Domestic satellite

THE WHITE HOUSE

WASHINGTON

July 1, 1969

DOMESTIC SATELLITE POLICY

The Federal Communications Commission has drafted a proposed Order outlining interim policies regarding the establishment and operation of communications satellite systems for domestic services. Briefly, this Order would:

- Authorize a single multi-purpose system to incorporate standard voice services, television distribution, and certain specialized data services.

- Establish an Advisory Committee to the Commission, consisting of the major competitors for common-carrier and specialized satellite systems, for the purpose of developing a plan for the technical and operational design of the pilot system.

- Designate Comsat as Planning Coordinator for the development of this plan.

- Defer all decisions on potential ownership of pilot or operational systems, or segments thereof, until the technical design and operational plans are submitted to and approved by the Commission.

The Administration feels a more constructive approach to this issue is possible and seeks an interim position on domestic satellites which is more definitive and which promotes greater innovation and flexibility on the part of the private sector. There are two basic reasons for doing so at this time. First, there are a number of basic objections to the Commission proposal when it is examined in the context of U. S. communications generally. Second, this is probably the only major decision for some time that gives us the leverage necessary to promote a re-examination of the need for extensive common carrier regulation of all U. S. communications by the FCC and to stimulate a more vigorous and innovative competition in the communications industry.

Background

The United States presently enjoys the most sophisticated, effective network of communications facilities and services of any nation, both common carrier and private. Because of our highly developed terrestrial systems, the role of communication satellites (or any new technology) in providing U. S. domestic services is both less striking and less easily discerned than is the case in other countries where satellites offer clear economic benefits.

Nevertheless, there is ample evidence that satellite technology could find many economic applications in the U. S. Specific proposals and cost analyses show cost or service advantages for some specialized services such as distribution of TV programs to local broadcast stations, communication with and between ocean vessels and high-speed aircraft, and meteorological data collection and exchange. Satellites may also enjoy a slight cost advantage for long distance carriage of "bulk" message and data traffic, though this is less certain at this time. Due to these generally favorable prospects, several major corporations (AT&T, Comsat, ABC, GE) as well as public-interest groups (Ford Foundation) have indicated a willingness to undertake the risk of establishing domestic satellite systems for various specialized or multi-purpose services.

Despite this interest and promise, incorporation of communication satellites into the highly-developed U. S. communications industry faces two serious impediments. First, wherever satellites appear competitive with existing terrestrial technologies, they pose a major uncertainty for regulated common carriers and threaten to weaken both existing and future rate bases. Second, FCC and Congressional policies make artificial distinctions between satellite and terrestrial technologies with respect to both ownership rights and public-interest objectives, and this raises both administrative and economic barriers to potential investors and users.

Evaluation of the FCC Approach

The FCC approach to this policy problem has the following problems:

(1) It would effectively lock the U. S. for the foreseeable future into a multi-purpose operation typical of common-carrier systems and would therefore impede the development and application of satellite technology for the specialized services for which it appears most promising in domestic U. S. communications.

(2) While the FCC cites the need to learn more about satellite technology and economics in domestic communications applications, the proposed Order precludes learning anything very significant by foreclosing the very kinds of systems we know least about and yet appear to offer the most potential.

(3) It precludes the industry from active exploration of the interplay of economics, technology, and operations which would stimulate active development of the potential for new uses and new services, by insisting on finding a way to accommodate the new technology to existing uses and operations and by forcing design of the system before the industry knows how ownership rights are to be established.

(4) It promises a "least common denominator" compromise solution by, in effect, requiring consensus among a consortium of mutually hostile interests, thereby extending to the domestic scene the demonstrated faults this approach has produced internationally.

(5) Finally, it places the burden of risk almost completely in the public sector rather than the private where it is appropriate, by insulating existing common carriers from "unfair competition" and by assuring adequate rate of return for the satellite system.

Action

We expect to inform the FCC that the Administration considers this an important policy issue and expects to have something to say on the matter in a short period of time. We will immediately

establish a working group with representation from DTM, CEA, Justice, and Commerce (with the FCC as an observer or member at their option) to attempt to work out an alternative approach. Our objectives would be to:

- foreclose (at least temporarily) the automatic extension of common-carrier regulatory policies to satellite communications until more experience is gained in domestic applications.

- minimize the regulatory impediments to technological and market innovation.

- use this approach as a wedge to encourage a more vigorous and innovative competition among communications organizations.

domestic satellite

May 13, 1969

MEMORANDUM FOR GENERAL O'CONNELL

The Communications Satellite Act appears to give the President substantial authority and responsibility relevant to the characteristics of a domestic satellite system. Could you please advise on how these provisions provide authority for the President to take an initiative in defining the broad characteristics of domestic satellite policy and of a domestic satellite system. This should include how the Act may limit what the President can do, how it has been interpreted, and the extent to which a Presidentially stated interpretation could clarify such issues.

Could you also forward a summary of the "30-circuits" case to include the issues as defined by the FCC, their ruling, and the provision for DTM certification that procurement of the circuits from COMSAT is in the national interest.

Signed

Clay T. Whitehead
Staff Assistant

cc: Mr. Whitehead
Central Files

CTWhitehead:ed

OPTIONAL FORM NO. 10
5010-103

UNITED STATES GOVERNMENT

Memorandum

TO : Dr. C. T. Whitehead DATE: 21 May 1969

FROM : IOP/PA - William N. Lyons

SUBJECT: Attached

FYI - I have the full text of the Marks speech if you are interested.

Comsat

May 13, 1969

MEMORANDUM FOR GENERAL O'CONNELL

The Communications Satellite Act appears to give the President substantial authority and responsibility relevant to the characteristics of a domestic satellite system. Could you please advise on how these provisions provide authority for the President to take an initiative in defining the broad characteristics of domestic satellite policy and of a domestic satellite system. This should include how the Act may limit what the President can do, how it has been interpreted, and the extent to which a Presidentially stated interpretation could clarify such issues.

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Clay T. Whitehead
Staff Assistant

cc: Mr. Whitehead
Central Files

CTWhitehead:ed

BB FORM
NO. 4

Bureau of the Budget

ROUTE SLIP

TO Mr. Whitehead

Rm. 103 EOB

Take necessary action	☐
Approval or signature	☐
Comment	☐
Prepare reply	☐
Discuss with me	☐
For your information	☐
See remarks below	☐

FROM Don Gessaman DATE 4-29-69

REMARKS

Attached is the revised Domestic Satellite paper.

Rm. 327

An Alternative Management and Ownership Arrangement for the Pilot Domestic Satellite Communications System

-Summary-

This paper presents an alternative ownership and management arrangement for a pilot domestic communications satellite system. The Task Force on Communications proposed a program managed by Comsat to be owned by:

Satellite--Comsat

Receive/transmit terminals--Comsat and Common Carriers

Receive only terminals--broadcasters

The alternative posed is a consortium of Comsat, common carriers, equipment manufacturers, and broadcasters. Each would share equally in ownership. Management would be exercised by NASA under reimbursable arrangements. At the conclusion of the pilot, permanent ownership and management arrangements would be made. Assets of the interim group would be assumed by the permanent body and reimbursement based on value of assets made.

Pilot Domestic Communications Satellite System

Introduction

This paper explores an alternative method of establishing a pilot domestic communication satellite system for the United States. The desirability of a pilot program has been assumed.

Who or what organizations should be involved in the pilot program? An easy answer is to say that Comsat is the only one competent enough to handle the problem. However, if one is not ready to propose or talk about a permanent arrangement, a simple solution could foreclose future options. Permitting Comsat to own and manage the pilot on the grounds that only it is experienced, effectively forecloses options because it guarantees that no other party will obtain experience. When determining final ownership, not going to Comsat would be equivalent to saying that the experience factor really wasn't important.

Those parties which should be and probably will be interested in the pilot are:

Party	Reason
Comsat	Currently in international satellite communications business. Has lot of excess capital (better than $100 million). In long run domestic business could be more lucrative than international.
AT&T	Controls domestic communications. Satellite system, if more economical than terrestrial, could take business from terrestrial system. At some point, a domestic satellite would have to plug into AT&T landline system. Also satellite could effect frequency assignments.
Broadcasters	Possibility that satellite transmission of network programs could reduce costs of transmission and free up money for programming.

Party	Reason
U.S. Government	Might be called on to indirectly subsidize program by being a principal customer. Need experience for regulatory purposes.
Equipment Manufacturers	Program will provide market for equipment.
Users in general	Large users will be interested in possibility of cost reduction. Small users such as the average citizen will receive little benefit even if the total savings are significant.
Ford and Carnegie Foundations	Possibility of reduced cost or no cost for transmission of educational television.

There might be additional interested groups but the above categories cover those with major interest and/or concern.

To derive a potential alternative ownership arrangement requires defining the objective of the pilot. Once the objective is determined, an alternative can be derived.

Objective of the Pilot

Several objectives could be listed. As in all cases, these objectives would be of varying importance to the national interest and to the participants. The national interest is not necessarily equivalent to the participants interest. Compromise between the two may be necessary since one or more participants could have enough leverage to effectively block a decision totally based on national interest. This analysis is based on conjecture as to organizational positions since it is impossible to determine an outfit like ATT's real feelings and assumption on national interest since there is no definitive statement of national interest to be referenced.

The underlying assumption herein is that a pilot is necessary. It follows that some type of experimentation and evaluation is necessary, otherwise it would be unnecessary to go through the pilot stage. Thus the primary objective of the pilot is experimentation.

What type of experiments should be performed? Experiments can be divided into two groups: (1) those which are essential and (2) those which are desirable. Following is a description of the types of experiments that could and/or should be performed.

Engineering--

(1) Interference conditions in the 4 and 6 GHz frequency bands.

(2) Propagation conditions above 10 GHz.

(3) Feasibility of spectrum conservation and increased communications capability through multiple use of the allocated frequency bands.

(4) Orbital spacing requirements.

(5) Feasibility of remote turning and switching for television distribution to individual broadcast stations, in lieu of routing via manned television operating centers.

(6) Communications capacity of the orbital space visible to the US in the 4 and 6 GHz bands.

Operational--

(1) Experiment with and evaluate the operating modes proposed by the participants in the FCC's proceeding.

Economic--

(1) Determine cost of various types of earth stations.

(2) Determine cost of networking facilities and services for TV distribution.

(3) Determine cost per space segment channel of alternative satellite configurations.

(4) Determine system operating costs.

If a domestic satellite were urgently needed, it could be established in short order utilizing current technology. However, the need does not appear to be all that great. As currently envisioned a satellite will provide no new capability but will provide an alternative method of satisfying requirements now being satisfied by terrestrial communications systems. If progress is narrowly defined as either the capability to do something which previously was impossible or a new process to perform more efficiently an existing task, the domestic satellite is of the latter type. It follows then that before a decision to commit the country to a particular course of action under the name of progress, it's necessary to make certain that progress is being made. Since a domestic satellite might perform an existing job more efficiently, the evaluation and experimentation should prove that progress will in fact be made.

Domestic satellite experimentation must be equally concerned with technical and economic factors. Two broad essential questions exist: (1) will it work?; and (2) can it provide service at reduced cost? No one questions whether satellites work. There are, however, some questions as to how a satellite will perform certain functions presently performed by terrestrial systems. The essential technical experiments concern the use

of technology rather than advancement of technology. Once having established how the technology can be used, it will be possible to determine the economic utility of a full scale operational program.

To the extent that advanced technology can contribute to the objective, such experiments should be included provided they do not become all important. Following is the classification of experiments into essential and desirable.

Essential

Engineering--Interference in 4 and 6 GHz band

Operational--identified task

Economic--all

Desirable

Engineering--Propagation above 10 GHz (if interference in 4 and 6 GHz band turns out to be a problem, this experiment becomes essential)

--Engineering experiments 3, 4, and 5.

If the above list is near accurate, the engineering experiments which need be performed are minimal. In fact, the interference experiment can be conducted without a domestic satellite. President Nixon requested a 1969 supplemental budget request of $777,000 for the Director of Telecommunications Management for the express purpose of determining potential interference levels. NASA's ATS-E satellite to be launched this August will carry a 15 GHz transmitter and a 30 GHz receiver and will provide much of the data needed to determine propagation characteristics above 10 GHz. Little technical experimentation is required -- the data can be obtained by alternative and possibly less expensive means.

Economic data could be estimated but with the possibility of a fairly high deviation from actual costs. In the electronics business, it appears necessary to build a gadget to determine how much it will cost in production. Operational data probably could be determined with a fairly high confidence level through simulation. However, pro and con arguments cannot be countered without a trial run -- the pilot can provide the trial.

Factors to Consider in Establishing Ownership and Management

A split between program management and system ownership appears possible. Since the primary objective is experimentation it is desirable to have those with the most knowledge on the subject participate in the project. The Task Force recommended that Comsat own the satellite; Comsat and common carriers own the receive/transmit ground stations; broadcasters own receive only and portable ground stations; and Comsat serve as manager. An Advisory Committee under the aegis of the FCC and the Executive would be created to monitor the program. All interested parties would be represented to make their views and needs known on such matters as satellite design, earth station characteristics and location, use of facilities and rates.

