outer Space*]; Communications Satellite Act of 1962 (Declaration of Policy and Purpose), 76 Stat. 419 (1962), 47 U.S.C. § 701 (Supp. IV, 1963).

2. *Documents on Outer Space* 316; White House Press Release, Aug. 31, 1962.

legislation, and of the international problems involved. This article will attempt to present at least the basic material necessary for such comprehension.

II. THE TECHNOLOGY

As the demand for radio communications services grows, it is necessary to move to higher and higher frequencies to provide sufficient channels to handle the transmissions.[3] Present overland television and microwave services are transmitted over such high frequencies.

At these high frequencies, radio waves tend to travel in a straight line, much in the manner of light. For this reason, after a relatively short distance, the curvature of the earth interferes with the transmission of these radio waves. Therefore, to transmit ultra high frequency radio waves over long distances requires the use of relay stations built within line of sight from one to another to carry the signals around the curvature of the earth. These take the form of relay towers, spaced some twenty to thirty miles apart, which now cross the continent making it possible to have voice, record and television signals span this entire territory.

Until the advent of communications satellites, there was no feasible way to extend such a relay system across the oceans. To get a line of sight across the Atlantic Ocean would require either the ordinary relay towers, twenty to thirty miles apart, or a single relay tower over 475 miles high, both obviously impractical.

This is where the communications satellite comes in.[4] A satellite in orbit, thousands of miles above the North Atlantic, is high enough to provide a direct line of sight between the United States and Europe. It can relay microwave frequency signals in a single hop

3. A voice channel is a convenient measure of traffic which implies an information band width of 3 kilocycles in each direction with certain well-known statistical characteristics in both the time and the frequency domains. Typically, 22 telegraph or telex channels equal 1 voice channel, and 600 2-way voice channels occupy space in the spectrum equal to one TV channel.

4. For descriptions of the technical aspects of communications satellites and more or less detailed statements of their history and how they operate, see the statement of Dr. Elmer W. Engstrom, President of Radio Corporation of America, *Hearings Before the Subcommittee on Monopoly of the Senate Select Committee on Small Business, Public Policy Questions on the Ownership and Control of a Space Satellite Communications System*, 87th Cong., 1st Sess. 121-31 (1961); Reiger, Nichols, Early & Dews, *Communications Satellites: Technology Economics and System Choices*, The Rand Corporation, Memorandum RM-3487-RC (February 1963); PROCEEDINGS OF THE SECOND NATIONAL CONFERENCE ON THE PEACEFUL USES OF SPACE, SEATTLE, WASHINGTON (May 8-10, 1962), published by the Office of Science and Technical Information, National Aeronautics & Space Administration (NASA) (SP-8, Nov. 1962) [hereinafter cited as PROCEEDINGS]; FCC REPORT OF THE AD HOC CARRIER COMMITTEE IN THE MATTER OF AN INQUIRY INTO THE ADMINISTRATIVE AND REGULATORY PROBLEMS RELATING TO THE AUTHORIZATION OF COMMERCIALLY OPERABLE SPACE COMMUNICATIONS SYSTEMS, FCC Doc. No. 14024 (Oct. 12, 1961) [hereinafter cited as REPORT OF THE AD HOC CARRIER COMMITTEE].

across the ocean, performing the same function as relay stations or cables. And since the number of channels which a satellite can be expected to provide is very high, the satellite can be used not only for telephone service but also for television and telex, teleprinter, facsimiles, and other types of high-speed data transmissions.

A natural inquiry is whether such communications service cannot be supplied entirely by cables. Until now the answer, as a practical matter, has been in the negative. A single television signal would occupy some six-hundred voice circuits, more than are now provided by all the cables under the Atlantic Ocean. For this reason the United States has been unable to televise live programs to Europe by cable.

However, transistorized cables, which are under development by American Telephone and Telegraph Company (AT&T) will be capable of accommodating a great many additional voice circuits. For example, a trans-Atlantic transistorized cable could have a capacity of as many as seven-hundred-twenty two-way telephone grade circuits and could provide for the areas served by such cables the various forms of telecommunications traffic which a satellite system might serve. It has been suggested that although no transistorized cables are scheduled to be in operation by the end of 1965, the potential of such cables may lessen the economic justification for communications satellites. Contrariwise, it has been said that with international television and the increasing use of broad band data services making great demands on capacity, it would be simpler, more efficient, and eventually less costly to use satellites rather than cables. Further, advocates of the satellite communications development predict that increased demand for voice and record communications would be almost certain to use up the total capacity of such a new cable soon after its completion.[5]

In recent months AT&T made an important announcement that should go a long way in allaying the fears of those who thought that competition might be shaping up between the communications satellite system and AT&T's new transoceanic cable. This was to the effect that the company would prefer using satellite circuits to laying additional cables across the North Atlantic, if "suitable satellite facilities" were ready on schedule, and that such preference would continue

5. For example, it has been estimated that from 1970 to 1980, the number of circuits required for telecommunication facilities will triple. REPORT OF THE AD HOC CARRIER COMMITTEE 15; see also Jaffe, Smith & Attaway, *The Impact of Communications Satellites on the Less Developed Areas*, in UNITED STATES PAPERS PREPARED FOR THE UNITED NATIONS CONFERENCE ON THE APPLICATION OF SCIENCE AND TECHNOLOGY FOR THE BENEFIT OF THE LESS DEVELOPED AREAS, Vol. XII, Communications 115, 116-19 (U.S. Gov't. Print. Office, 1963) [hereinafter cited as UNITED STATES PAPERS].

until the cable and the satellite voice circuits serving the North Atlantic routes were approximately equal in number.[6]

By now it can certainly be said that there is substantial agreement that, even with improvement in cables, satellite development must go forward, and in the long run, communications satellites will constitute an essential part of any global communications system.

With this background we turn to the principal types of communications satellites which have been placed in orbit. These may be divided into two categories—the passive and the active.

Preliminarily, the popular misconception that before long satellites will be broadcasting directly into the home should be corrected. It is not expected that such broadcasting by satellite will become technically feasible for at least another decade.[7] The types of satellites in operation today are all of the relay type, *i.e.*, they broadcast not directly to the home receiver, but rather through a ground station which in turn transmits to the home by ordinary communication media, for example, a telephone switchboard or a television station's transmitter.

A. *The Passive Satellite*

The passive satellite is one which merely acts as a large radio wave reflector or mirror. Essentially, the passive system consists of (1) a powerful transmitter on earth which simply "bounces" a signal off the surface of the satellite, and (2) a station on earth which has large movable antennas and sensitive receivers to receive the reflected signal.[8]

Potentially, passive satellites are very reliable,[9] because they have no electronics which can fail; and a single satellite can be "used" by many ground stations simultaneously provided, of course, different frequencies are available for use. On the other hand, passive satellites only reflect signals; they do not amplify them. Therefore, for high volume usage such satellites require expensive and powerful

6. Newsweek, March 16, 1964, p. 88. By suitable satellite facilities, AT&T explained, it meant circuits that are satisfactory in quality and having costs bearing a reasonable relationship to alternative methods of getting the circuits.

7. Address by Jaffe, *Communications Satellites*, The First World Conference on World Peace Through Law, Athens, Greece, July 3, 1963.

8. The first demonstration of the passive communications satellite technique occurred in 1958, when United States scientists carried on a trans-continental two-way voice conversation using the moon as the relay point for the reflected signals. Subsequently, NASA's Project Echo utilized the first man-made passive communications satellite.

9. Echo I, a 100-foot metalized balloon, was launched by NASA in August 1960. Many successful experiments were conducted with it. Although now shriveled and dented after four years in space, it can still be seen with the naked eye. Echo II, which is 135 feet in diameter and made of a heavier, stiffer material, was launched in January 1963; it is still in use and can also be seen with the naked eye.

ground transmitters and ultra-sensitive ground receivers, and even then the satellite's return signal becomes weak at altitudes over 2,000 miles. Hence, if the passive reflector satellite is to be employed, it will be for relatively low-volume traffic.

B. *The Active Satellite*

The active satellite, unlike the passive type, contains electronic equipment for receiving radio signals from the earth. The active satellite amplifies the signal and retransmits it back to a ground station, serving the same purpose as a microwave tower would if it were possible to construct one of sufficient height.[10]

AT&T's "Telstar," which provided the first trans-Atlantic television transmission, and Radio Corporation of America's (RCA's) "Relay," which was used to televise to Europe the launching of Astronaut L. Gordon Cooper, are both active relay satellites.[11]

Active satellites under consideration today are of two types: the medium altitude satellite and the fixed, or synchronous, high altitude satellite.

1. *The Medium Altitude Type.*—The medium altitude satellite for a commerical system is one which is placed in orbit from 5,000 to 10,000 miles above the earth. Telstar and Relay are both examples of this type.[12]

It is estimated that to maintain a continuous global communications service system using a medium altitude type of satellite (at an approximate height of 6,000 miles) would require a minimum of 12

10. The era of active communications satellites began in December 1958, with the Army Signal Corps' Project Score. A pre-recorded Christmas message by President Eisenhower was transmitted to earth from the satellite for 12 days. Although very limited in capability, Project Score was successful in proving the concept. In 1960, the United States launched its second active satellite, "Courier," a "delayed repeater" satellite which received a message and stored it on tapes while in view of one ground station and, at a later time when in view of another ground station, retransmitted the message to the ground.

11. For descriptions of Telstar, see Felker, *Telestar Project*, PROCEEDINGS 181; Findley, *Telephone a Star*, National Geographic, May 1962, pp. 638-51. For a description of Project Relay, see Address by Metzger and Schreimer, *Project Relay*, American Rocket Society, 17th Annual Meeting and Spaee Fligbt Exposition, Los Angeles, Nov. 13-18, 1962. Although Relay and Telstar were designed for similar capabilities, they differ in electronic circuitry and in two other respects: the communications transmitter of Relay has a power output four times as high as Telstar and Relay carries two complete communications transponders, both of which may be used in identical fashion.

12. Telstar I was launched on July 10, 1962. It ceased operating after four and one-half months because of radiation damage. Telstar II was launched on May 7, 1963. It failed to responded to commands after two and one-half months for undetermined reasons, but was reactivated subsequently for an additional period. Relay I was launched on December 13, 1962 and set a new record for performance and durability. Relay II was launched on January 21, 1964 and transmitted the first live television broadcast from Japan on Mareh 19, 1964. Relay II was still broadcasting as of this writing.

satellites, if spacing between the satellites is controlled through equipment within the satellites, and a minimum of 18 satellites if the satellites travel in random orbits. The reason for this relatively large number is to ensure that, as one satellite disappears over the horizon, another will come within range of each set of two communicating ground stations. In addition, to provide continuous communications, each earth terminal must have at least two antennas, so that as one antenna follows or tracks the satellite to the horizon, the second antenna would begin to communicate via another satellite as that satellite comes into view.

One disadvantage of the medium altitude system is that the ground stations are more complicated and expensive than in the synchronous system. Another is the radiation damage at low altitudes, a condition which rendered Telstar I inoperable. On the other hand, a significant advantage of the medium altitude system is that with many satellites in orbit, the system can continue to operate, although on a reduced basis, even if several of the satellites fail for mechanical reasons or because of radiation damage.

2. *The Synchronous Type.*—The other type of active satellite is the fixed, or synchronous, high altitude type.[13] This satellite is placed in orbit at 22,300 miles above the earth. At that altitude the speed of the satellite in orbit matches the speed of the earth's rotation on its axis. Consequently, such a satellite will have an orbit of twenty-four hours. If placed over the equator, the satellite will appear to remain fixed at a point in space in relation to the earth's surface in the manner of an enormously high relay tower. This means that the satellite is always visible from the same points on the earth's surface, and therefore, continuously available for communications.

As previously mentioned, increasing the altitude of a satellite enlarges the area over which it is visible to ground stations for communication-relay purposes. At the 22,300 mile altitude, three satellites spaced at approximately one-hundred-twenty degree intervals would provide coverage over virtually the entire world (except the polar regions).

The major advantages of the synchronous system are (1) that it requires few satellites to provide world-wide coverage, and (2) that since synchronous satellites remain in the same area over the globe, this system permits simpler ground stations, there being no need for the expensive precision-built tracking antennas required to maintain uninterrupted service in the case of the medium altitude satellite. On the other hand, the synchronous satellite itself is far

13. For a description of the synchronous type, see Adler, *Synchronous Orbit Communications Satellites,* PROCEEDINGS 187-91.

more complicated than the medium type. Moreover, there is still some question whether in some respects, the synchronous satellite can provide the desired quality of telephone service.

The first experimental synchronous satellite (Syncom I) was launched on February 14, 1963 and failed to operate.[14] In July and August, 1963, NASA launched its second synchronous satellite, Syncom II. Unlike Syncom I, Syncom II has a good record of performance, having completed more than 2500 hours of communication time by August 15, 1964. As this article goes to press, Syncom III has just been launched.[15]

All of this technological development has been quite remarkable, especially when we realize that the first specific satellite possibilities were presented less than a decade ago.[16] However, scientific development was so rapid that early in 1961, it became apparent that international communication by means of satellites would be entirely feasible. With this knowledge came the realization that the establishment of a world-wide space communications system under United States leadership was entitled to high priority, and the government concentrated on legislation designed to make this possible.[17]

III. The Communications Satellite Act of 1962

In the working out of communications satellite legislation, certain salient facts had to be considered. In the first place, the American

14. The launching was nearly perfect and the satellite was placed in an elliptical orbit, the peak altitude of which was about 22,300 miles. At that point, the on-board rocket was to be fired, adding enough velocity to keep the satellite at the synchronous altitude. However, approximately twenty seconds after the on-board rocket was fired, all signals ceased and Syncom I has been silent since.

15. Syncom III was launched on August 19, 1964. If successfully positioned, it will be made available to transmit Olympic television from Japan. Under the plan, which is being coordinated by CSC, the TV signals will be sent from a Japanese ground station near Tokyo, relayed by Syncom III over the Pacific, and received at the Naval Missile Center at Point Mugu, California, which will serve as the Pacific coast ground station. The signals will then be sent by microwave to the Los Angeles facilities of the Bell Telephone system where the video transmission will be made available for distribution to participants in the project. The project will be financed initially by the Radio Corporation of America and the Japan Broadcasting Corporation. National Broadcasting Company, Inc., will carry on its national television network, and also make available to other networks, the opening ceremonies. News Release, Office of the White House Press Secretary, July 22, 1964; FCC Report No. 1586, July 22, 1964. It should be noted, however, that Syncom III was not basically designed for television transmission and the quality of the picture from Japan will not be comparable to that which is expected in the global commercial communications satellite system. Communications Satellite Corporation, First Report to Shareholders, Augnst 3, 1964 p. 12.

16. The idea of communications satellites appears to have been first advanced by Arthur C. Clarke, a science writer, in an article published in The Wireless Wires in 1945. See Pierce, *Communications Satellites*, Scientific American, October 1961, p. 90.

17. For comment on the background leading up to the enactment of the Communications Satellite Act of 1962, see Moulton, *Communications Satellites—The Proposed Communications Satellite Act of 1962*, 18 Bus. Law. 173, 174-75 (1962).

communications industry has traditionally been in the hands of private companies, both domestically and internationally. Private industry in this country, therefore, has a very large stake in a satellite system; it has developed a great deal of competence in the communications satellite field and has made substantial contributions to its development.