Comsat's proposal for the pilot carried an investment price of $57.7 million made up as follows:

	($ in millions) investment	annual operating
Space segment		
R&D	15.000	
Satellites (2)	6.400	
Launches (2)	14.000	
Telemetry/control	.300	
	35.700	

	($ in millions) investment	annual operating
Ground Environment		
85'stations (2)	11.700	1.404
42'stations (2)	1.630	.344
25/32'stations (30)	5.130	1.012
Miscellaneous*	3.500	1.300
	22.000	4.060

* includes cost of program management

Comsat's pilot program would cover at least 5 years. However, the needed experiments probably could be conducted within a 3 year time period. A three year experiment would cost:

	($ in millions)
Investment	57.700
Operations	12.080
Total	$69.780

The above figures do not include profit. This raises a question as to whether the pilot should be a profit making venture. With the exception of R&D performed for the Government, the performance of experiments normally does not merit profit. Experiments are performed in anticipation of future profits. An experimental program, such as the pilot, would not be entered with the expectation of immediate gain.

In the aircraft industry, a new commercial airplane is tested for a period of time before it is turned over to the airlines. Testing costs are included in the aircraft price. The communications satellite industry is somewhat different. Whereas the aircraft equipment industry develops a product to satisfy a need of the airlines the communications satellite equipment industry waits for the users to fund the development. Common carriers

perform the test and evaluation phase of satellite programs. An outfit like Comsat which has no manufacturing affiliate has to write off evaluation costs against services sold rather than units of manufacture. Recoupment takes longer.

For satellite communications, it is obvious why equipment manufacturers don't perform R&D with their own funds. Not only is a satellite costly to build, but launch costs are often equal to or greater than satellite costs. In contrast to an aircraft, a worldwide communications satellite system can be established with 3 satellites. Thus, the market for satellites isn't very great. Currently, the market is limited to Comsat/Intelsat, NASA and DOD. Therefore, he who wants the system pays for the R&D in advance of the production.

The domestic satellite is in the same category. While a full-scale operational system could be of large capacity and costly, it need not consist of many satellites. Ten satellites (more than anyone has proposed) would provide enormous capacity. With a short term demand for less than 10 domestic satellites, it is no wonder satellite manufacturers are not about to pursue its development with their funds.

One is hard pressed to find another industry with such a limited market for its products. Hughes, TRW, Philco, and Lockheed, all sizeable firms, constitute the satellite manufacturers. Other large firms occasionally do or try to break into the field but the above named are the principals. A small market potential and the number of suppliers means that pressure will constantly be applied on others to use satellites: to provide funds for continuing R&D and to support a production base. At the same time, Comsat is in the position of having too much capital. These

two conditions appear to have had more to do with creating the need for the domestic satellite than have communications requirements.

Given the small demand for satellites, it's reasonable to assume that their unit cost will be high, not only because of a lack scale of economies in production, but because the time between orders might be considerable. To avoid excessive prices the equipment manufacturers should participate in financing the pilot. The same reasoning is not directly applicable to ground stations builders, though there is no strong reason for their exclusion.

Since the ultimate beneficiaries of reduced costs via satellite communications will be the users, there is no strong reason for their exclusion. In fact, if the pilot is to be useful, their participation is almost mandatory.

Because adequate private capital is available and considering the priorities of other government programs in relation to the domestic satellite there is no obvious reason for the use of government capital in the project.

Since AT&T controls domestic telephone and television transmission and since domestic satellite revenue will constitute losses to AT&T, there is no reason for excluding AT&T. Exclusion could cause AT&T to effectively block the utility of a satellite for several years.

Since the maintenance of future ownership options is considered essential one participant in the program doesn't seem reasonable. Consequently, permitting Comsat to finance the program doesn't seem consistent. In addition, since it is sometimes difficult to differentiate between capital and

management with respect to program control, permitting a private concern to exercise the management function doesn't seem consistent. NASA appears to be the closest thing to an independent, objective program manager.

In the above paragraphs, guidelines have been stated which can be used to determine an alternative to the Task Force Recommendation. In summary these guidelines are:

(1) Capital should come from more than one source;

(2) Program management should not be exercised by a single participant;

(3) AT&T should be included;

(4) Users should participate;

(5) Equipment manufacturers should participate; and

(6) Government financing is undesirable.

The alternative

Ownership could be a consortium of Comsat, common carriers, broadcasters, and equipment manufacturers. Participatory shares would be equal among participants. That is, if 20 participants, each participant would provide 5% of the capital. A board of directors would be established with one representative from each participant. Program management would be exercised by NASA under the control of the board of directors. NASA would be reimbursed any costs attributable to its efforts in program management.

Why?

The pilot would be conducted on a no profit basis. At the end of the pilot, a review would be conducted. This review would solicit the views of the participants and others. A decision by the government on permanent

ownership arrangements would then be made. The selected permanent owners would assume ownership of the assets of the pilot and arrangements made for reimbursement to the pilot program owners for current value of the assets assumed. Through this type of arrangement no one existing entity would stand to gain preferential position through the pilot with respect to permanent arrangements. In addition, the cumbersome ownership arrangements based on types of terminals and satellite versus ground terminals would be avoided. On the minus side is the creation of a new, though interim, organization.

not nec

Need strong FCC partic
Can we have FCC/NASA
mgt?

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Dr. C. T. Whitehead DATE: April 14, 1969

FROM : IOP/PA - William N. Lyons

SUBJECT: Domestic Satellites - Random Thoughts while Walking to Work

QUESTION - Can the United States embark on a domestic satellite program without triggering a mad proliferation of other domestic and/or regional systems, thereby threatening the infrastructure of the international INTELSAT system?

If the strictly domestic issue could be separated from the regional one, what countries would be of sufficient geographic size to warrant economically a satellite over a terrestrial system? Are there others?

United States
USSR
Canada
China
Australia
India
Brazil
Indonesia
Pakistan

The USSR already has a domestic system; the Chinese will do what they want and are capable of doing in any event. ERGO: For the foreseeable future it is a consideration of the U.S., Canada and Australia, ultimately of four more countries, now hardly economically viable enough to maintain a terrestrial system. Assuming the worst (or best), would nine domestic satellite systems (none save the U.S. and possibly the USSR requiring more than one satellite) be a serious threat to frequency interference or orbital parking?

Regional satellites are another kettle of fish.

U.S. DEPARTMENT OF COMMERCE

APR 10 1969

To : Tom Whitehead

From: W. R. Hinchman WRH

Had intended to leave this with you yesterday. It represents the type of approach I believe we must take in addressing some of these problems. In this case, it is an attempt to develop a clear concept of the "radio resource" which is generally but erroneously considered to be the radio spectrum. Viewed as the "electrospace". I believe this resource can be managed and used much more efficiently, even without any large-scale "research" or "management" programs such as have been suggested. But this does require a much better understanding of the resource than now exists in frequency management quarters.

FOR PRESENTATION AT IEEE INTERNATIONAL COMMUNICATIONS CONFERENCE - JUNE 10-12, 1969

Domestic Satellite

USE AND MANAGEMENT OF THE ELECTROSPACE: A NEW CONCEPT OF THE RADIO RESOURCE

W. R. Hinchman
Institute for Telecommunication Sciences
Boulder, Colorado

Summary

Growing concern over the ability to accommodate new and expanded radio services without harmful mutual interference has led to the concept of a "radio resource" which must be conserved and utilized efficiently. Attempts to identify the electromagnetic spectrum as this resource have proved both confusing and inadequate. An alternative concept of an 8-dimensional electrospace encompassing the many characteristics required to distinguish one flow of electromagnetic radiation from another has been developed; this appears to best fit the definition of a radio resource. The non-discrete and interactive nature of electrospace use appears to dictate centralized coordination of all such use; however, this need not preclude the use of economic incentives for resource allocation and re-allocation which have proved an effective mechanism in other areas. Of several potential allocation and management options, the use of license fees proportional to electrospace availability, demand, and extent of use seems the most attractive at this time.

Introduction

In the past few years, the demand for new radio services and for expansion of existing services has grown increasingly intense. Pressures for a greater number and diversity of radio services is being fueled by rapid, cost-reducing technological advances coupled with a growing recognition of the social and economic benefits potentially available from such services.

These pressures have led many who are concerned with such problems to espouse the concept of some limited natural "radio resource" which is used and required by radio systems and for which there is thus competition among prospective services. This resource is most commonly identified as the "electromagnetic spectrum" or "frequency spectrum," and those concerned with its use are generally referred to as frequency or spectrum managers, offices, engineers, etc. In this paper a new concept of the radio resource, termed the electrospace, will be developed. There is reason to believe that such a concept is essential if meaningful progress is to be made in allocating, managing, and using this resource for the greatest social and economic benefit.

The Spectrum Concept

Generally, when one thinks of "using" some resource in a productive endeavor, he is implicitly or explicitly aware of three major characteristics of that resource:

- Its identify, i.e., its physical characteristics and what it can do;
- Its dimensions, i.e., a system of units by which the resource or its use can be accurately measured; and
- Its value, i.e., some standard measure of the utility of a given unit of the resource for various purposes.

As previously noted, many consider the electromagnetic spectrum to be the "radio resource" -- i.e., the indispensable natural phenomena which permits the transmission and/or reception of information via radiated signals. However, attempts to characterize the spectrum as a resource and establish its dimensions or value raise a host of problems and logical inconsistencies.

The electromagnetic spectrum is generally defined as the entire range of wavelengths or frequencies of electromagnetic energy. "Spectrum" is thus an abstract concept which describes the range of values of one particular characteristic -- i.e., frequency or oscillation rate -- of electromagnetic energy. Some well-known characteristics of radio systems will serve to highlight the inconsistencies in labeling this the radio resource:

- Both radiating (radio) and non-radiating electromagnetic systems "use" the spectrum, thus it is not unique to radio services.

- Many electromagnetic systems -- whether radiating or non-radiating -- may simultaneously "use" the same frequencies without interaction, provided they are suitably separated by geography, physical barriers, or other characteristics of electromagnetic energy; thus, the "spectrum" is not scarce in the usual sense of a limited resource.

- On the other hand, even radio systems employing significantly different operating frequencies may seriously interact with one another and their physical environment under certain circumstances to produce deleterious effects such as intermodulation, radiation pattern distortion, etc.; thus, nominal frequency difference is an inadequate distinction between uses of the radio resource.

In attempting to find a way around these inconsistencies, several efforts have been made to attribute added dimensions of space, time, etc. to the spectrum resource concept. Mr. Richard Gifford of General Electric introduced the concept of PODAF's or units of power flux density, area,

and frequency bandwidth. Other authors have variously attributed three dimensions: space, time and frequency; or five dimensions: frequency, time and the three space dimensions -- to the spectrum resource. Without at this point attempting to debate the number or identify of these dimensions, it need only be observed that such attempts to re-define and re-dimension the spectrum -- which in many situations (e.g., non-radiating uses) is clearly not multi-dimensional -- seem likely to create more confusion than they will resolve.

The Electrospace Concept

The above considerations have led the author to conclude that the best approach to identifying and dimensioning the radio resource is to depart completely from the spectrum concept and terminology.

The basic question we need to answer is "For what must radio services compete in order to exist? (i.e., what incredient essential to radio services exists in limited quantity?)" This will be, by definition, the radio resource.

Radio systems operate by the transmission and/or reception of information-bearing electromagnetic radiation through "space." Electromagnetic radiation is not itself scarce -- one can in principle produce radiation of whatever intensity desired without inhibiting another's ability to do likewise. Nor is the radio spectrum scarce -- one can also transmit radiation possessing as many frequencies as desired without inhibiting others. The same may be said of other individual characteristics of electromagnetic radiation.

Looking at the other end of the radio system -- i.e., the receiver -- gives a similar result: It is possible to collect radiation having as many frequencies, polarizations, intensity levels, etc. as desired -- without significantly affecting another's ability to do likewise.

On the other hand, considering both the transmission and reception of electromagnetic radiation simultaneously provides a different result: Radiation passing through any small volume of physical space can be characterized by its frequency, time, polarization, and intensity characteristics, and its direction of propagation. The job of a receiver is to distinguish among desired and undesired radio signals by recognizing some particular combination of these characteristics. Thus, each radio system consisting of a particular transmitter/receiver pair is in competition with other systems for essentially "orthogonal" positions in an 8-dimensional matrix whose axes correspond to the 3 space dimensions and 5 other radiation characteristics noted above. This matrix -- which the author has termed the electrospace -- must therefore be the radio resource.

The subject of matrices generally brings forth the idea of abstract mathematical models -- and it is quite true that mathematical modeling of the electrospace is envisioned as a very useful tool for the future. However, the physical significance of the electrospace concept should not be lost. Since electromagnetic radiation does indeed possess all the physical characteristics mentioned and can be distinguished by them, the electrospace provides a very real, physical interpretation of interactions in the vicinity of a radio receiver, the only place where competition for the radio resource is in evidence.

At this point, it is perhaps worth noting the distinction between electrospace dimensions and electrospace usage. The dimensions cited above are all discrete quantities -- i.e., it is possible to identify the frequency, polarization, intensity, direction, etc., of electromagnetic radiation and attribute discrete values to these. On the other hand, radio systems do not make discrete use of these quantities -- i.e., radio signals typically possess a complex, time-varying and interrelated distribution of frequency, intensity, and other characteristics, rather than discrete frequencies or frequency bands, etc. Thus, there are no fully orthogonal electrospace combinations insofar as actual usage is concerned, and fully discrete, non-interacting user rights cannot be identified -- although any desired degree of uniqueness and independence can be achieved by sacrificing potential utilization, as by assigning overly-wide bandwidths, overly-large geographic separations, etc.