At the same time, the government has its own stake. As Nicholas deB. Katzenbach, Deputy Attorney General of the United States, has stated, the government's interests include "dedication to scientific progress in space, the control over the launching facilities and air space used for access to space and the . . . responsibility to encourage satellite communications in order to improve communications among nations and assist in their economic development, which have long been major objectives of United States foreign policy."[18]

After protracted Congressional hearings[19] the Communications Satellite Act of 1962,[20] an imaginative and creative piece of legislation, finally emerged.

The best expression of the policy and purposes of the Act is contained in the Act itself, in the following words:

> 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 and national objectives, which will serve the communication needs of the United States and other countries, and which will contribute to world peace and understanding.[21]

Congress additionally provided that such services should be pro-

18. Address by Katzenbach, *Communications Satellites*, The First World Conference on World Peace Through Law, Athens, Greece, July 3, 1963, Doc. No. T7/45, p. 2. See also Katzenbach, *Address on Communications Satellite Legislation*, 7 ANTITRUST BULL. 421 (1962).

19. Four committees held hearings on the proposed legislation: the Senate Aeronautical and Space Sciences Committee on February 27 and 28 and March 1, 5, 6, and 7, 1962, S. REP. No. 1319, 87th Cong., 2d Sess. (1962); the House Interstate and Foreign Commerce Committee on March 13, 14, 15, 16, 20, 21, and 22, 1962, H.R. REP. No. 1636, 87th Cong., 2d Sess. (1962); the Senate Commerce Committee on April 10, 11, 12, 13, 16, 24, and 26, 1962, S. REP. No. 1584, 87th Cong., 2d Sess. (1962); and the Senate Foreign Relations Committee on Aug. 3, 6, 7, 8, and 9, 1962, S. REP. No. 1873, 87th Cong., 2d Sess. (1962). Hearings on related matters were also held by the Subcommittee on Monopoly of the Senate Select Committee on Small Business, the Communications Subcommittee of the Senate Commerce Committee, the Subcommittee on Antitrust and Monopoly of the Senate Committee on the Judiciary, the Antitrust Subcommittee of the House Committee on the Judiciary, the House Committee on Interstate and Foreign Commerce, and the House Science and Astronautics Committee.

20. 76 Stat. 419 (1962), 47 U.S.C. 701 (Supp. IV, 1963).

21. 76 Stat. 419 (1962), 47 U.S.C. 701(a) (Supp. IV, 1963).

vided to economically less developed countries, that all authorized users should have nondiscriminatory access to the system, and that competition in the providing of communications services to the public should be maintained and strengthened.[22]

The entity to bring about these objectives is the Communications Satellite Corporation, popularly known as COMSAT or CSC,[23] whose organization and proposed method of operation are unique.

One theme running through the Act is that of a working partnership between the corporation and certain specified governmental agencies. Concerning matters of internal management and operation and essentially commercial transactions, the corporation is given the broad powers usually enjoyed by private enterprises. At the same time several government agencies are assigned the role of assuring that the national policy and the public purposes which led to the creation of the corporation are carried out.

Thus, the incorporators, who became the initial board of directors, were appointed by the President with the advice and consent of the Senate, and even after the corporation has issued its capital stock,[24] three directors are to be appointed by the President.[25] The remaining twelve directors will then be elected by the shareholders: (1) six by the communications common carriers which have purchased shares, the expectation being that such carriers will own fifty per cent, the maximum allowed them under the Act, and (2) six by shareholders other than communications carriers, of whom no one shareholder may own more than ten per cent of the shares and foreigners may not own, in the aggregate, more than twenty per cent of the shares.[26]

The government's participation in regulation, and in a few instances in control, is extensive, as is seen from the following examples:

The President is to aid in the planning, development, and execution, and to provide for continuous review, of a national program for a communications satellite system and to exercise such supervision as may be appropriate to assure that the corporation's activities shall be consistent with the national interest and foreign policy.[27] The State

22. 76 Stat. 419 (1962), 47 U.S.C. 701(b)(c) (Supp. IV, 1963).

23. Of these short-form designations, CSC will be principally used throughout this article.

24. CSC made its offering of ten million shares on June 2, 1964. For details on ownership of CSC stock see notes 72, 73, *infra*.

24. 76 Stat. 423 (1962), 47 U.S.C. 732 (Supp. IV, 1963).

25. 76 Stat. 423 (1962), 47 U.S.C. 733(a) (Supp. IV, 1963).

26. *Ibid.* However, pursuant to provisions of the Articles of Incorporation, the Board of CSC established 1% as the maximum percentage of shares that may be owned by any shareholder other than an authorized carrier. CSC and the FCC are in disagreement as to whether such action is subject to FCC review.

27. 76 Stat. 421 (1962), 47 U.S.C. 721(a) (Supp. IV, 1963).

Department is to advise the corporation on relevant foreign policy considerations[28] and to exercise certain specific powers.[29]

NASA is to furnish the corporation, on a reimbursable basis, with satellite launching and associated services for the establishment and operation of the system and for research and development, and is to consult and cooperate with the corporation in these fields.[30]

Quite naturally, the Federal Communications Commission is given a wide variety of duties and responsibilities. Thus, the Commission prescribes accounting regulations, engages in rate-making procedures, and authorizes the corporation to issue additional shares of stock and to borrow money. The Commission is also directed to insure non-discriminatory use of, and equitable access to, the system under just and reasonable charges and classifications; to approve technical characteristics of the system; to grant authorizations for the construction and operation of satellite terminal stations; and to insure the compatibility of the system with existing communications facilities.[31]

As to its operations the primary purpose of CSC is, of course, to construct, own, and operate a commercial communications satellite system, which it may do by itself or jointly with foreign entities. In addition, it may lease channels to authorized carriers, foreign and domestic, and it may also own and operate ground terminal stations when licensed by the FCC.[32]

Although, under the Act, CSC is authorized to furnish channels of communication to authorized users other than common carriers, the understanding is that CSC will deal only with communications carriers serving as a "common carrier's common carrier"[33], and that the cus-

28. 76 Stat. 426 (1962), 47 U.S.C. 742 (Supp. IV, 1963).

29. 76 Stat. 421 (1962), 47 U.S.C. 721(c)(3) (Supp. IV, 1963).

30. 76 Stat. 421 (1962), 47 U.S.C. 721(b) (Supp. IV, 1963). CSC has taken the position that it should not be required to pay, compensate, or reimburse NASA for expenditures in researeh and development conducted for the benefit of CSC, but not expressly requested by it. The basis for this position is, *inter alia*, that NASA research and development in the satellite communications field and related areas is essential if NASA is to carry out its own responsibilities under the Communications Satellite Act, as well as under National Aeronautics and Space Act, and that such continued research by NASA, without reimbursement from other sources, was clearly envisioned at the time of the passage of the Act. See *Hearings on H.R. 5466 Before the Sub-Committee of the House Committee on Science and Aeronautics on Application and Tracking and Data Acquisition*, 88th Cong., 1st Sess. pt. 4, at 3328-3333 (1963).

31. 76 Stat. 419 (1962), 47 U.S.C. 721(c) (Supp. IV, 1963).

32. 76 Stat. 425 (1962), 47 U.S.C. 735 (Supp. IV, 1963).

33. Address by Ford (FCC Commissioner), *Commercial Communications Satellite System*, The Inter-American Bar Association, XIII Conference, Panama City, Panama, April 19-26, 1963, p. 5. See also address by E. William Henry (Chairman of the FCC), delivered before the Standing Committee on Communications, American Bar Association, August 14, 1963 (FCC Memo. 39827), p. 7.

tomer will continue to deal with the common carriers in the usual way.[34]

IV. The Establishment of a Global System

In working out the international framework of a global system, the United States has been faced with the difficult task of achieving agreement on a new and unique development among nations with different resources, different priorities, and different aspirations in this field. Unfortunately, present day sources of international law are not too helpful, offering at best only analogies.[35] Evolving rules and establishing procedures for the operation of a global communications satellite system will be a difficult and complex task, calling for what has been aptly termed "creative statesmanship at all levels of endeavor."[36]

A. *International Radio Frequency Allocation*

A threshold problem involves the crucial matter of international radio frequency allocation. Only selected frequencies within the radio spectrum are available for use in connection with communications between space vehicles on the one hand and earth or ground stations on the other. A prerequisite to the establishment of a global commercial communications satellite system is that there be adequate frequency allocation on a basis technically feasible and generally acceptable to the nations of the world.