The Question of Electrospace Scarcity

With the electrospace concept firmly in mind, the question of radio resource "scarcity" can be approached with greater perception. One might visualize a radio receiving system located somewhere in a major metropolitan area where spectrum scarcity and congestion are cited as major problems. Assume that this system can selectively tune through the entire frequency spectrum; can scan through all directions with an antenna directivity which is just comparable to good state-of-the-art design; and can scan likewise through the range of distinguishable polarizations.

The results of an experiment conducted with such a system might surprise some of those who believe the radio resource is currently "scarce," "polluted," "congested," or any of the other adjectives frequently used in this regard. Observing the frequency dimension alone -- i.e., summing over all the other dimensions for each frequency scanned -- would probably reveal signals occupying only a small fraction of the frequency range most useful at the present time (e.g., below 10 GHz). If the data from this experiment were further subdivided into typical message-unit time blocks, and angle-of-arrival sectors and polarization sectors equivalent to state-of-the-

art antenna design, it is doubtful that even 5-10% of such combinations would be found in use -- even in the most congested urban area. Furthermore, of that 5-10%, further analysis would likely reveal that a large proportion of the signals observed need not have been present at the measurement site, had the radiation been reasonably constrained to the communication path actually required.

The basis for such far-out statements -- lacking actual measurements -- is to be found in the basic guideline under which the radio resource is currently used and managed (the National Table of Frequency Allocations) and the general system standards and guidelines which accompany these. Consider for example just the first 1 GHz of the spectrum, particularly the range from 30 to 960 MHz. In the allocation table, some 26% of this range is allocated exclusively to Federal Government use, and 8% is shared between Federal and non-Federal uses. Thus, about 30% is reserved on a nationwide basis for Federal use.

Looking at the non-Federal allocations, one finds that 53% (i.e., 492 MHz) of this particular frequency range is reserved -- also nationwide -- for television broadcasting. Federal Government and television allocations thus jointly account for over 80% of this spectrum range. But how are these allocations actually used in a typical urban area? Except for aeronautical services, which comprise a good part of the Federal/non-Federal shared category, Government radio services in this frequency range tend to be concentrated near major training centers, test ranges, operating fleets, theatres of war, etc. Since none of these are typical of urban population centers -- though certain ones may occasionally be found in such areas -- it is reasonable to conclude that these frequency allocations are not extensively employed in typical urban centers.

While it is very difficult to be quantitative about unused Government frequency allocations -- many Government radio services are either classified, or of an emergency nature where actual usage is less important than the availability for use when required -- unused TV broadcast allocations are much more easily quantified. To avoid co-channel and adjacent-channel interference among TV signals, the FCC has established a station allotment (assignment) plan which indicates the specific channels which may be used in a given area within the overall TV spectrum allocation. Normally, only 5-10 of the 83 allocated channels are allotted to any major urban area; only in the very largest cities (e.g., New York, Los Angeles, Chicago) is this number larger, and there only 10-15 channels are allotted. Thus 65 to 70 spectrum bands each 6 MHz in width, though allocated nationwide to television services exclusively, cannot be used for such service in the typical urban area. The extent to which these could be used by other radio services within individual urban areas, by employing directive antennas, narrower bandwidths, lower power, and different transmit/receive locations -- i.e., by making effective use of other dimensions of the radio resource -- is not known with any accuracy. However, a report by the FCC Land Mobile Frequency Relief Committee dealing with the congested Northeastern U.S. indicates that as many as 14 of the lowest 50 UHF TV channels -- or 84 MHz -- could be used in the New York area by conventional high power land mobile services, without interference to TV stations operating in accord with the FCC allotment plan. Considering the remaining 20 UHF TV channels and the possibility of lower power land mobile service operating at selected locations within such an area, this number could likely be at least doubled.

This analysis could be carried further, to include unused frequency allocations for specific categories of maritime, aeronautical and land mobile services which are not required in a particular urban area, as well as some allocations for other services which remain unused. Looking at other frequency ranges, large allocations for radio location (e.g. radar), television remote pickup, etc., can be found which, while perhaps fully utilized in some specific area, are virtually unused in and around many urban areas. The net effect, as noted before, is that the frequency dimension of the radio resource is lightly utilized if considered on an area-by-area basis.

We might next explore the use of other dimensions of this resource. In general, the historical focus on managing the frequency dimension alone has permitted these dimensions to be used very wastefully and ineffectively. Typically, transmitting antennas for television and mobile radio services, for example, are located on the highest hills or towers available and are made omnidirectional in coverage. While this may be a cost-effective approach for the individual service, it usually represents a significant waste of the space dimensions as compared with the use of more directive antennas covering only the area normally served. Polarization is rarely used as a means for multiplying the number of orthogonal combinations of electrospace available. Time-sharing of other dimensions of this resource is also rare except in the mobile radio services, where it is generally an uncoordinated, ad hoc procedure.

Challenges to Electrospace Management

To summarize the discussion thus far, the radio resource -- when defined as the electrospace with all its dimensions -- seems very lightly utilized in comparison with state-of-the art capabilities. The major challenges, beyond further definition and dimensioning of this resource, are thus (a) to make available for use those dimensions not now accessible, and (b) to create an effective mechanism for promoting efficient utilization of the entire resource.

The first of these challenges can only be met, under existing mechanisms for managing the radio resource, by administrative action to make orthogonal electrospace units available as required on an area-by-area basis, somewhat irrespective of nationwide spectrum allocation plans. In other words, by treating the National Table of Frequency Allocations as merely a planning guideline to promote the development of standardized, economical equipment for specific services on a more-or-less nationwide basis; while encouraging flexible deviation from this table to meet local variations in the demand for services, or simply to make available electrospace resources which will otherwise go unused. This is not likely to happen, however, until both government and industry representatives obtain a much more comprehensive understanding of the radio resource than now exists.

The second challenge, surprisingly, has achieved a great deal more attention than the first, despite the apparent incongruity of such an approach. One is tempted to question the feasibility of creating an effective mechanism for promoting efficient utilization of a resource whose dimensions have never been accurately determined nor brought into use! Yet, there have been a number of studies and proposals for sophisticated spectrum engineering approaches, social and economic value analysis of spectrum use, market mechanisms for spectrum allocation and exchange, etc.

Alternative Management Approaches

Spectrum Engineering -- a term adopted by the IEEE/EIA Joint Technical Advisory Committee for its recent (1968) report on the radio resource and its use -- contains some elements of the electrospace concept presented in this paper, and generally recognizes the vast capacity of this resource for telecommunications, given the use of analytic tools and approaches which can bring about compatible sharing among competing claimants. The ingredient lacking in this study is that of an incentive mechanism. Implicit in the JTAC analysis is the assumption that government must continue to make all decisions on spectrum usage, based on some form of administered priority system. Spectrum engineering would provide the tool by which new services could be accommodated, but would not identify which services <u>should</u> be accommodated in case of conflict, nor what cost should be incurred in the accommodation of new services, nor to whom this cost should be assessed.

Social and economic value analysis of the spectrum, as conceived by its proponents, would in effect complement the spectrum engineering tool, at least in principle. The major thrust here is to develop and establish a system of administrative priorities based more rationally on the social and economic value of competing radio services. Depending on the point of view, these priorities would consider such factors as contribution to the GNP, value of equipment used, or nature of service provided (e.g., defense of the Nation, safety of life and limb, education, business, etc.). Its supporters believe that a quantified ranking of radio services under such a system could make the administered priority approach to resource allocation somewhat more equitable -- and there seems little doubt of that. Some of the major difficulties with this approach are: (1) the problem of finding the truly objective individual or group to establish and continually update a priority system; (2) the problem of local variations in both relative value and electrospace availability, which would require separate priority ratings for each area; and (3) the problem of accurately reflecting <u>marginal</u> value -- i.e., the value of the $(n+1)$th electrospace unit to competing services -- in any priority system. These are very difficult problems, to which there have as yet been no satisfactory solutions.

The Market Approach -- i.e., placing the radio resource on the open market to be bought and sold as any other commodity -- has also been suggested with considerable zeal in some quarters. It is argued this would truly maximize the benefit/cost of radio services, since the radio resource would be continually transferred from lower- to high-valued uses and there would be a positive economic incentive for users to minimize the amount of resource employed through innovation in design and operations. The basic concept of this approach -- i.e., of providing <u>individual incentives</u> for efficient resource utilization, and of using the interplay between individual users rather than centralized control to transfer resources from lower to higher valued uses -- is quite appealing. Again, however, there are certain pitfalls: First, radio services may provide social benefits not readily measured by the willingness or ability of a prospective user to purchase electrospace rights. Second, the non-discrete, dynamic and interactive nature of electrospace utilization renders it extremely difficult -- if not impossible -- to identify discrete units or user rights for the resource which could effectively be traded.

The first of these problems -- i.e., social value -- is certainly a valid and genuine concern, particularly with regard to national defense, public safety, education, and a host of other radio services. However, it must be recognized that these services currently either pay for or expropriate every other resource -- fuel, land, minerals, manpower, etc. -- required in their operations. Thus, it would not be totally inconsistent to ask that they obtain their radio resources in similar fashion. The radio resource is indeed no more indispensable than many of these others to successful operations.

The second problem is considerably more difficult. Unless the user can obtain resource units or usage rights which can be transferred readily from one use to another, an effective market is unlikely to evolve. Despite several attempts, it has not been possible to identify such independent units or rights without significant waste of the resource potential -- and the prospects for future progress along these lines do not appear bright.

Thus far, we seem to have made little progress toward an effective incentive mechanism for encouraging efficient use of the radio resource. There is yet another alternative which deserves some consideration. Granting that it may be essential for a centralized agency to identify electrospace rights on more or less a case-by-case basis and ensure their compatibility, it still does not seem necessary that this agency grant such rights on the basis of administrative priorities. Instead, we might adopt the best of both approaches, by establishing a set of license fees proportional to the amount of electrospace used as the primary incentive to more efficient use. One could even envision an adjustable fee schedule, which would take into account the variations in demand for electrospace from one region to another. Also, it might be desirable to permit the transfer of clearly identified rights directly between users as well as to establish procedures whereby users could provide one another direct indemnification against rights abrogations (i.e., interference).

Conclusions

This paper has explored in somewhat fragmented fashion a wide range of issues. The major conclusions can be recapitulated briefly as follows:

-- Attempts to identify the electromagnetic spectrum as the radio resource have proved both confusing and inadequate.

-- The concept of an 8-dimensional electrospace describing the many characteristics required to distinguish one flow of electromagnetic radiation from another seems to best fit the definition of a radio resource.

-- Radio systems require the use of quasi-orthogonal combinations of the many electrospace dimensions in order to avoid mutual interference.

-- Centralized coordination of electrospace use seems essential to ensure compatibility -- i.e., reasonable orthogonality -- between services; particularly in view of the statistical uncertainty and inherent variability of electromagnetic radiation.

-- In view of the above, a free market in electrospace rights hardly seems feasible, despite its attractiveness for replacing administrative priorities with individual economic incentives as a means to more efficient use of the electrospace.

-- One possible approach combining the centralized coordination required with greater individual incentives would be to establish a system of license fees proportional to the amount of electrospace used, with perhaps a variation in fee schedule among regions to reflect relative demand.

-- A most urgent task for the scientific and engineering community is to correctly define and dimension the radio resource or electrospace and its use, in order that progress can be made toward freeing resources now locked in national and international frequency allocations, making more efficient use of both existing and new resources, and establishing through appropriate mechanisms the relative social and economic value of alternative resource uses.

3/8/67

File with Rath memo on domestic sat.

AVAILABILITY OF ATS SATELLITES FOR EXPERIMENTAL OR DEMONSTRATION PURPOSES

Under the Applications Technology Satellite (ATS) program, NASA has now in orbit ATS-I and III, launched December 1966 and November 1967, respectively. ATS-E is scheduled for launch in September 1969, and ATS-F and G beginning in late 1971 or 1972. Attached is a technical summary of the communication capabilities of these satellites.

ATS-I and III have largely fulfilled their primary technical experimentation period, and although they are continually being used by the Weather Bureau and others there are periods when they would be available for additional experimentation. This use could include experiments by those desiring to investigate how satellites might be employed to serve communication requirements or applications they feel are unique. It may also be assumed that when the already selected technical experiments on ATS-E, F and G have been completed, those satellites would also be available for additional experimental or demonstrational purposes, provided they remain operative.

NASA intends to continue its practice of making the ATS satellites available for worthwhile experimentation by other organizations for as long as the satellites remain operative. This includes organizations which might be potential users of future operational systems, such as other government agencies, educational institutions or private concerns

who would be willing to invest in the necessary ground facilities, provide the message content and cover other ground costs. Experimenters are required to submit proposals which would explain in detail the objectives and conduct of the experiments and the arrangements for the dissemination of the information developed. NASA would review the technical and other aspects of the plans and determine in each case whether the use of the satellite time would be consistent with the NASA mission and the already existing commitments and priorities for the use of the satellites. NASA could not, of course, assume any responsibility for the continued availability of satellite capacity should existing or planned satellites fail to function adequately. These opportunities for additional experimentation and/or demonstration are based solely on the continued availability of the capacity of ATS satellites that NASA has programmed for specific research and development activities.

In considering additional experiments any number of receiving terminals can be considered. The NASA transmitting terminals at Roseman, N. C. and Mojave, California are normally used for transmitting information to the ATS satellites.

Proposals for technical and applications experiments should be addressed to NASA Headquarters, Director of Space Applications, Code SA, and proposals for public demonstration should be addressed to NASA Headquarters, Communications Satellite Demonstration Coordinator, Code I.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

IN REPLY REFER TO:

March 18, 1969 (Revised)

MEMORANDUM TO: ADA/Mr. Shapley
W/Gen. Smart

FROM: Mr. Edward J. Roth

SUBJECT: Domestic distribution satellite applications

While many persons were contacted and many studies referred to in connection with this report, its contents represent my own personal views concerning the complicated subject of domestic satellites.

Satellite technology has advanced to a point where it is now possible to actively plan for a fully operational domestic satellite system for the United States within the next few years.

While the technological prognosis is encouraging, the policy required to support it is not, for there is in fact no policy. Establishing policy will not be easy for the subject is complex and surrounded by controversy. During the past three years there has been an increasing amount of activity designed to encourage and to assist the FCC, the Congress and the Executive to make the policy without which there can be no domestic satellite program. It is unfortunate, however, that at this late date many points of view remain tenaciously held and widely separated. Even

the Final Report of the President's Task Force on Communications Policy is appendixed with three statements of partial dissent.

Not the least of the problems is that concerning the use to which a domestic satellite system will be directed. Differences of opinion exist here as well, but it has been possible during the past several weeks to receive positive answers to the question: "If you had access to a domestic distribution satellite, what would you do with it?"

This, then, is the general purpose of this study, and it may be more formally described as follows:

A. OBJECTIVES:

1. To explore how a domestic distribution satellite could be utilized with a particular emphasis on uncovering what, if any, new user techniques exist which specifically require a satellite in order to function most effectively.
2. To make specific recommendations on matters arising out of research into domestic distribution satellite applications.

B. BASIC ASSUMPTIONS:

Actually, few assumptions guided this study. Technical capacity has been assumed; and with a somewhat guarded optimism, the willingness of those persons interviewed to objectively struggle toward the best answers for the national good has also been assumed.

In the time allowed, it has not been possible to specifically relate this study to other NASA programs. In no way is it concerned with national security considerations. The study does not detail costs and cannot include an economic analysis to support the recommendations and conclusions.

C. METHODS USED:

The methods used to conduct this study were simple and straight forward consisting entirely of the studies made available to me by Dr. Walter Radius and Mr. Greg Andrus of NASA; by interviews with representatives of government agencies and of companies or organizations which had earlier expressed opinions concerning a proposed domestic satellite system; and by meetings with NASA personnel, in particular Messrs. Radius and Andrus.

D. SIGNIFICANT RESULTS OF THE STUDY:

Earlier it was stated that differences of opinion exist concerning virtually every phase of the subject of domestic satellites. While this study is concerned primarily with the use or application of satellites, it became apparent very early in the study that it is difficult to separate "use" from such matters as the number of satellites; the number of channels and frequencies the ownership of ground stations; and the structure of the organization selected to lead the U.S.A. into this new communications era. Where so much remains to

be known about the entire subject of domestic satellites, use and structure are particularly co-related, many maintain, with an increasingly hardening attitude toward the latter.

It is essential this point be kept foremost in mind for it is the most persuasive of all the conclusions coming out of this study. Impartial conclusions will be difficult to arrive at for as the debate continues, honest men appear determined to hold on to their conflicting points of view.

In sum, what the study has shown is that in terms of the areas of general interest, which are:

1. Broadcast distribution
2. Broadcast networking
3. Telephone communication
4. Record communication

the demonstrably significant advantages of a domestic distribution satellite system are two, namely economy and flexibility. NBC, CBS, and ABC, responding to the core question, state they would use a domestic distribution satellite for program distribution and for obtaining more flexibility in networking. The Ford Foundation would use a domestic distribution satellite for instructional, educational, and cultural programming. The General Electric Company requests a satellite for record communication and the McCall Corporation for experimental television programming, for coalition and transmission of data from multiple access computers and for transmission of graphic material and the

National Association of Educational Broadcasters for national instructional television. H.E.W. has indicated an interest in experimenting with instructional and educational television programs designed for isolated communities. Reference is made later in this report to National Educational Television and to the National Library for Medicine.

With the possible exception of the comments of the NAEB, to which more direct reference shall be made later, there does not appear to be, at the moment at least, any newly developed demand or end-user technique of any substance for using satellite communication in the U.S.A. that stands by itself as something truly unique and which is not identified more with economy and flexibility than newness. Therefore, insofar as the core question ("If you had access to a domestic distribution satellite, what would you do with it?") relates to "newness", the response at the moment is inescapably negative.

What does all this mean to NASA and to the future of domestic satellite communications in the U.S.A.? In general this negative response should have no effect on the need to mount an experimental program as quickly as possible. Experience has shown that new technological advances have traditionally inspired new applications and the development of new end-user equipment because the new capacity was there and ways were discovered to use it. Moreover, economy and flexibility are values which stand by

themselves as highly desirable. It must, therefore, logically follow that the present-day absence of any new end-user demand should not in any way whatever be permitted to delay decisions concerning an experimental domestic distribution satellite program. Development of such a program should be high on the list of national priorities.

Perhaps the most interesting use of domestic satellites is that proposed by the National Association of Educational Broadcasters.

NAEB feels there is tremendous waste in much of our educational system because of the overlapping of activities; that more of an effort should be made to share specialized skills and relieve the teacher who spends too much time on expositional efforts. NAEB believes that by having a fully operational domestic satellite system, television could relieve the local teacher of the other burdens to spend more time teaching; that a national program over satellites covering the more formal courses, i.e., new mathematics, languages, music and the sciences, and using the very best skilled teachers available, will have the direct effect of <u>increasing</u> personal contact between the local teacher and student in the school receiving such programs. NAEB is concerned that much of today's educational structure invites mediocrity because thousands of school systems are duplicating the work of each other unnecessarily; that new opportunities for

bringing about excellence and equal access to quality will be made available by centralizing the sources of producing good textbooks and that an additional benefit accruing from a domestic satellite system will be the virtual elimination of the delay between the time new ideas are discovered and the time they are utilized in the nation's schools. NAEB concludes that satellites used for instructional purposes and for general educational and cultural purposes as well, can provide the U.S.A. with a dynamic new force for good.

The availability of skillfully produced programs and the willingness of the teaching population to accept them within the framework of the school curricula remain problems to which more time and effort should be directed.

The National Library for Medicine (H.E.W.) believes strongly that if it had access to a satellite channel it would be in a greatly improved position to disseminate medical/scientific information quicker, less expensively and more efficiently to the different medical communities and groups in the United States. While any activity designed to improve medical standards in the country should be eagerly approved, the National Library for Medicine proposal must be considered subsidiary if it is to be used as a justification for obtaining a satellite channel. Ample terrestrial technology is available at the moment to accomplish precisely what the National Library for Medicine proposes to do.

The National Education Television would in general support the NAEB concept of satellite use. On December 16, 1966, NET submitted comments to the FCC in support of the Ford Foundation proposal. The comments were not considered particularly responsive to the issues raised in the initial supplemental notices of inquiry. The NET comments were in the form of a study of the nature, structure, financial condition, programs and plans of NET.

The General Electric Company filed a comment with the FCC on April 3, 1967, which was basically of a technical nature. General Electric is interested in record communication services over satellites, and it submitted further reply comments to the FCC on January 17, 1969.

E. THE DEBATE:

To return to the matter of unresolved questions, some of which are referred to in Section D of this report:

With persistent regularity, concern has been expressed over what appears to be foremost in the minds of those interested in the domestic satellite potential, namely what will the industry structure be for using satellites to meet domestic communications requirements? There appears to be general agreement that the answer to this root question will provide the answers to the remainder.

Two main thoughts have emerged. First, many believe NASA should be given authority to mount an experimental domestic distribution satellite

Program which would then be turned over to a new entity entirely in, say, five years after the initial testing period was over. There are those who maintain NASA has the authority to conduct such a project. Others say if NASA does not possess such authority under the 1958 Space Act, it should request it from Congress. The Congress might be persuaded to temporarily expand NASA's role for the common good by enacting legislation with a specific time period thus removing the inevitable accusation that big government was invading the private sector of the economy.

NASA's prestige is very high among the people interviewed; and as a further expression of their interest in cooperating with NASA in such an undertaking, several companies have stated their willingness to contribute funds to participate in an experimental project. (National Broadcasting Company, American Broadcasting Company, McCall Corporation and the Ford Foundation with the Columbia Broadcasting System representing that depending upon the circumstances it might allocate funds for such a purpose.)

It should be emphasized that these organizations, with the exception of McCall Corporation, are mainly interested in dedicated domestic satellites and their agreement in principle to participate financially and otherwise in experimentation with NASA is an indication of their desire for quick

action rather than an indication of change in their long-term view. Indeed, as recently as October of 1968, the American Broadcasting Company made its views known again to the FCC.

Second, others believe, notably the telephone companies and the Presidential Task Force, that COMSAT is the instrument that should be used, but only in the beginning period, to lead the country into the new technology of domestic satellites. Those who hold this view generally maintain NASA has no authority whatever to experiment with a domestic satellite system. COMSAT shares this view.

The telephone companies apparently accept the COMSAT Pilot Plan as a temporary expedient so activity will begin in this area. In no way have they retreated from the view that common carriers should ultimately control any domestic satellite activity. The question whether COMSAT is a common carrier or a truly unique entity created by Congress is relevant to this point.

Since August of 1966 at least 33 large corporations have submitted policy, legal and technical filings and reply comments to the FCC. As we enter the fourth year of formal debate there are indications the FCC will rule on the matter shortly. Congress is expected to hold hearings, however; and this could delay the FCC.

Not all debate directly involves NASA for there are many areas of contention. Some of the points of view have subtle differences; some appear inconsistent, while others change as circumstances do as may soon be determined. To assist the reader to understand the complexities involved, the following is a capsule summary outlining the substance of the various positions taken by several of those who submitted comments to the FCC in the matter of Docket #16495--Domestic Use of Satellites. (The Ford Foundation filings and reply comments to Docket #16495 have not been summarized as it is believed the Ford position is very well known.)

American Broadcasting Companies, Inc.

In its submission to the FCC on August 1, 1966, the American Broadcasting Companies, Inc. stated: Under the Communications Act of 1934, the FCC is given broad power to grant licenses authorizing facilities for interstate and foreign communications in the public interest. ABC asserts that the Satellite Act of 1962 does not confer on COMSAT' singular authority to use satellites for communications, as alleged by COMSAT. In establishing COMSAT, it was not the intent of Congress to redistribute domestic traffic within the United States and its possessions. Terrestrial facilities are not adequate to meet ABC's requirements. Discussion of revenue figures for AT&T indicates that the domestic carriers would not lose a substantial source of income. COMSAT would lose nothing since it was neve contemplated that it would operate in the domestic sphere.

ABC submitted further documents to the FCC on December 16, 1966, April 3, 1967 and on September 18, 1968 with its last declaration to the FCC dated October 24, 1968, in which it said: "We have urged, and continue to urge, that a dedicated system will do a better job for the broadcast industry than a system having diversified and conflicting responsibilities to several industries.". The single purpose satellites thus far proposed by ABC, CBS, NBC and the Ford Foundation each have 24 channels, twice the number initially proposed by COMSAT and by AT&T.

Even COMSAT has been forced to concede that video data distribution via a dedicated system would be less costly to the networks and to individual broadcasters than such distribution via a multi-purpose satellite. Both Ford and ABC, in their filings of April 3 and September 18, 1967, set forth at some length reasons why any test programs undertaken at this time should be conducted by NASA.

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COMMUNICATIONS SATELLITE CORPORATION

On August 1, 1966, COMSAT stated to the FCC: As a matter of law the FCC does not have the authority to authorize private use of communications satellites to meet domestic needs. The Corporation's position is based on the assertion that the Communications Satellite Act of 1962 is comprehensive legislation on satellite communications. The day day affairs to satellite regulation have been left to the regulatory agencies, but two matters have been reserved to the Corporation: (1) construction and operation of satellites; and (2) construction and operation of earth stations, alone or in conjunction with carriers. COMSAT was created by Congress as a unique entity. The language of Section 102(d) is precise, and a distinction must be drawn between the "national interest" spoken of in that section and the "public interest, convenience and necessity", the phrase invariably appearing in references to the powers of the FCC. COMSAT submits that this dual standard was intentional. NASA is not authorized to furnish satellite launch services for ordinary commercial purposes. NASA's enabling legislation defines its purpose as to "plan and conduct aeronautical and space activities". This phrase has been defined broadly but does not include setting up of operating systems. Launch services to COMSAT are expressly authorized in the 1962 Act. If COMSAT's legal position is rejected, it is urged that the

ABC plan would not be in the public interest. Private entities should be excluded from operating satellite systems; this decision is urged in order to expedite the development, by COMSAT and the other common carriers, of necessary facilities to meet domestic communications requirements.

Then, on December 16, 1966, COMSAT included in a second filing to the FCC: The Ford Foundation proposal cannot be implemented under present statutes. At least five elements of the Foundation's proposal are beyond FCC power. The arbitrary division of services such as earth stations, control centers and satellites is economically and technically unsound.

COMSAT filed again on April 3, 1967, and on September 19, 1968, in another filing to the FCC maintained: There is in COMSAT's offer to initiate a pilot program on a trusteeship basis no sinister aim and no risk of a monopoly as a fait accompli which would tie the hands of the Government. Moreover, there is nothing in the COMSAT proposal which would be inconsistent with an ultimate authorization of a dedicated broadcast satellite service. The satellite capability and the earth station network contemplated by the pi program are fitted equally to a multi-service or single-service approach.