This problem is one entrusted to the International Telecommunication Union (ITU), a special agency affiliated with the United Nations. In the field of telecommunications, the ITU acts as the general agent for allocation of the radio frequency spectrum for different types of uses.[37]

In 1959, when the ITU delegates met at Geneva, they provisionally allocated certain frequencies to be used on an experimental basis for space communications. However, anticipating the notable growth and development of communications satellites, the delegates at Geneva in 1959 recommended that an Extraordinary Administrative Radio Con-

34. Address by Marks, *Communications—The Lifeline of Civilization*, The First World Conference on World Peace Through Law, Athens, Greece, July 3, 1963.

35. Address by Segal, *Communications Satellites—Pathways to International Understanding*, The First World Conference on World Peace Through Law, Athens, Greece, July 3, 1963.

36. Address by Katzenbach, *The Development of Law for Outer Space*, The Chicago Planetarium Society, Chicago, Ill., Dec. 7, 1961, p. 5.

37. For a comprehensive review of the background of the ITU and the various international telecommunication conferences, see Glazer, *The Law-Making Treaties of the International Telecommunication Union Through Time and in Space*, 60 Mich. L. Rev. 269 (1962); Glazer, *Infelix ITU—The Need For Space-Age Revision To the International Telecommunication Convention*, 23 Fed. B.J. 1 (1963); see also generally, Codding, The International Telecommunication Union: An Experiment in International Cooperation (1952); Estep and Kearse, *Space Communications and the Law: Adequate International Control After 1963?*, 60 Mich. L. Rev. 873 (1960).

ference of the ITU on Space Radio Communications (EARC) be convened in 1963, primarily for the purpose of assigning the frequencies necessary for all categories of space communication services. This Conference was held in Geneva in October and November, 1963, and was attended by representatives of seventy nations. The Conference allocated radio frequency bands for communications satellites and for other space communication services involving use of the frequency spectrum. 2500 to 2700 megacycles of frequency space were allocated to communications satellites on a shared basis with radio services, and two 50 megacycle bands on an exclusive basis.[38] The treaty resulting from this conference was ratified by the United States Senate in March, 1964.

The resolution of the radio frequency question was, of course, a *sine qua non* to the establishment of any global system. Beyond that, however, there still remain broad and complex problems involved in establishing a usable global communications system.

B. *International Organization of a Global System*

The initial level for possible international participation in a communications satellite system is in the decisions on key issues relating to the establishment of the system—such as the selection of a system, the type of system, its design, the scope of the system, and its financing. Such questions are not merely matters of technique or detail. They involve factors of tremendous cost and may affect the whole course of a global communications system.[39] Even so space-capable a nation as the United States, which has spent many millions of dollars in initial development of communications satellites, has not yet been able to work out all of its own answers as to which of the approaches to a communications satellite system is most desirable.

Obtaining extensive international participation in the initial stages of establishing a global communications satellite system affords the pragmatic advantage of insuring, at the outset, the existence of the broad base which appears to be necessary to make the system successful.

38. Allocations obtained at the Conference, although not in all cases those proposed by the United States, are believed to be of sufficient quantity and quality to accommodate the requirements presently projected by the United States. REPORT TO THE CONGRESS FROM THE PRESIDENT OF THE UNITED STATES ON UNITED STATES AERONAUTICS AND SPACE ACTIVITIES DURING 1963, Jan. 27, 1964.

39. Dr. Leonard Jaffe, Director, Communications Systems, National Aeronautics and Space Administration, has pointed out that within the basic choices of number, altitude and kind of satellite, there lies "an extraordinary number of alternatives, each of which must be put to the test of cost, complexity, feasibility, and reliability . . . and nearly every choice changes the factors involved in every other choice. Behind each technical decision is a long series of tradeoffs of weight, of cost, of reliability, of service, etc." Address by Jaffe, *Communications Satellites*, The First World Conference on World Peace Through Law, Athens, Greece, July 3, 1963.

However, there are also disadvantages to international participation in the basic choices. It is obvious that few nations have the technical competence at the present time to make meaningful contributions to decisions bearing on the establishment of the system.[40] Even space-capable nations do not see eye-to-eye on many important technical aspects, and the resolution of differences among the participants involves possibilities of delay. The International Telephone and Telegraph Consultative Committee (CCITT),[41] for example, has provisionally recommended technical time specifications which might well rule out the use of synchronous satellites except over communication links for which no alternative means of communication can be provided,[42] a decision which United States experts consider unwarranted.[43] Furthermore, participation in the key initial decisions leading up to the establishment of a system could create a complex of difficult politico-strategic problems, especially where participating nations have different ideologies and pursue different objectives in the establishment of a system. Unfortunately, progress in outer space cannot yet be divorced from politics in inner space.

The United States has thus been faced with uneasy alternatives. If it had deferred the establishment of a system until full international participation could be worked out, the pace of the technological development would inevitably have suffered and the risk of another country's coming out with a competing development would also have been incurred.[44] On the other hand, if the United States had by itself made all the key decisions on the establishment of a communications satellite system and had then offered the result to other nations on what would have been essentially a "take it or leave it" basis, other

40. The fact that a nation has not itself achieved a highly developed technology does not mean, of course, that it may not wish to participate in these initial decisions. A non-space-capable nation may believe that participation in the initial stages may offer a variety of values, such as prestige, the opportunity to train scientists, a forum to advance the nation's economic interests, insurance against being bypassed later on, or any number of other socio-economic-political benefits. The pros and cons of foreign participation in the key decisions are ably set forth in Schwartz & Goldsen, *Foreign Participation in Communications Satellite Systems: Implication of the Communications Satellite Act of 1962*, The Rand Corporation, Memorandum RM-3484-RC (February 1963).

41. One of the permanent organs of the International Telecommunication Union.

42. House Comm. on Interstate and Foreign Commerce, *Communication Satellite Act of 1962—The First Year*, H.R. REP. No. 809, 88th Cong., 1st Sess. 3 (1963).

43. At a technical session on Syncom II, held by the Institute of Electrical & Electronic Engineers in New York in March 1964, officials of the Army's Satellite Communications Agency, Fort Monmouth, New Jersey, delivered papers which presented the conclusion that voice communications using a synchronous satellite system are not hampered by the approximately six-tenths of a second round trip time delay.

44. For example, there have been numerous indications from Soviet sources that a communications satellite program has a high priority in Soviet planning and is in the development stages. See Clesner, *Soviet Space Communications Expectations*, 44 J. PAT. OFF. SOC'Y 398 (1963) for a collection of such sources.

nations might well have decided to "leave it." Such unilateral action might have jeopardized the requisite broad base and might also have driven other nations to pursue competing systems. At the least the opportunity for a truly international development might have been jeopardized.

Until about a year ago, these alternatives did not have to be faced squarely because the United States itself was not far enough along in its technology to require decisions on the key issues concerning the type and nature of communications satellite systems to be established.

Wisely, while the United States was proceeding with its technological development, it undertook constructive measures to enlarge the ambit of international cooperation in this area. Thus, the United States regularly afforded other nations the opportunity to participate in space communication experiments and even invited foreign scientists into its laboratories.[45] Further, the United States encouraged other nations to join with it in important experimental projects in satellite communications. In April 1961, the United States entered into agreements with France and England[46] and in November 1962, with Japan[47] to cooperate in the testing of the experimental communications satellites, Relay and Rebound,[48] both launched by NASA. All three of these countries have made ground stations available for test demonstrations of telephone, radio, and television through domestic telecommunications networks.