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COLUMBIA BROADCASTING SYSTEM, INC.

In its filing to the FCC on August 1, 1966, the Columbia Broadcasting System maintained: The FCC may, as a matter of law, authorize non-governmental entities to construct and use satellites for private or specialized domestic communications requirements; COMSAT is the United States instrumentality in the international phere. It should not have a monopoly in the domestic sphere. There are three principles leading to the conclusion that the Satellite Act not only does not preclude, but actually favors private domestic systems (1) the general principle in the United States of furthering true competition; (2) the primary concern of 1962 Act with the global system; and (3) the fact that Congress could not have intended that international approval be necessary for establishment and operation of domestic satellite services. The FCC has the power to authorize such activities. Domestic use of communication satellites is completely compatible with he aim of the Satellite Act. Congress could not have wished to give the world a voice in United States internal communications affairs.

The Columbia Broadcasting System made a second filing to the FCC on December 16, 1966; but on September 18, 1968, it had the following to say: CBS urges immediate authorization of COMSAT's pilot program. A practical test may be an effective manner of resolving at least some of the technical problems.

The COMSAT program should be viewed as a feasibility study and not solely a demonstration of COMSAT's capability. Other approaches should not be automatically foreclosed from development; and if other entities are willing to foster test programs, they should be given favorable consideration.

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AMERICAN TELEPHONE AND TELEGRAPH

On August 1, 1966, the American Telephone and Telegraph Company stated to the FCC that: The FCC may, as a matter of law, authorize private use of communications satellites if "required in the national interest". Section 102(d) of the Communications Satellite Act of 1962 provides for the possibity of additional communications satellite systems, and set standards for authority of such systems. The implementary body must be a government regulatory agency. The purpose of the Communications Satellite Act of 1962 is to make available to the general public technical advances in the field of communications made possible through satellites. A private system would be inconsistent with that purpose. Private systems are designed to serve private needs, thus the full advantages of satellite communications can best be realized through the common carriers. Our national policy of conservation of frequency spectrum could best be implemented through the common carriers. The technical data outlined briefly lead AT&T to the conclusion that the proposed ABC system would not be in the public interest.

AT&T filed reply comments and technical data on December 16, 1966, and April 3, 1967, and on September 18, 1968, had the following to say: Early implementation of COMSAT's pilot plan is in the public interest. One of the principal virtue's of

COMSAT's proposal is accepted to work with COMSAT and other participants to integrate the satellite system with the terrestrial telecommunications facilities of the domestic common carriers. AT&T urges that the earth stations of the experimental system be owned and controlled by the common carriers utilizing them to provide services to the public.

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NATIONAL BROADCASTING COMPANY

In its filings on August 1, 1966, and December 16, 1966, the National Broadcasting Company proposed to the FCC that: The FCC has the legal power to authorize domestic satellite transmissions, as public interest considerations indicate. There is nothing in the Satellite Act leading to the conclusion that COMSAT was set up to govern domestic satellite communications activities. The authorization of a domestic system should have no adverse effect on the policies and goals expressed in the Communications Satellite Act or on the international obligations of the United States Government, since a domestic service is not governed either by the Satellite Act or the 1964 Agreements. The FCC does not have the authority under present law to authorize the entity or service proposed by the Ford Foundation. The FCC should undertake a high-priority examination of the comparative advantages and disadvantages of a specialized system for program distribution. Establishment of a specialized satellite system should substantially lower program transmission charges and provide service of at least as high reliability and of superior technical quality.

Then on September 18, 1967, NBC said: NBC agrees with COMSAT on the advisability of a conference of interested government and industry parties and the desirability of a test program,

but urges that the conference precede any authorization in principle or detail, in order to give the Commission a more complete and considered basis than is now available on which to authorize a test program.

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WESTERN UNION TELEGRAPH COMPANY

On August 1, 1966, the Western Union Telegraph Company submitted its comments to the FCC that: The entire concept of a private domestic system is inconsistent with the basic policies of the Satellite Act and the FCC has no power to authorize such private use of communications satellites. The establishment of such a private system is contrary to Congressional intent. The Satellite Act was enacted to provide a completely separate framework for activities in the area of satellite communications. COMSAT was set up as the controlling entity. Originally, only international functions were discussed, but Section 102(d) contemplates possible future establishment of a domestic system. The FCC cannot authorize private satellite systems. To achieve the goal of establishing a communication satellite system a new common carrier, COMSAT, was created. The only method of conducting domestic operations is through common carriers. Apart from possible stimulation of research, Western Union can see no specific advantages in the ABC proposal.

In its filing on December 16, 1966, Western Union continued by stating: COMSAT is, as a matter of law, the only entity which may provide the space segment of a domestic satellite system. Only COMSAT and/or common carriers may construct and operate earth stations. The broad public interest is at issue in the Ford proposal and the financial burden of this proposal should not be visited only on commercial communication interests.

Then on September 18, 1966, Western Union stated to the FCC: Western Union agrees generally with the concept proffered by COMSAT of a domestic communications satellite program, but cautions against allowing COMSAT to obtain a de facto position of dominance from which it would be difficult to dislodge. Western Union believes that earth stations should be common-carrier owned.

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Two additional FCC notices of inquiry, Docket #18261 and Docket #18262, are relative to the point at hand for they are concerned with the possibility of rearranging a considerable number of frequencies for use by mobile applicants. This report is not concerned with the frequency problem and the FCC action is referred to only as a point of reference.

Some maintain there is enough knowledge gained from the experience with INTELSAT to determine now the permanent organizational and ownership structure of the new entity. Others, of course, contend the exact reverse to be closer to the truth. Various proposals have been suggested by one group, alternatives by another. To demonstrate the complexities involved in the debate, a list of the known possibilities is herewith submitted. (All subject to government regulation.)

1) Common Carrier (one common carrier or a group of common carriers)

   a. Having control over:

      1. Entire system

      2. Satellite only

      3. Ground stations only

2) COMSAT

   a. Having control over:

      1. Entire system

      2. Satellite only

      3. Ground stations only

3) Other companies or organizations
(Foundations, broadcasters, publishers, computer-data)

a. Having control over:

1. Entire system

2. Satellites only

3. Ground stations only

4. One complete channel only

4) A new COMSAT-type corporation

a. Having control over:

1. Entire system

2. Satellite only

3. Ground stations only

5) Government (an agency of the government)

a. Having control over:

1. Entire system

2. Satellites only

3. Ground stations only

6) A Combination (of #1, 2, 3, 4 or 5, with participants sharing control over):

1. Entire system

2. Satellites only

3. Ground stations only

4. One complete channel only

7) Dedicated satellite corporations (with each entirely owning and controlling its own satellite system.)

1. Broadcasting companies combined, including educational broadcasting companies and fouucations.
2. Common carriers (mainly telephone and record).

In any situation a separate policy decision is required to determine if the domestic satellite corporation shall have the authority to:

1. Deal only with the terrestrial carriers.
2. Deal only with other users.
3. Deal with both.
4. Deal only with industry-related users.

One can immediately see the difficulty. The preceding comments focus clearly on many of the arguments and may very well explain to some degree why there has not been much creative thinking directed toward discovering new uses for domestic satellites. The available evidence, nevertheless, does tend to support the premise that new and exciting applications will evolve out of experience, once an organizational structure is formed and satellite communications are available to all.

The President's Task Force on Communications Policy had this to say on the subject: "We must contemplate the possibility that permanent approval of any fully operational system at this

time might well fix the institutional and operational framework of domestic satellite communications services prematurely and foreclose valuable options for the future." This recommendation is sound and certainly directs itself to the long term national interest.

It is unfortunate that at the moment the subject is embroiled in a form of "chicken and egg" dilemma. Technology has moved ahead in leaps and bounds while policy and the disciplines which both determine and arise out of policy have lagged woefully behind.

F. CONCLUSIONS:

It is very possible decisions will be taken in 1969 which will determine the form and shape of the organization selected to exploit the opportunities in domestic space. It would be inexcusable if these opportunities were lost by the creation of an organization incapable of moving forward in the manner required, even assuring its temporary status.

What is required with urgency is a determination to reach an ultimate goal through a series of well-planned stages. The complexities involved demand taking a long-term view.

What should NASA's role be?

The United States has attained the preeminent position of leadership in space research and development largely through the

efforts and expertise of NASA. To rigidly adhere to the premise, as some do, that NASA should adopt a totally hands-off attitude toward domestic space would not only be contrary to the national interest, but foolhardy and wasteful to talent in the extreme. To the contrary, it is precisely in the national interest to devise a method wherein NASA's vast experience and knowledge will be brought directly to bear upon the domestic space scene. This is not to say that NASA should dominate or otherwise control domestic space. This is to say, however, that common sense should prevail.

The Ford Foundation argues, with histroy and tradition to support it, that there is considerable merit to the idea the people as a whole are entitled to a dividend from the large sums appropriated for the space effort. NASA could be the entity to provide it, in the experimental period, in particular. As stated earlier many, but not all, believe Congress could designate NASA as its instrument for experimental stage one with no infringement being made upon our free enterprise economy.

There are two main conclusions to be drawn from this report:

First, that widespread differences of opinion exist concerning the entire subject of domestic satellites, with particular emphasis on the matter of organizational structure;

Secondly, that the subject is so complex and the knowledge gap so wide the question of precisely how to use a domestic satellite has not been solved.

As the second conclusion cannot be remedied prior to solving the first, it must follow that a concentrated effort be made concerning the main problem.

Two major impediments to a solution at the moment are COMSAT and what role that organization should have, if any, and what authority should be given to the common carriers. Many responding to Docket #16495 are suspicious of COMSAT's motives, even as they may relate to a pilot program. Some allege if COMSAT controls a pilot program objectivity will be virtually non-existent, believing that COMSAT is too common-carrier oriented. Can it be said to be truly in the national interest to automatically consider transferring to domestic space the status quo of the terrestrial common carrier environment?

In the present climate of doubt, it is likely the debate will continue and a domestic satellite program could be delayed indefinitely, perhaps for years. If permitted to do so, this would be a national tragedy.

There is a solution and however temporary it may be, it has much to recommend it in the present circumstances. Either NASA alone or NASA in close cooperation with other interested government agencies and corporations from the private sector could be designated to conduct an experimental program within a definite time period.

It was not possible in the time involved to query all the respondents to FCC Docket #16495. Of those interviewed, however, there appears to be general approval of NASA as the agency to be used to begin the development of domestic space.

If Congress approved using NASA's overall know-how, definite plans and schedules could be arranged very quickly, the country would be moving ahead in utilizing domestic space for the common good in a less hostile climate and the Executive and Legislative branches of government would be better equipped to decide upon the major issues involved later in setting up a permanent system.

Prudence demands concentrating on those areas which all or most agree.

As many large corporations in the private sector are in agreement about NASA's role, this entire subject should be carefully reviewed. This is recommended.

Not everyone would support this proposal, however. The Task Force (Section V-29) has this to say on the matter:

"Ideally, the pilot program should be controlled by a completely neutral and disinterested entity, lest the pattern of ownership of any fully operational system harden prematurely. The Ford Foundation has suggested that NASA is such an entity but there are practical obstacles to NASA's undertaking the pilot project. While NASA could technically provide the space segment, we doubt that it would be the appropriate entity to test the commercial and operational feasibility of domestic satellite

services, and in any case it would need Congressional authority to do so. Seeking new legislation could cause considerable delay in starting a program for domestic use of satellites, and it is questionable whether Congress should be asked to appropriate public funds for a project when private interests are apparently willing and able to commit the necessary resources."

This is a specious form of logic. No doubt there are problems, but none are insurmountable, especially if they are equated and solved in terms of what is in the national interest.

With the knowledge its role was a temporary one, restricted by law. NASA would be more completely neutral and disinterested than any other entity.

Furthermore:

- while time is important, it is more important to pioneer in domestic space within the framework of sound policy;
- the time delay consideration may very well decrease with NASA's expertise and already planned ATS/E, F, G satellites;
- commercial and operational feasibility tests could be conducted by NASA in cooperation with its partners;
- private interests are apparently willing and able to commit the necessary resources to an experimental program with NASA;

- whatever public funds were in fact used, which were not to be used in the suggested alternative, would be for the long term national interest;
- and experience teaches one never to prejudge the wisdom of Congress.

To quote again from the Task Force Report V-30; paragraph one:

"We think it important that a pilot program be designed to ensure that no participant obtains a preemptive position. Since there is little doubt that the pilot project will in fact have a shaping influence on the future regulatory pattern of the domestic satellite industry, the project should be designed to meet this concern."

The report continues with what appears to be a contradiction, (Ref. V-32-C), for under its six strict conditions it recommends "The space segment should be owned by COMSAT as trustee." Even allowing for the qualifying comments which follow, when the aforementioned references are read together they amount to a de facto permanent acceptance of COMSAT-Common Carrier control of the space segment.

No one single entity, other than the U.S. Government, should have a monopoly in domestic space; one of the country's most valuable natural resources.

Corporate entities other than common carriers must, in all fairness, be given an equal opportunity to develop this natural resource and become, under government control, proprietors of a segment of it, if they so desire.

Future events may demonstrate the feasibility of common carrier control of the space environment. The message here is: Don't accept as inevitable the status quo, for this is not progress.

Intelsat, COMSAT, and its relationship with Intelsat and the entire matter of global communications are subjects to which time and effort will be formally directed shortly. Assuming the continuance of COMSAT's position in global communications, and having a view toward the political ramifications involved, can it be said to be in the national interest to have COMSAT involved domestically in any way whatever?

To conclude: NASA should be given authority to mount and to control an experimental program in domestic distribution satellites. No practical problem exists which is incapable of being solved once NASA's position is agreed upon.

G. RECOMMENDATIONS:

a. NASA should develop its views and form a policy concerning domestic satellites. To the extent it is permitted to do so under the law, NASA should then make its views known as soon as possible

to the appropriate government agencies, and in particular to the much-harassed FCC, the Executive Branch and to the Congress.

b. Reference has been made to the willingness of several companies to contribute monetarily to an experimental satellite program conducted under the aegis of NASA. H.E.W. has also indicated its interest to join such a project either by way of a joint venture with NASA or with NASA and other groups. It must be emphasized, however, that the H.E.W. interest in instructional television for isolated communities and the National Library for Medicine program for medical information require satellite facilities that exceed those available in the design concepts of the pilot program advocated by COMSAT. It is strongly recommended these matters be pursued.

c. FCC and Congressional decisions may be delayed. NASA could make a contribution toward solving the problems of domestic space by again offering and encouraging the experimental use of the ATS satellites for the variety of purposes requested of the FCC. In any event, useful data would be acquired to assist the government in making its decisions and to enable the United States delegation to the ITV World Administrative Radio Conference for Space Telecommunications (to be held in late 1970 or early 1971) to speak with more authority concerning the highly complex matter of frequency allocations. This is recommended.

d. Previous comment has been made concerning the effect of new technology on new application. During the past several years, accelerated considerably by the growth of the CATV industry, there has been a similar increase in the development of exotic electronic hardware for use in the home as well as business. Harvard and Massachusetts Institute of Technology are experimenting in such areas as computer graphics and multiple access computers, the latter demonstrating, among other things, how the entire taxable population could file their income tax forms from the home with total accuracy. Other universities and private research laboratories are engaged in similar or related activity. What is now a laboratory level will largely determine the hardware and end-user demands of the future. Knowledge of new developments in terrestrial hardware might very well point the way to new uses for domestic satellites. As there is a coequal importance between research and application, this is a fertile field, ripe for further study. It is recommended this entire area be explored.

e. No person contacted in connection with this study discussed the possibility of using domestic satellites to help relieve the plight of our cities. America's number one problem cannot be solved without adequate communications. This is fundamental. One can visualize how a coordinated effort between the Office of Urban Affairs, the OEC and/or H.E.W. and an entity formed to develop a domestic communications satellite system

could encourage the creation of new cities in remote sections of the U.S.A. as well as the re-creation of rural America. What will the communications problems be in the city of the future...the megalopolis stretching from Boston to Washington? Is it possible that satellites will be used in the future to help rid our cities of air pollution, smog, etc.? This is a vast area and could form the basis for further study and it is so recommended and urged to be considered favorably.

###

H. The following list of persons/companies contacted is being submitted for reference only.

COMSAT:
Louis B. Early, Manager
Engineering Economy Department

Robert Button, Chief Executive Officer
and Special Assistant to the Chairman
of the Board

National Association of Educational Broadcasters:
William Harley, President

James Fellows, Assistant

(H.E.W.) National Library for Medicine:
Davis McCarn

FCC:
Bernard Strassburg, Head
Common Carrier Division

Columbia Broadcasting System, New York:
William B. Lodge, V.P., Affiliate
Relations and Networking

James D. Parker, Staff Consultant
Telecommunications

National Broadcasting Company, New York:
Alan Cooper, V.P., Planning

James Butler, Director, Planning

Donald Kivell, Manager
Facilities, Planning and Scheduling

John Weir, Manager
Televisions Operations

McCall Corporation, New York:
William L. Schubert
V.P., Director of Corporate Planning

Ford Foundation:
Fred Friendly, New York

David Ginsberg, Washington

U. S. Senate:
Nicholas Zapple,
Legislative Council, Commerce

General Electric:
Donald Atkinson

National Educational Television, New York:
Robert Hudson, Executive V.P.

*American Broadcasting Company:
Vernon Wilkinson

H.E.W.:
David Pollen
Deputy Associate Commissioner for Research
Office of Education

*McKenna and Wilkinson:
A Washington, D.C. communications law firm representing General Electric and the American Broadcasting Company

National Education Association:
Dr. Lewis R. Tamblyn

I. List of Reading and Reference Material (partial list)

Presidential Task Force Report

Edusat

STRIDE

ASCEND

COMPLAN STUDY

SPINDLETOP RESEARCH, 1966

SPACE APPLICATIONS, SUMMER STUDY 1967, Vol. 3 Part II

General Electric, Selected Studies

ABC - Hughes 1965 and related letters, documents

McCall Corporation proposal, July 1968

Northrop Page Task Force Study, July 1968

Ford Foundation Proposal, December 1966 and related letters, documents

Canadian Government White Paper on Satellites

NAEB assorted material

The OART/MAD Study on future communications requirements 1970/1980

The OMSF/ERC Study on requirements for Saturn V television payload

Staff working paper on Broadcasting

Communications Satellite Set of 1962 Report on the Committee on Interstate and Foreign Commerce

House Report No. 809, 88th Congress, 1st Session

November 12, 1968, letter to Bernard Strassburg from James McCormack, Chairman, COMSAT

Procurement Request: Applications Study for an Experimental S-V Television System

NASA, Moffett Field, California. Specification for Information Transfer Satellite

Requirement Study date November 25, 1968, Airborne Educational Television

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ROUTE SLIP

TO Mr. Clay T. Whitehead

Take necessary action	☐
Approval or signature	☐
Comment	☐
Prepare reply	☐
Discuss with me	☐
For your information	☐
See remarks below	☐

FROM Don Gessaman DEG DATE 3/7/69

REMARKS

Attached is my paper on regional satellites. While it is somewhat "skimpy" on analysis, I feel that "skimpy" analysis is better than none or one to support a predetermined position. If you think I'm on the right path and additional time is available, I will pursue the subject further.

REGIONAL SATELLITES

A discussion of regional satellites needs to begin with defining what a regional satellite is or could be. This requires identifying various types of communications satellite applications and classifying each. Satellites can provide communications services:

(1) within a particular nation

(2) among nations

These are normally referred to as domestic and international communications, respectively.

Domestic communications are fairly explicit -- within one nation's jurisdiction. International communications are a bit more complex. This could be between 2 nations, all nations, or some number in between. Intelsat was conceived as providing a medium for all nations to derive the benefits of satellite communications. The big benefit was seen as permitting direct communications between any two nations in the World. Many nations previously had direct communications through other techniques - transoceanic cable, terrestrial systems in the case of adjoining nations, and high frequency radio. The problem was that transoceanic cables connected only those points between which traffic volumes were dense -- Europe to U.S., Europe to Africa, U.S. to Pacific area, etc. To get to the cable required passing through the communications systems of several countries. Since the alternative in many cases was to not communicate, the countries through which the traffic passed tended to charge higher rates for this service to subsidize their domestic

communications operations. High frequency (HF) radio also tended to concentrate on the high density routes. While HF is relatively inexpensive, full time service cannot be guaranteed, nor can the availability of frequencies. By and large, both cables and HF radio connected the more developed nations. The lesser developed countries (LDC) of the World were connected to either their motherland if they were part of an empire or to the nearest developed nation. All LDC international communications therefore passed through the developed countries. While unreasonably expensive for many countries, changing the system would have been prohibitively expensive.

The advent of communications satellites offered a less expensive means of changing this system of communications at less cost than was previously possible. Any country within site of a satellite could talk directly to any other country which was also in view of the satellite provided each had the proper ground stations. This concept of direct links between nations was what got INTELSAT started. More than anyone else the LDC's gained through the move.

As satellite technology improved it became possible to put up satellites with more capacity without increasing the cost of the satellite in a linear manner. As the cost per channel decreased, satellites were then ready to compete with the high-traffic transoceanic cable links between the developed countries. This is where we are today. Satellite communications now offer two benefits: (1) direct communications and (2) more economical means of passing traffic over high density routes.

The next development in satellite communications will be low cost communications within a small land mass. This last phase could have significant impact on the first phase of satellite service - direct communications. The first phase enabled a few channels to be passed between many countries. The second phase permitted passing many channels between few countries, and the third phase will permit passing many channels within a single country.

The most important developments in the satellites have been in the power supplies and in the antennas. Particularly impressive have been antenna developments. The first satellites radiated in all directions -- thus much of their power was wasted in sending signals to places where there was no use. The next generation of satellites directed their signals toward the earth. This improved the level of signal received at the ground station but power still was wasted in that much of it was directed toward water. The latest satellites will point their signals at specific land masses. Intelsat IV, for example, will have three beams -- one pointed at Europe, one at the U.S., and the last toward the whole atlantic basin area. Thus, Intelsat IV will provide direct communications and high density route communications (Phase II). Both of these require large ground antennas. The high density routes need large stations because of the large number of channels being used. The LDC's need large stations because the signals they are using continue to be wasted to the extent the satellite transmits towards water as well as the ground station at the other end of the link.

The next step and the one which would be used in a domestic satellite system is where all the power of the satellite would be focused toward land masses. Such focusing will permit the size of the ground stations to be reduced and, therefore, the cost of the ground station. If only a few channels are needed the size of the antenna could be reduced from the 84 foot antennas currently in use to ones of 20-30 feet. Such a reduction probably would cause the cost of the station to decrease by a factor of 4 to 8. This type of reduction would permit 4 to 8 times as many ground stations for an equal investment. Three applications of such systems appear reasonable to assume. One is domestic communications another is regional systems, and the third is service to nations with low channel requirements.

Whether Intelsat should be considering the use of smaller ground stations is beyond the scope of this paper. Of interest here are the domestic and regional satellite systems and the principle issues are:

(1) Is there reason to differentiate between domestic and regional satellites and

(2) What alternative policies could be adopted by Intelsat concerning regional and/or domestic satellites?

(1) Differentiation between domestic and regional communications satellite services.

As stated earlier, domestic services are those performed within a nation. How a nation provides its own services are of little importance to others unless others are financing the system provided the internal

system does not interfere with others. The International Telecommunications Union was formed in order that standards could be established concerning interference. Nations appear to be cooperating to make certain their domestic systems are compatible in order to permit such things as international direct dialing. The major consideration, though, is to make certain that the systems don't interfere. This is controlled through frequency allocations and assignments. International cooperation is required in order that an equitable assignment of frequencies takes place. For satellites, one additional factor appears important -- orbital spacing.

While currently not too important, there are a limited number of "parking spaces" for satellites in a synchronous orbit. The number of available spaces is dependent on the frequencies used, the power, and the directivity of the radiations. Thus, how a nation designs and uses a domestic satellite can be of importance to others.

Anything that can be said of domestic satellites is applicable to regional satellites. Regional satellites, though, take on additional features. For one, a regional satellite, by nature, must be backed by some type of agreement among the participating nations. For another, a regional satellite would provide services that could be handled by an Intelsat satellite. The difference between the regional and Intelsat systems is that the regional system would be limited to a few users. There are several reasons why nations might want regional satellites or service. For some, a regional satellite might prove to be an inexpensive method

of improving communications among neighboring nations. Political factors might cause one to want to join all nations using a common language. Another might want to prove to the World that its technology is equal to that of others.

What is to be considered is how to continue Intelsat as a viable organization, if one wants to, but at the same time permit the members to carry out their national objectives as they see them. This requires balancing the national objectives of the members and the common objectives of Intelsat members. Both cannot be served to the maximum extent.

Since Intelsat is conceived as a not for profit, non-political commercial venture, it seems that the objective should be the provision of service to the member nations at a minimum of cost. It follows that a member should not engage in ventures which would go against this objective -- this could be a provision for membership. On the other hand should a member be required to use a system which is more costly to him than necessary to satisfy his needs? This is to say if a member can procure his needs from Intelsat at a cost of $2 million but if it put up his own satellite to be used in conjunction with the Intelsat satellite and save $.5 million in the process, should he be required to pay the premium rate for Intelsat service.

Intelsat rates are currently derived by adding the cost of the satellites and supporting investment and dividing this by the number of circuits expected to be in use. All rates are the same; it makes no

difference whether the Indian Ocean, Pacific Ocean or Atlantic Ocean satellite is used or the amount of traffic being passed through a particular satellite. Assuming that the investment in each satellite is the same regardless of location but that the Indian Ocean satellite passes only half as much traffic as the Atlantic Ocean satellite the cost of a circuit in the Indian Ocean satellite is the same as one in the Atlantic Ocean satellite. If each satellite were considered a cost center, the cost per channel in the Indian Ocean satellite would be twice that of the Atlantic Ocean satellite. Thus the users of only one of the satellites receive service at a premium or reduced rate depending on the point of view. This principle of average pricing is used in setting rates for domestic communications system in the U.S.

A regional or domestic satellite user would not face the averaging problem to the same degree as faced in the global satellite -- particularly if only one satellite were used. As an indication of this disparity the following data is presented. This data was developed between 6 and 12 months ago and reflect the charges for circuits from Comsat.