The United States also took the initiative in seeking to establish cooperative relationships with the Soviet Union.[49] Following an exchange of views between the Chairman of the Soviet Council of Ministers, Nikita S. Khrushchev, and President John F. Kennedy, Dr. Hugh L. Dryden of the United States NASA and Academician A. A. Blagonravov of the USSR Academy of Sciences were designated by their respective countries to explore the possibilities of cooperation in various areas of space endeavor including communications satel-

45. For example, under a Memorandum of Understanding dated March 29, 1961, between the United States and France, NASA agreed to accommodate, in its space science centers, technicians sponsored by the French *Comite des Recherches Spaticles* (Committee for Space Research). See *Documents on Outer Space* 192-93; see also NASA News Release 71-71, March 20, 1961.

46. NASA News Release 61-62, April 4, 1961.

47. NASA News Release 62-238, November 6, 1962.

48. Relay and Rebound were research and development projects to demonstrate the feasibility of basic concepts and technological apparatus and to evaluate various systems to be employed in communications satellites.

49. President John F. Kennedy, in his Message to Congress on the State of the Union, January 30, 1961, stated that "this administration intends to explore promptly all possible areas of cooperation with the Soviet Union and other nations to invoke the wonders of science instead of its terrors. . . . Both nations would help themselves as well as other nations by removing these endeavors from the bitter and wasteful competition of the cold war." *Documents on Outer Space* 184.

lites. As a result of meetings held in Geneva in 1962, during sessions of the United Nations Committee on the Peaceful Uses of Outer Space, an agreement was worked out and finally signed in September, 1963, providing for Soviet-United States cooperation in experiments on communications by means of the United States' satellite Echo A-12.[50] The agreement also provides that the Soviet Union and the United States shall further consider joint experiments using active satellites that may be launched by either nation in the future, including the mutual exchange of information on the results of such experiments. Perhaps most significant is a provision for discussions of "the working out with other nations of a project for an experimental global system of space communications with due regard to the recommendations of the ITU."[51]

However, by the latter half of 1963 the technical development of the United States had advanced so rapidly that the establishment of a commercial communications satellite system for use in 1966 appeared feasible.[52] The time was suddenly at hand for many of the key decisions, and the question of whether those decisions were to await international participation had to be faced squarely.

The decision—shared in by the Communications Satellite Corporation and the Government—was to go forward with the development of an operational communications satellite system, whether or not the basis for international participation had been established by the time the system became operational, while at the same time continuing energetic efforts to secure participation by other nations. One rationale for this decision may have been the view that scientific progress has *a priori* values of its own which compel going forward notwithstanding the possible adverse effects on achieving international cooperation.[53] A more pragmatic rationale is that this is an age when the prestige, as well as the economic advantage of achieving scientific priorities is considered vital in the struggle between competing ideologies.[54] The Communications Satellite Corporation interpreted

50. United States Mission to United Nations, Press Release 4614, December 6, 1962, pp. 1-4. For the text of the Agreement, see *Documents on Outer Space* 273-77.

51. For the suggestion that Soviet strategy calls for the use of an international scientific conference merely as a means of developing "auxiliary" sources of international law to support the Soviet view of "peaceful co-existence," see Crane, *Soviet Attitude Toward International Space Law*, 56 AM. J. INT'L L. 685, 720-24 (1962).

52. See REPORT OF COMMUNICATIONS SATELLITE CORPORATION, H.R. REP. No. 809, 88th Cong., 1st Sess. 5 (1963) [hereinafter cited as REPORT OF SATELLITE CORPORATION].

53. See, *e.g.*, *Hearings Before the Senate Comm. on Aeronautical and Space Sciences on Testimony of Scientists on Goals of the Nation's Space Program*, 88th Cong., 1st Sess. 118, 122-23, 143 (1963).

54. See REPORT OF THE HOUSE COMMITTEE ON SCIENCE AND ASTRONAUTICS, *The Practical Values of Space Exploration*, H.R. REP. No. 1276, 87th Cong., 1st Sess. 15-18, 25-41 (1961).

its mandate from Congress to require the attainment for the United States of that priority in the field of communications satellites.[55] In short, the possible consequences of waiting too long were regarded as more costly than the consequences of proceeding too rapidly.

The decision of the Communications Satellite Corporation to press forward rapidly was publicly revealed on December 22, 1963, when CSC formally invited fifteen qualified American firms to submit proposals for contracts for the design of satellites for a commercial communications satellite system.[56] The request was directed toward the establishment of a "basic system" for CSC which could include either satellite design for a "medium altitude" system or one employing synchronous satellites.[57] The design for the medium altitude system was required to be one which provided global coverage not later than 1967. For the synchronous system, the date for global coverage was 1968.

After evaluation of the proposals, which were submitted in February 1964,[58] CSC stated that it would award contracts for the design of satellites of more than one type to be completed within six months.[59] On the basis of the completed design, a system design will be chosen

55. In a position paper presented by NASA to the Senate Committee on Aeronautical and Space Sciences, Dr. Leonard Jaffe, Director of Communications System of NASA, stated:

"The development and full exploitation of the possibilities of communications satellite systems are immensely important to the Nation's economy and to its prestige.

"Although the United States has pioneered in this field and demonstrated its feasibility to the world, the U.S. position of leadership will soon be lost if we do not press ahead vigorously in the establishment of the first operational system, and if we are not the ones to indicate the direction for continuing improvement and extension of the services and capabilities.

"Not only will the Nation's economy benefit from the use of communications satellites and the revenues produced by their use, but it must be recognized that the potential foreign market for equipment will turn to the leading nation in this new technology.

"To insure that the United States does indeed retain the leadership that it now enjoys, the planning, the organization, the establishment of operational systems, and the continued advances in the technology must be supported and nurtured carefully by both private interests and all of the agencies of government concerned."

Hearings on S. 1245 Before the Senate Committee on Aeronautical & Space Sciences, 88th Cong., 1st Sess., pt. 1, 421-22 (1963).

56. Public Release of the Communications Satellite Corporation of December 22, 1963; see also Broadcasting, December 30, 1963, p. 48, col. 1-2.

57. The request for proposals set forth specific criteria and basic minimum requirements for the satellites of a commercial system, including requirements with respect to telecommunications capacity, in-orbit operating lifetime, and suitability for launching by designated types of launch vehicles.

58. The following proposals were submitted: AT&T and RCA jointly for the design of a medium altitude random system; Philco Corporation also for a medium altitude random system; International Telephone & Telegraph Corporation (ITT) and Space Technology Laboratories, Inc. (STL) jointly for a medium altitude controlled system; Hughes Aircraft for a synchronous satellite system.

59. On June 8, 1964, CSC announced it would award contracts for six months design studies. The team of AT&T and RCA will design a random orbit medium altitude satellite system calling for eighteen satellites to be placed in random orbits 6,000 miles

and CSC will award contracts for the manufacture of satellites. Under this program CSC expected that the initial implementation of a commercial communications satellite system would take place in 1966.

Moving ahead even more rapidly, in February 1964, CSC announced a further program for the launching in 1965 of one or more synchronous satellites on an experimental-operation basis to provide communication channels between terminal states in North America and Western Europe for the purpose of gathering data relevant to the design of a full commercial system.[60] At the same time, CSC announced its intention to negotiate a contract for such a satellite with Hughes Aircraft Company. Subsequently, an agreement was concluded with Hughes for delivery of two such satellites in 1965, one by the spring of that year.[61]

The decision to move ahead with the establishment of the system did not mean that CSC gave up, or even slackened, its efforts to work out arrangements with foreign governments and business entities for participation by them in the establishment and operation of the system.

These efforts had begun early in 1963 when Leo D. Welch, board chairman and chief executive officer, and Joseph V. Charyk, president of CSC, held exploratory talks with communications officials of Canada, the United Kingdom, France, Germany, Italy, Denmark, Norway, Sweden and Japan, in an effort to interest them in the setting up of a global system. Mr. Charyk reported that each of the countries manifested a desire to participate.[62]

In the late summer of 1963, CSC drew up a statement of principles for a global system for presentation to foreign nations or their designated telecommunications entities. The principles were reviewed with representatives of the President, the Department of State, the Department of Justice, the FCC, NASA, and other appropriate gov-

high. STL with ITT as the principal subcontractor will design a medium altitude system calling for twelve satellites to be placed in a "controlled orbit." Hughes will engage in additional studies with respect to an improved synchronous-type satellite. New York Times, June 9, 1964, p. 29; Electronic News, June 15, 1964, p. 13.

60. Business Week, February 22, 1964, p. 78. These satellites would have a design capacity for operations between appropriately equipped terminal stations of up to 240 two-way telephone channels which could also be utilized for facsimile data or telegraphic message traffic or for black and white television transmissions.

61. On June 22, 1964, CSC filed an application with the FCC for authority to modify the earth station at Andover, Maine, pursuant to an agreement with AT&T, to enable the station to work with the synchronous satellite which CSC plans to launch in the spring of 1965 to provide voice, record or television transmission from North America to Europe. The station, as modified, is intended to be used by CSC to transmit communications to and from earth stations at Goonhilly Downs, United Kingdom; Pleumeur Bodou, France; Raisting, West Germany; and Fucino, Italy, on the basis of arrangements to be worked out with the foreign participants. CSC News Release, June 22, 1964. FCC approval was received on July 29, 1964.

62. REPORT OF SATELLITE CORPORATION 6.

ernment officials and also with representatives of the American communications carriers. As a result of these discussions, certain revisions were made.[63] The CSC proposal was then discussed with the foreign nations, or their telecommunication entities, which are expected to be the principal participants in the global satellite communications system.[64] As these discussions have proceeded, the participation by the Department of State has increased.

The discussions with foreign nations which took place in the latter part of 1963 and early 1964 quite naturally resulted in some refinements and revisions in the CSC proposal.[65] In general, the proposal, as it shaped up early in 1964, called for a system comprised of a single space segment and multiple ground segments. The space segment was to consist of the communications satellites and the various facilities required to operate them. A ground segment would consist of the various ground facilities needed to utilize the allocation of satellite services to a country or group of countries.

The CSC proposal called for ownership of the space segment by the participating countries (or their communications entities) with shares allocated to each owner based upon its share of world communications traffic and upon its anticipated use of the system.[66] A key element of the CSC proposal was that CSC was to have the essential responsibility for the development of the system and for management and maintenance of the space segment, although certain major decisions relating to design, establishment and operation would require the concurrence of some of the other space segment owners.

Apparently recognizing the reluctance of some foreign nations to enter into a definitive arrangement which vested so much control in CSC, the proposal was not offered by CSC as the ultimate arrangement for the global system but only as an interim arrangement among prospective participants prepared to make immediate investment commitments in the system.

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63. *Ibid.*

64. In a report to the Chairman of the Committee on Interstate & Foreign Commerce, dated September 20, 1963, the State Department, in referring to the statement of principles developed by CSC for participation by CSC and foreign nations in a global system, stated: "The principles will be presented as those developed by the corporation and the reaction of the Europeans will be considered highly important in the formulation of the final Government position on the same subjects." H.R. REP. No. 809, 88th Cong., 1st Sess. 26-27 (1963).

65. While all of the details of the proposal were not made public, the general outline of the plan was disclosed. See, *e.g.*, *id.* at 6; Katzenbach, *Communications Satellites*, *supra* note 18; New York Times, September 29, 1963, p. 1, col. 2; Newsweek, March 16, 1964, pp. 87-88.

66. The designated entity could be a private or public entity. In the case of the United States the space segment owner would be the Communications Satellite Corporation.

Early in 1964 a major advance in the negotiations took place. By that time it must have become clear to foreign nations that from a technological viewpoint, CSC would undoubtedly be able to establish a communications satellite system within a relatively short time and that CSC was prepared, if necessary, to finance the entire system without foreign participation. In short, CSC made plain that it did not intend to permit prolonged international discussions to delay its plans to place a workable commercial system into operation as soon as feasible.[67] At the same time it also became clear to foreign telecommunications entities that if CSC were able to provide suitable satellite circuits by 1966 or early 1967, American communications carriers would not place additional cables in service, preferring to use satellite circuits instead.[68]

These factors appear to have hastened the course of the discussions. A significant breakthrough occurred in January 1964, when at a private meeting of a special satellite committee of the European Conference of Postal and Telecommunications Administrations, Great Britain, which had previously expressed its reluctance to participate in the satellite system, modified its position. A representative of the British Post Office, which until then had stood as the champion of cables over satellites, not only came out in favor of British participation in the ownership and use of a satellite system, but urged prompt decisions by European nations.[69] Other key nations also publicly voiced their intention to participate in the satellite system.

Accordingly, during the first half of 1964, CSC officials and representatives of the State Department continued to work out the basis for an interim agreement with foreign participants, particularly with respect to those nations which were prepared to make immediate investments in the space segment of the proposed communications satellite system.

By the time CSC issued its Preliminary Prospectus in May, 1964, for a public offering of 200 million dollars of CSC stock,[70] the interim arrangements with foreign participants had progressed far enough to

67. Statement Prepared for Presentation to the Military Operations Subcommittee of the House Committee on Government Operations, by Dr. Joseph V. Charyk, President of CSC, March 24, 1964.

68. See note 6 *supra*.

69. Electronic News, April 20, 1964, pp. 1, 19. That CSC's decision to launch a commercial satellite by 1965 was material to Great Britain's statement is evident from a statement by the Postmaster General of Great Britain that the 1965 date was some years earlier than Great Britain had theretofore thought likely. According to the Postmaster General, it was not praetical for the United Kingdom or Europe to stand aside from these developments. Electronic News, February 17, 1964.

70. Preliminary Prospeetus, May 27, 1964.

indicate that a viable arrangement could be effected which would easily meet the CSC timetable.[71]

CSC's first public issue was a complete success.[72] The ten-million share issue was quickly sold out, half being purchased by authorized communication carriers and half being purchased by the general public.[73] CSC was thus assured of the availability of funds to proceed with its program.

C. *The International Agreements of July, 1964.*

During the spring and early summer of this year, representatives of the United States, fourteen European countries, and Canada, Australia and Japan met in London and then in Washington for intensive negotiations on the international arrangement for the system.[74] One of the controversial issues was how many votes would be required for a controlling majority on policy issues. Another difficult question was at what stage the "interim" arrangements proposed by the United States should be supplanted by a formal international organization. Both of these questions involved the concern of other countries with the extent to which domination over the system would be exercised by the United States.

These negotiations moved quickly and on July 24, 1964, representatives of the United States, Australia, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Japan, the Netherlands, Switzerland, the United Kingdom and the Vatican City State concluded two interrelated agreements establishing Interim Arrangements for a Global Commercial Communications Satellite System.[75]

The first agreement is an intergovernmental one and contains the

71. The Prospectus itself contained only the barest outline of the proposed international arrangement and did not set forth the details of the proposals then under negotiation. However, the Prospectus pointedly noted that CSC intended to proceed with its program and was prepared to finance the "entire cost of establishing the system exclusive of the costs of foreign terminal stations." Prospectus, p. 21.

72. The public offering was oversubscribed. Brokers reported that the demand for the stock was the greatest for any issue in history. The Washington Post, August 14, 1964, p. D7.

73. In its First Report to Shareholders, dated August 3, 1964, CSC reported that more than 130,000 persons owned CSC stock in their own names. CSC spokesmen have indicated that at least 50,000 other individuals hold shares in "street names." New York Times, August 14, 1964, p. 33. The stock which was offered to the public on June 2, 1964, at $20 per share was being traded on August 14, 1964, at around $35 per share.