Estimated Revenue requirements assuming Intelsat IV launched in 1970
($ in millions)

	1970	1971	1972	1973
Atlantic Circuits	34.2	36.2	34.7	33.7
Other Circuits	42.8	46.3	46.2	43.7
Total	77.0	82.5	80.9	77.4

Estimated half-circuit demand

Atlantic Circuits	1521	1765	1999	2258
Other Circuits	955	1140	1300	1474
Total	2476	2905	3299	3732

Estimated charges to Comsat Customers ($ in thousands)

	1970	1971	1972	1973
1. Averaging	31.1	28.4	24.5	20.7
2. Actual cost				
Atlantic Circuits	22.4	20.5	17.4	14.9
Other Circuits	44.8	40.6	35.5	29.6

In this case the actual cost for Atlantic service on a per channel used basis runs about half as much as does service through the other satellites. Thus, nations might desire special satellites to serve their own needs at a lower cost than from Intelsat. To be considered, though, is that rates for the remaining Intelsat circuits would increase.

The more power that the member nations give Intelsat, the less they reserve for themselves. To see what this means, seven alternative arrangements for Intelsat with respect to regional satellites are considered. These alternatives are briefly described in the following paragraphs.

(1) Do nothing: In this alternative, Intelsat would consider anything but a global system outside its jurisdiction and consequently not be concerned with them. This carriesthe disadvantage that traffic on dense routes could be diverted from Intelsat which would result in the traffic remaining in Intelsat passed through the system at a higher per channel cost. Some economic advantage could accrue to the participants of such a system at the expense of those continuing to rely on Intelsat. However, economics could have little bearing on a members decision to invest.

The worst consequence would be the erosion of Intelsat to the point where the lesser developed countries (LDC's) were the major participants in the system.

(2) Coordinate: Under this alternative, Intelsat would perform no services but would coordinate the separate systems of the members. Intelsat would have no veto power but would work with the members to attempt to optimize the global and regional systems to provide the most services for the fewest dollars. In effect, this alternative is similar to the "do nothing" approach.

(3) Assistance: Intelsat would assist members, when requested, in designing, procuring, or launching satellites. This service would be at the users cost. Under this arrangement Intelsat could play an active role in developing regional systems, though, the global system still could be jeopardized.

(4) Veto Power: This alternative is "Coordinate" plus the power to veto a system if certain conditions are not met. What condition would cause veto would be subject to considerable discussion. At the least, the regional satellite would have to be shown as not hurting the members financially.

(5) Assistance and Veto: This alternative is a combination of providing assistance if requested and retaining the power to prohibit systems if certain conditions were not met. As in alternative (3), Intelsat would take an active interest in regional systems.

(6) Do Everything: Under this alternative Intelsat would provide any special communication satellite services desired. The members desiring such service would provide the Manager with his special needs (such as domestic TV broadcasting) above and beyond those being met by the global system. Separate accounting could be used to keep the costs of the special system from being included with the global system costs. The investment capital would have to be supplied to Intelsat prior to initiation of the project. Arrangements would have to be made as to whether the procurement would be left to the Manager's judgment or could be dictated by the user. This has the advantage that all international satellite communications could be optimized in an economic sense.

(7) No Regional Satellites: This alternative is similar to the "Do Everything" alternative except the member would have no say in the making of the system used to satisfy his needs.

The following matrix compares the above alternatives with respect to satisfying national vs. Intelsat goals.

Alternative:	Satisfaction of national goals	Satisfaction of Intelsat goals
(1) Do Nothing	Yes	No
(2) Coordinate	Yes	No
(3) Assist	Yes	No
(4) Veto	Maybe	Yes
(5) Assist and Veto	Maybe	Yes
(6) Do Everything	No	Yes
(7) No Regional Satellites	No	Yes

In evaluating the above alternatives, the following criteria were used:

(1) It is in Intelsat's best interest to make certain a proposed regional system will not steal business from the consortium and thereby penalize the other members.

(2) Anything which can reduce the cost of international satellite communications to some members without jeopardizing the interests of the other members is in Intelsat's interest.

(3) National interests can best be served by having no higher authority.

According to the criteria of satisfaction of national objectives versus satisfaction of Intelsat goals, alternatives four and five appear to be the best compromise positions. While neither set of goals could be optimized, neither would be completely sacrificed. It is worth considering that if Intelsat were to decide against regional satellites, groups of nations could get around this block by means other than satellites.

If the nations considered the value of a certain type of service to be greater than the cost of obtaining the service through Intelsat, they might be willing to pay a premium in order to serve some national purpose. For example, a transoceanic cable might be installed. While Intelsat would have little to say about a cable, the cable could have an effect similar to that of a satellite wholly outside Intelsat. Therefore, it would appear to be in Intelsat's best interest to not only be

concerned with regional satellites, but to take an aggressive approach to the subject. This leads to a proposed answer to the second question -- What alternative policies could be adopted by Intelsat concerning regional satellites? There appear to be two positions which could reasonably be adopted by Intelsat.

(1) Be granted the right to veto the regional satellite system plans of members if selected conditions are not met, or

(2) Have the same right stated in (1) but in addition provide assistance to members in establishing such systems.

In either alternative, the important factor is Intelsat's power to veto applications. As to which alternative is the better, a judgment has to be made as to whether Intelsat should be limited to judging regional plans or should be permitted to actively participate in the development of such systems.

To be considered is the future trend of satellite technology. In the next 10-15 years satellite-to-satellite relay might prove feasible. If regional systems and domestic systems develop, global communications could be provided by links between the regional and/or domestic satellites. The time delay problem, though, will have to be solved for voice communications.

It would appear to be in Intelsat's best interest to take the active role in regional satellites in order to protect its existence.

Domestic satellites appear to be somewhat different than regional satellites. The same alternatives that were considered for regional satellites can be considered for domestic satellites. The providing of domestic communications is not currently an objective of Intelsat. Intelsat, however, should be interested in domestic satellites in so far as frequencies and orbital spaces are concerned.

Alternative:	Satisfaction of national goals	Satisfaction of Intelsat goals
(1) Do Nothing	Yes	No
(2) Coordinate	Yes	Maybe
(3) Assist	Maybe	No
(4) Veto	No	Yes
(5) Assist and Veto	No	No
(6) Do Everything	No	No
(7) No domestic satellites	No	No

The above evaluation of alternatives is based on the following:

(1) Since the provision of domestic service is not an objective of Intelsat, providing such service or assistance to develop such capabilities do not further Intelsat goals.

(2) Intelsat should be concerned that domestic satellites don't use resources that will be needed for international communications.

(3) Turning control of internal communications over to an international entity is not in the best interest of nations.

The conclusion reached in this paper is that the Intelsat position on domestic satellites should be to coordinate the efforts in order that domestic satellites and Intelsat satellites will not interfere with each other.

Thus this paper has proposed that Intelsat should take different positions on domestic satellites than on regional satellites.

One satellite configuration which has not been considered is where one satellite is used for domestic communications in more than one country. If no traffic goes from one country to another, this system should be considered domestic. If any fraction of the traffic is between nations then the satellite should be considered regional.

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ROUTE SLIP

TO Mr. Clay T. Whitehead

- [ ] Take necessary action
- [ ] Approval or signature
- [ ] Comment
- [ ] Prepare reply
- [ ] Discuss with me
- [ ] For your information
- [ ] See remarks below

FROM Donald E. Gessaman DATE 3-6-69

REMARKS

Thought you might be interested in reading this. My paper on the same subject is being typed.

March 5, 1969
Walter Hinchman

Regional Satellites

The term "regional satellite" is subject to several different interpretations. In the strict technical sense, all satellites are "regional" in that they are visible to only a limited region of the earth's surface. Thus to some the existing INTELSAT system of global satellites is considered to be in fact three regional satellites, serving respectively, the Atlantic, Pacific, and Indian Ocean basins. Various suggestions have been made for restructuring INTELSAT ownership in accord with this particular concept of regional satellites.

A second interpretation of the term regional is that of a satellite serving the joint needs of a particular grouping of nations irrespective of their geographic positions. Thus, a satellite linking France with her former colonies and present associates in Africa and North/South America has been suggested as one possible "regional" satellite.

In the context of this paper, regional has yet another -- primarily technical and economic -- meaning. In short, a regional satellite as here defined is simply one which is optimally located and designed to provide primarily internal communication services from a single land mass -- or major segment thereof -- or an insular group. Thus, a satellite

serving solely U.S. domestic needs would be termed regional in this context, as would those serving U.S./Canada, or South America, or Europe, or other similar areas.

No one can forecast at this time what the "optimum" number, location, and characteristics of communication satellites will be -- or what variety of communications needs they will best serve. However, one can recognize certain fundamental technical, and economic considerations which are bound to affect rather strongly the natural development of satellite services, given a relatively objective policy and regulatory framework. The purpose of this paper is to set forth some of those considerations, in terms of the "regional" satellite concept noted above, in the hope that these may lead to informed -- and above all, flexible -- policy positions on the part of the U.S. in the present INTELSAT Conference. As a point of departure, it may be noted that the author does <u>not</u> consider prior U.S. approaches to the regional satellite question as either enlightened or likely to be productive.

It is frequently asserted that the cost of providing a communications circuit via satellite is independent of distance. This assertion has led some to believe that all satellites should serve as wide a geographic area as possible, namely, the

roughly 40% of the globe visible from a spot in the geostationary orbital belt. This belief may lead in turn to the further notion that all satellites must be "international" in the broadest possible sense, and therefore that any form of "satellite regionalism" is detrimental and to be resisted.

The facts regarding satellite communications are quite different from the above concept. While it is true that the cost per circuit is constant irrespective of distance within a particular satellite/earth station configuration, this cost can be drastically altered by the choice of configuration adopted. Specifically, a satellite employing very narrow antenna beams capable of concentrating the total satellite power -- and radio frequency bandwidth -- on a small geographic area can provide communication circuits at a small fraction of the unit cost of a global (i.e., earth-subtending) satellite system. This is so because the size and complexity of the earth station transmitting/receiving equipment (including antennas) needed to derive a specified number of circuits may be significantly reduced when working with such "spotlight" satellites.

Another assertion frequently voiced is that so-called "global" satellites will be capable of providing "regional" (i.e. land-mass) services more economically than the regional satellites described above because of their large "economies of scale." This argument again ignores several fundamental technical factors affecting

both the operational effectiveness, operating constraints, and cost-effectiveness of satellite communications:

1. Operational Effectiveness

A primary objective of global (i.e. transoceanic or intercontinental) satellites is to serve a large number of nations separated by large, oceanic reaches; thus, the optimum location for such satellites is above the mid-ocean areas, where they are visible to only a fraction of the total land mass of any continent. By contrast, to be operationally effective in serving the internal communication needs of a given land mass or segment thereof, satellites must be visible from any location within that mass. For example, since neither the Pacific nor Atlantic INTELSAT satellite is visible to more than 50% of either the U.S., Canada, or Mexico, the internal communications needs of North America could not be served effectively by these satellites. Conversely, a satellite which sought to serve the Asian land mass (e.g. USSR) most effectively would not be optimally situated for "international" traffic in the Indian Ocean area.

2. Operating Constraints

The necessity of using electromagnetic radiations (radio) as the mechanism for transferring messages imposes several operating constraints on communication satellites.

First, the large number of claimants for use of the radio spectrum has dictated that satellites be allocated only a finite amount of this valuable resource; this limits the total communications capacity which can be provided through a single satellite. Second, the existing spectrum allocations for communication satellites are shared with terrestrial radio relay services, due to this same problem of shortage; this creates the prospect of mutual interference between these services, which is more likely to occur when satellites are displaced significantly from the geographic area being served due to the lower elevation angles this entails. Third, radio waves of the frequency range currently allocated to satellites suffer differing degrees of spreading and absorption loss depending on the angle of arrival at (or departure from) the earth's surface; thus, signals from satellites situated at the same longitude as the geographic area being served suffer less loss than from those displaced in longitude.

The combined effect of the above constraints is that satellites situated near the same longitude as the geographic area being served can provide a given level of service at lower costs, and with less probability of mutual interference with terrestrial radio relay systems, than those removed in longitude. Furthermore, a many-satellite array occupying the geostationary

belt is inherently capable of providing much greater overall communications capacity from a given spectrum allocation than a few-satellite system, due to the multiplicative effect of spectrum re-use. This latter advantage may be further enhanced by the use of narrow-beam satellite antennas, which will permit a limited amount of multiple spectrum use from even a single orbital position. Since such narrow-beam antennas provide only regional coverage, the regional satellite concept is particularly germane to the question of effective spectrum use.

3. Cost-Effectiveness

In order to serve any communications need, satellites must be cost-competitive with the various terrestrial alternative communication modes. For global or transoceanic services, the primary alternative is the submarine cable, a facility with limited flexibility (e.g. no video or other wide-band capability) and fairly high cost. Thus, global satellites can afford to radiate their power inefficiently into the oceans in order to expand their coverage, while remaining cost-competitive with submarine cables.

For land-mass communications, satellites are faced with considerably more competitive terrestrial alternatives, including microwave radio relays, open-wire, coaxial cables, and

tropospheric scatter systems. This does not mean that satellites will necessarily be more costly than these terrestrial systems -- indeed various studies indicate they may be cost-competitive for some services within the highly-developed U.S. communications system, which should render them highly attractive in less-developed areas. However, it does mean that all the economies from limiting the satellite coverage, using the optimum geostationary orbit location, reducing the size and complexity of earth stations, etc., may be required.

Summary and Conclusions

The extensive deployment and use of "regional" (i.e. land-mass oriented, limited geographic coverage) satellites appears a most likely course of development for satellite communication services, for a variety of purely technical, operational, and economic reasons. Indeed, since most communications traffic tends to be within major land masses rather than between or among them, it is reasonable to expect that "regional" satellites will in the near future carry more traffic than so-called "global" satellites, given a receptive policy and regulatory environment. Global satellites will not be replaced nor made obsolete by regional satellites, but will serve a different (i.e. primarily transoceanic) market.