74. New York Times, July 20, 1964, pp. 1, 44.

75. The agreements were initialed *ad referendum* to the governments or designated authorities as the concluding act of the Plenipotentiary Conference to Establish Interim Arrangements for a Global Commercial Communications Satellite System. See De-

organizational principles established for the system. The second agreement, referred to as the "Special Agreement," is one by communication entities, public or private, designated by the governments signing the first agreement. In essence, the Special Agreement deals with carrying out commercial, financial and technical operations of the system according to the principles established in the Intergovernmental Agreement.

The Intergovernmental Agreement provides that the parties shall cooperate to establish a single global commercial communications satellite system which is to include (1) an experimental and operational phase, in which one or more synchronous satellites are to be placed in orbit in 1965, and (2) succeeding phases employing satellites of types to be determined, with the objective of achieving basic global coverage in the latter part of 1967.[76]

Ownership quotas in the space segment[77] are established for each communications entity, public or private designated by each participating government as the signatory to the Special Agreement. The largest ownership quota is 61 per cent for the communications entity designated by the United States, *i.e.*, CSC. No other country even approximates this quota; the next in size being 8.4 per cent for the communications entity of the United Kingdom.[78]

The basic direction of the system is to be by an Interim Communications Satellite Committee which is to have responsibility for the

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partment of State Press Release, No. 346, July 28, 1964, to which the agreements are attached. The agreements will be open for signature in Washington beginning August 19, 1964, for a period of six months to all countries which are members of the International Telecommunication Union.

76. Agreement Establishing Interim Arrangements for a Global Commercial Communication Satellite System, July 28, 1964 [hereinafter cited as Agreement], art. I. The timetable is essentially the one which had been established by CSC.

77. The term "space segment" includes the communications satellites and the tracking, control, command and related facilities and equipment required to support the operation of the satellites.

78. The presently assigned quotas (based on a total of 100) are as follows: Australia (Overseas Telecommunications Commission) 2.75; Austria (Bundesministerium für Verkehr und Elektrizitätswirtschaft, Generaldirektion für die Postund Telegraphenverwaltung) 0.2; Belgium (Régie des Télégraphes et Téléphones) 1.1; Canada (Canadian Overseas Telecommunication Corporation) 3.75; Denmark (Generaldirektoratet for Post og Telegrafvesnet) 0.4; France (Government of the French Republic) 6.1; Germany (Deutsche Bundespost) 6.1; Ireland (An Roinn Poist Agns Telegrafa) 0.35; Italy (to be designated) 2.2; Japan (Kokusai Denshin Denwa Company Ltd.) 2.0; Netherlands (Government of the Kingdom of the Netherlands) 1.0; Norway (Telegrafstyret) 0.4; Portugal (Administracao Geral dos Correios, Telegrafos e Telefones) 0.4; Spain (Government of the State of Spain) 1.1; Sweden (Kungl. Telestyrelsen) 0.7; Switzerland (Direction Générale des PTT) 2.0; United Kingdom of Great Britain and Northern Ireland (Her Britannic Majesty's Postmaster General) 8.4; United States of America (Communications Satellite Corporation) 61.0; Vatican City (Government of the Vatican City State) 0.05.

design, development, construction, establishment, maintenance and operation of the space segment of the system.

Each signatory to the Special Agreement whose quota is at least 1.5 per cent will have one representative on the Interim Committee. Two or more signatories with quotas of less than 1.5 per cent may obtain a representative on the Committee if their combined quotas total 1.5 per cent. Each signatory or group of signatories represented on the Interim Committee is to have the number of votes equal to its quota. Thus, the United States will have 61 votes, the United Kingdom 8.4 votes, France 6.1 votes, and so on.

Since 61 votes will obviously give the United States (CSC) control over all matters left to majority vote, the agreement provides that on certain subjects any decision must have the "concurrence of representatives whose total votes exceed the vote of the representative with the largest vote by not less than 12.5."[79] The matters subject to this provision are the key issues likely to arise, including choice of type or types of space segment to be established, establishment of general standards for approval of earth stations for access to the space segment, establishment of rates, approval of budgets by major categories, placing of contracts, and approval of matters relating to satellite launchings. On such issues, therefore, for the position of CSC to prevail, it would have to obtain at least 12.5 other votes. However, as to certain key issues, such as the type of space segment to be established, if a decision is not reached in 60 days then decision may be taken by the concurring vote of CSC and at least 8.5 other votes.[80] Since no other nation or entity has more than 8.4 votes (the United Kingdom), CSC would have to obtain concurrence of at least two others for its view to prevail.

Pursuant to the policies and determinations of the Interim Committee, the Agreement establishes CSC as the manager of the space segment with respect to its design, development, construction, establishment, operation and maintenance.[81]

Contributions of the signatories to the Special Agreement are based upon an estimate of 200 million dollars with each signatory paying a percentage according to its quota. If additional contributions are required in excess of 300 million dollars, a special conference of the signatories to the Special Agreement must be convened to recommend appropriate action.[82]

The second agreement—the Special Agreement—the parties to which are the communications entities designated by each participating

79. Agreement, art. V (c).
80. Agreement, art. V (c).
81. Agreement, art. VII.
82. Agreement, art. VI.

country, deals with certain aspects of the financial arrangements,[83] the items to be included as part of the cost of the space segment,[84] the general rules for utilization of the space segments by earth stations,[85] and the guide lines for placing of contracts.[86]

The Special Agreement also establishes, in a general way, the principles to be followed in establishing the rate of charge per unit of satellite utilization. The Agreement states that, as a general rule, charges shall be sufficient, on the basis of the estimated cost 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."[87] The Special Agreement also spells out in some detail the specific functions of CSC as manager.[88]

The Agreements will remain open until February 19, 1965. Until then any country which is a member of the International Telecommunication Union can acquire ownership on the original terms, with its quota set by the Interim Committee. After that date a country may obtain part ownership upon such financial conditions as the Interim Committee shall determine. Quotas amounting to 17 per cent ownership have been allocated for additional signatories to the Agreements, with the quotas of the nineteen original members to be reduced proportionately as others join the system. Significantly, even if the entire 17 per cent is allocated, the ownership quota of the United States will still remain just above 50 per cent.

The course of these events certainly vindicates the decision of CSC officials to press forward with the technological development of a communications satellite system, despite the uncertain status of international negotiations at the time. A solid interim international arrangement has now been worked out to mesh with the timetable for which CSC has been steadily pressing.

It bears emphasis, however, that the present arrangement is an interim one only. Not later than January 1, 1969, the Interim Committee is to submit its recommendations for *definitive* arrangements.[89] That report is to be considered at an international conference,[90] with a view to a definitive arrangement established by January 1, 1970.

During the interim period there are of course still formidable problems to be resolved. The details of the rate structure are yet to be

83. Special Agreement, art. IV.
84. Special Agreements, arts. V, VI.
85. Special Agreement, arts. 7, 8.
86. Special Agreement, art. 10.
87. Special Agreement, art. 9.
88. Special Agreement, art. 10.
89. Agreement, art. IX.
90. Agreement, art. IX.

determined. The provisions for the letting of contracts are obviously a compromise between the preference of this country to award contracts primarily on the basis of competitive bidding and the desire of many of the European nations for allocation of contracts on a quota basis; obviously, this may be a continuing sensitive area. The compensation for CSC as manager is still to be worked out. Many of the space segment owners also operate competing communications facilities giving rise to possible conflicts of interest. Other sensitive problems may arise out of CSC's dual responsibility to participating nations under the international agreements and to the FCC under the Communications Satellite Act. The fact that domestic communication carriers may urge their own views on the FCC contrary to those of CSC might create further complications.[91] Developments in these areas will undoubtedly be carefully watched by foreign nations who may endeavor to diminish CSC control by the time a definitive agreement is evolved.

The need to work out a viable and cooperative arrangement, not only on an interim basis but definitively, is, of course, crucial to the ultimate success of the satellite system. Beyond that, the importance of international cooperation in this field is further emphasized since such achievement could provide a valuable precedent for the solution of other problems where effective international organizational arrangements may be needed.[92] As Deputy Attorney General Katzenbach has pointed out, perhaps the most valuable indirect benefit of achieving a cooperative system is that "men and nations will grow in confidence that national aspirations whose effective realization calls for international action need neither be abandoned nor attempted in isolation but may be successfully undertaken together."[93]

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91. For example, on August 14, 1964, CSC filed a siguificant petition with the FCC requesting that CSC be given exclusive eligibility for ownership and operation of the initial ground stations for the communications satellite system. CSC noted that under the Communications Satellite Act, the FCC is to decide whether CSC or other commercial communications carriers, or both, should build and operate the ground stations. However, CSC urged that the public interest would best be served by giving CSC exclusive control over the initial ground stations.

It is likely that at least some of the communications carriers will rigorously oppose the CSC petition and will request the FCC to allow them to obtain individual interests in the proposed satellite system ground stations. As of the date this article went to press, commercial communications carriers had not yet filed answers with the FCC or otherwise publicly indicated what their position would be with respect to the CSC petition.

92. Segal, *Communications Satellites—Pathways to International Understanding, supra* note 35.

93. Katzenbach, *Communications Satellites, supra* note 18, at 4.

V. Provision for Underdeveloped Nations

While the present international arrangement is certainly a major achievement in itself, the long run objectives of a global system surely require that a way be found to make the benefits of the system available to the underdeveloped nations of the world. How is this to be accomplished? One solution might be for the financially able nations participating in the system to provide the finances and technical assistance necessary to construct and maintain ground terminals in other countries unable to finance or maintain such facilities for themselves. But from the viewpoint of the underdeveloped nations, this wonld hardly be a satisfactory solution. For mere access to a global communications satellite system may not be meamingful to a nation whose internal communications facilities are still in a primitive stage and whose external communications links, even with its immediate neighbors, are largely inadequate.

What is necessary is a program of economic and technical assistance designed (1) to improve each such nation's internal communications, (2) to improve regional communications, that is, communications among a group of countries in the same area, and finally (3) to provide linkage into the communications satellite system.[94]

One possible method of achieving these objectives, initially at least, would be to establish a ground terminal in an underdeveloped region (serving two or more countries) or a limited number of ground terminals in selected countries in an underdeveloped region. Then all the individual countries within this region would be tied into the system by means of conventional facilities, such as land microwave relays or land lines which would follow the principal trade routes between the major cities of each country.[95]

This approach would have many advantages. First, it would have a stimulating effect on the development of the internal communications of each participating country. Cities and towns along the internal route could have access to such facilities for various communications services. Second, these facilities would join the communications systems of contiguous countries, encouraging and stimulating increased trade among the countries and facilitating cultural and educational exchanges. Third, such a regional system would, in itself, provide an example of international cooperation among neighboring nations working together toward a common goal and with a potential for similar cooperation in other fields of endeavor.

94. See generally, Jaffe, Smith & Attaway, United States Papers 126-27; Johnson, *The Commercial Uses of Communications Satellites*, The Rand Corporation, pp. 13-15 (paper reproduced by the Rand Corporation, June 1962).

95. *Ibid.*

Finally, the countries would be linked into the world-wide communications satellite system, with all the benefits that would flow from such a system.

Whatever program is developed to provide meaningful access for these nations, it is manifest that the cost of doing so will be great. Who is to bear that cost? Certainly it would be neither feasible nor fair to impose the burden on any one nation, no matter how enthusiastic a sponsor of global communications it might be.

As to some underdeveloped nations, financing by institutions like the International Bank may provide the solution. But what of nations unable or unwilling to resort to such financing? Their access and use would be possible only if the participating resource nations would be willing to jointly assume the additional financial burden. Whether a way can be found to make inclusion of the underdeveloped nations feasible may well prove to be one of the ultimate tests of whether a communications satellite system, truly global in scope, can be attained.

VI. CONCLUSION

On July 3, 1963, four Americans participated in a panel discussion of communications satellites at the First World Conference on World Peace Through Law at Athens. They were Nicholas deB. Katzenbach, Deputy Attorney-General of the United States and Co-Chairman of the President's Ad Hoc Communications Satellite Group, Leonard H. Marks, an incorporator and director of CSC, Leonard Jaffe, Director, Communications System of NASA, and the writer.[96] As a review of the papers which were delivered at that time amply demonstrates, it did not then seem possible that in only a year's time there would be so much progress toward the perfection of an effectively operating satellite system and so much headway in reaching agreement with foreign nations or their telecommunications entities. As President Johnson recently stated "this extraordinary communications medium is moving rapidly from creative hope to actual fact."[97]

These developments—with their combination of domestic and international aspects—have highlighted the need for a reappraisal of our entire telecommunications structure and policy. The spectacular technological progress in telecommunications facilities generally, and communications satellites specifically, necessarily affects the entire telecommunications industry, blurring existing distinctions and outmoding present concepts.

Over the past fifteen months, leaders of the communications in-

96. See notes 7, 18, 34, 35 *supra.*

97. *Report of President Johnson to the Congress on Activities and Accomplishments under the Communications Satellite Act of 1962,* Feb. 10, 1964, p. 1.

dustry, citing the inadequacy and random character of our domestic and international communications policies, have called for broad evaluation and drastic changes.

General David Sarnoff, RCA Board Chairman, has proposed that all American international telephone and telegraph facilities and operations, both present and planned, be merged into one unified organization within the CSC.[98] He urges that this plan would offer three far-reaching benefits to the public, as follows:

> It could take maximum advantage of modern technology to achieve the most economical and efficient use of radio frequencies, cables and satellites to provide maximum efficiency at lowest cost to the public.
>
> It could start with an immediate revenue base provided by the traffic of existing United States international communications carriers. In 1962, this totaled $160 million. This would place the Satellite Corporation on a sound financial footing at an early date.
>
> It could deal with equal strength, and on equal terms, with government monopolies in foreign countries—a vitally important need in such matters as rates, division of revenues, classes of service and facilities.

Harold S. Geneen, ITT President, has suggested instead that Congress pass legislation permitting voluntary merger of international record communications carriers to assure that "they will remain an independent and competitive factor in the telecommunications field."[99] Under this proposal, CSC would provide service to this consolidated organization as a carrier's carrier. Mr. Geneen argues "that private enterprise, so encouraged, can operate international communication services more efficiently than can any resulting quasi-governmental organization, and hence with greater customer satisfaction and at a tax-paying profit instead of a tax-absorbing loss."

Following these proposals, E. William Henry, Chairman of the FCC, in a comprehensive address, called for a "broad-gauged study" of our international communications systems with a re-evaluation of objectives and procedures.[100]

Such a study would not be an easy one. It would require the efforts and energies of all agencies of government with responsibility in telecommunications planning or regulation, and it would need the skill and experience of the American communications industry.

Industry and government together have brought this nation to its present preeminence both in conventional and space communications.

98. Letter From Brigadier General David Sarnoff to Senator Warren G. Magnuson, Chairman, Committee on Commerce, United States Senate, June 27, 1963; see also New York Times, May 29, 1963, p. 9, col. 1.

99. Letter From Harold S. Geneen to Senator Warren G. Magnuson, Chairman, Committee on Commerce, United States Senate, June 18, 1963.

100. Address by E. William Henry before the Standing Committee on Communications, American Bar Association, August 14, 1963 (FCC Memo. 39827).

Surely, it is not too much to hope that continued cooperative effort between government and industry in this dynamic field will evolve an overall telecommunications policy and structure for the United States which will meet the dramatic call of the future and will enable this country to continue to provide the leadership and impetus for the establishment of a communications satellite system encompassing all the nations of the world.