To the extent that INTELSAT either is or could be motivated to design, produce, and operate such regional satellites -- and to price their services according to individual or appropriately weighted costs -- economies could accrue to all users through common research, development, procurement, and operating activities. However, it must be recognized that neither the existing nor proposed INTELSAT arrangements provide an effective incentive for INTELSAT to engage in such activities. A basic principle embodied in these arrangements is that neither INTELSAT as an entity nor any of its members may derive a profit from the provision of satellite technology or services to other members. Thus, the entities which effectively control INTELSAT (e.g. COMSAT, and the European telecommunications ministries) have little reason, either collectively or individually, to develop such regional satellites within the INTELSAT framework. On the other hand, the provision of terrestrial technology and services is not so contrained by international agreement. Thus, there <u>is</u> an effective incentive to both U.S. and European interests to market terrestrial systems throughout the world, irrespective of their cost-effectiveness or viability vis-a-vis regional satellite systems. So long as this combination of satellite dis-incentives and terrestrial incentives prevails, continued uneconomic development of terrestrial facilities such as the

ITN microwave network in South America may be expected. The social and economic consequences of this situation in areas such as the U.S. or Europe is difficult to assess, given the highly developed terrestrial networks and many alternative technologies available in those areas. In developing areas of the world, it seems more apparent that economic and cultural development may be seriously hampered by a continuing lack of the effective, low-cost telecommunication services which regional satellites could provide.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF TELECOMMUNICATIONS MANAGEMENT
WASHINGTON, D.C. 20504

March 10, 1967

A Single Global System for Commercial Satellite Communications

I. Introduction:

The term "single global system" has been applied to commercial satellite communications with a variety of meaning and interpretations since it was first used in the INTELSAT Agreements of 1964. To some, this phrase implies any system of satellites under single management used exclusively for international communications; to others, a specific system design for exclusively international communications; and to still others, a specific system design for both domestic and international communications.

None of these concepts or definitions of a "single global system" seems to reflect the apparent intent of the Congress and Executive Branch to make satellite communications available to all nations, both large and small, to serve their vital communications requirements as expeditiously and economically as possible and to promote world peace and understanding through better communications. This paper will attempt to identify and define a "single global system" which does reflect this intent, and to contrast such a "single global system" with alternative "global systems" and with various possible "regional" or "domestic" satellite communication systems.

II. Congressional Statement of Policy and Purpose:

In Section 102 of the Communications Satellite Act of 1962, "Declaration of Policy and Purpose," the Congress established a number of objectives for "a commercial communications satellite system, as part of an improved global communications network," which:

". . . will be responsive to public needs and national objectives. . ."

". . . will serve the communication needs of the United States and other countries. . ."

". . . will contribute to world peace and understanding."

Furthermore, these 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."

The Congress further declared that "care and attention would be directed toward:"

> ". . . providing services to economically less developed countries and areas as well as those more highly developed. . ."
>
> ". . . efficient and economical use of the electromagnetic frequency spectrum."
>
> ". . . the reflection of the benefits of this new technology in both quality of services and charges for such services."

III. International (INTELSAT) Agreements of 1964

To further reinforce these objectives, the U. S. was an active promoter of the International Agreements of August 20, 1964, to which 56 nations have now adhered. The preamble to this agreement states, in part:

- -

> "Desiring to establish a single global commercial communications satellite system as part of an improved global communications network which will provide expanded telecommunications services to all areas of the world and which will contribute to world peace and understanding;"
>
> "Determined, to this end, to provide, through the most advanced technology available, for the benefit of all nations of the world, the most efficient and economical service possible consistent with the best and most equitable use of the radio spectrum;"

- -

IV. Priority of U. S. Effort:

- As outlined above, the U. S. policy clearly implies a focusing of effort in the international field, and in the early provision of satellite communications to serve less-developed areas of the world as well as those more highly developed.

- While domestic and regional satellite communications services are certainly not excluded under this policy, it seems clear that such services are not to compete with nor in any way hinder the development of the global communications system.

V. Potential Evolution of Satellite Communications:

A. International Communications

The present system of satellite communications is but a first, faltering, but essential step toward achieving the full potential to be derived from this new communications technology. It is specifically designed to link together, for the first time and via the most direct interconnections possible, all the major international communication centers of the world. This system began as a time-shared, two-party service, wherein only two stations could use the space segment at any given time to communicate with one another, other two-party connections being permitted at different times. This very simple approach was dictated initially by the novelty and uncertainty of application of this new technology. Both the technology and "applications awareness" of satellite communications is literally mushrooming, however, thus the second phase of system implementation is already under way. In this phase, several earth stations may simultaneously use the space segment for two-way communications with one another, using preassigned subchannels within the space segment. This will permit greater continuity of communications between those pairs of international stations which have sufficient mutual traffic to justify such service. However, some international stations, particularly in less developed areas of the world, may

not have enough communications traffic to specific other stations to justify full-time use of preassigned circuits to every other international station, even though its total international traffic requirement is adequate to justify the station cost. Thus, in the third phase of system implementation now being planned, demand-assigned satellite channels will be made available, for use by any pair of earth stations on-demand to establish a short-term link between them.

B. Domestic/Regional Communications

At one time, it might have been considered that phase 3 above represented the end of satellite system design, the only remaining effort being the addition of more satellites and more international earth stations to handle additional international traffic. It has become increasingly apparent, however, that satellite communications has great potential for other applications, such as domestic common carrier services, TV distribution, "regional" (as opposed to intercontinental) services, etc. To realize this potential, additional design, development, and implementation phases are called for; these may certainly be carried out in parallel with one another and with phases 2 and 3 indicated above. Some typical examples might be:

Phase 4: Develop a satellite system (or systems) for U. S. domestic common carrier services, including TV distribution.

Phase 5: Develop a satellite system for European regional common carrier services, including TV distribution.

Phase 6: Develop a satellite system for Canadian domestic applications.

Phase 7: Develop a satellite system for Japanese regional services.

Phase 8: Develop a satellite system for South American regional services.

Phase 9: Develop a satellite system for Southeast Asia regional services.

and so on, ad infinitum.

All these phases, and many more, are not only possible but indeed very probable in the evolution of satellite communications to serve the great variety of world communication needs which now exist or which will develop in the ensuing years. The important question is, how will these phases be planned, designed, financed, implemented, and coordinated so as to achieve the greatest benefits for each individual nation as well as for the community of nations from satellite communications? Let us examine some of the coordination required to achieve this objective.

VI. Coordination Required for Full Utilization of Satellite Communications Potential:

The planning and implementation of a satellite communication system must take into account a number of technical/operational/economic factors. For example, due to the long round-trip time delay involved between earth stations via a satellite relay, two-way voice telephony is highly unsatisfactory over more than a single satellite relay. Thus, a domestic or regional satellite system must either 1 provide international service as well through the same satellite or 2 through some form of satellite-satellite relay to an international satellite, or 3 all international traffic must be routed via separate surface communication facilities to reach a separate international earth station. The first alternative requires not only international coordination, but a willingness on the part of all international correspondents to build a special earth station which looks at the particular domestic/regional system proposed. The second alternative requires international coordination prior to launch of either international or domestic/regional satellites, plus added cost in the international satellite which must be shared by all its users, and added cost in the domestic/regional satellite as well. The third alternative requires no coordination, but results in heavy economic penalties via indirect routing, particularly in less developed areas of the world. These economic penalties are borne not only by the regional/domestic system users, but are reflected in the costs to all international users who communicate with that region!

Other aspects of system planning which require extensive international coordination include:

Orbital Parking Space and Electromagnetic Spectrum:

Orbital parking space for satellites, as well as the electromagnetic spectrum, are finite international resources which can be utilized with varying degrees of effectiveness by different system designs, or "wasted" and "polluted" by poor designs. To some extent, the electromagnetic spectrum is already subject to international regulation and coordination. It is clear that the international interest will in the future dictate even greater regulation of this vital resource, as well as the equally vital resource of orbital parking space. Coordination of the use of these for domestic/regional purposes will definitely be required. If each nation in the world should demand an equal share of these resources, as seems their right, it would be technically impossible for any nation to place a satellite in orbit without interfering with another's orbit and spectrum space! On the other hand, if major nations (such as the U.S., etc.) begin independent large-scale exploration of these resources, the U.N. may clearly decide to intervene and take complete control of these resources, and perhaps of satellite communications entirely.

Spare or Emergency Space Segments:

Any communication system obviously requires spare facilities to maintain continuity of service in the event of catastrophic failure of any element of the system. In satellite communications, due to the long delay in scheduling launch service and achieving orbit and position, this implies the existence of spare space segments in orbit. These spares, unless and until required, represent virtually a total loss to the system although there is, of course, the possibility of some use for overflow or infrequent service requirements. Clearly, if many satellites are in orbit, serving many diverse needs, a spare for each system represents a rather significant waste in investment. Through prior coordination and planning, a single (in the early system stages) spare properly spaced in a profuse system should be capable of providing backup for any failure, at major reduction in waste investment plus the added reliability of service thus provided.

Progressive Implementation of New Service and Design Changes:

Satellite communication technology needs to be and could be in an almost explosive state of development. In nine years we have progressed from the first demonstration of satellite communications

to a relatively simple straight three relay providing only 240 voice channels between only two stations at a time. Much more could have been done much sooner. The coming generation of stationary satellites with broader band relays, capable of 1,200 equivalent voice channels, will provide continuous service at costs which should within a few years be below the cost of equivalent surface or subsea communications over long distances. New development technology now exists, although not yet incorporated in systems, which can provide multiple antenna beams, higher power capacity, etc., to provide even greater channel capacity, lower cost stations, which will provide further cost reductions. Clearly, such technological possibilities create serious problems in system implementation and make important the utmost possible expediting of research and development. In order to begin providing service as expeditiously as possible, it is necessary to begin to implement systems which may well be technologically obsolescent before they are even in operation, and almost certainly before they can be fully amortized! This requires a most careful balancing of investment and system implementation, based on the best possible projections of technology, and further requires a built-in flexibility, particularly in the ground environment, which will allow the newer technology to be readily assimilated without either undue cost or delay. This is a serious enough problem when there is one agency (INTELSAT) coordinating the phasing plan; if multiplied severalfold, by the political and financial vagaries and national interests of a number of nations the problem gets out of hand and incompatibilities between independent regional or domestic systems seem inevitable.

These are only a few of the coordination problems associated with the development and implementation of regional and domestic satellite communications systems on a large scale. The following questions outline additional problems:

What should be the size of a regional communications system? Who should be included or excluded in a given area? Based on whose judgment? Should there be a continuation of colonially-oriented systems which exclude next-door neighbors? How shall rates and routing be established? By whom? What is a domestic system? Does it include only a single nation, or would adjoining nations with common interests and existing telecommunications interconnects be included (e.g., U.S./Canada, Intra-Europe, etc.)? Again, decided by whom? etc. etc.

Perhaps the most fundamental question of all is this:

Considering that communication satellites are so completely and irrevocably international in nature (e.g., use of international resources, virtually unavoidable coverage beyond national borders, requiring extensive international coordination of all aspects of design and operation, etc.) is there any justification for so-called "domestic" or "regional" systems, particularly with regard to the space segment? The answer, it would seem, must clearly be NO.

VII. Description and Justification of a Single Global System

As used in this paper, a "single global system" of satellite communications 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 without discrimination.

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 optimized for specific intended application, as determined jointly by the Consortium and prospective users, Consortium having final authority.

The key factor in this concept of a single global system is the completely international, joint operation of the space segment of all commercial satellite communications as a cost-shared service available to all nations. The actual use of these space segments for domestic and international communications is left to the discretion of each individual nation or group of nations. This is in keeping with the U.S. position of providing the benefits of space and of space technology to all nations on a non-discriminatory basis. It is also in keeping with its position of non-involvement with other nations' internal affairs. Of equal importance, however, it assures that no nation may exploit or control another nation through control of its communications links, either internal or international. At the same time, it can provide for the development and implementation of the most economical services of all types for all users, through the provision of a common management, design, and financing organization for all members. And finally, it can assure the most efficient utilization of frequency spectrum and orbital space, which are inherently international resources of great value for present and future generations.

VIII. Discussion of Alternatives to the Single Global System

These are some of the characteristics of the single global system, as envisioned here. To fully appreciate these, it is necessary to consider the alternatives to such a single global system. Basically, these are:

1. Independent domestic satellite systems, tied together via a patchwork arrangement of "international" satellites or necessarily by cables if two satellite hops would be involved.

2. Independent domestic satellite systems, tied together by a combination of international satellites and cables.

3. A series of regional/domestic systems on an area basis, interconnected for intercontinental purposes by a series of individual patching interconnections or a separate intercontinental system. Again such patching would have to be done by cable (for telephone use) if more than one satellite hop were required by the design of the over-all system.

4. A series of hegemonies, each comprised of one or more "dominant" nations to which a number of smaller, widely dispersed "satellite" nations are linked; inter-hegemony interconnections again by cables or by another satellite system if systems design permits one-hop operation.

Each of these alternatives unfortunately contains a number of serious flaws. For example:

Alternative 1

a. With the exception of the United States no nation individually can viably afford even a single satellite at the present time for purely domestic purposes.

b. Since orbital space and frequency spectrum are finite international resources, any sub-optimum use or pollution of these by one nation is a detriment to all nations.

c. Two-hop circuits (e.g. via separate domestic and international satellites) provide very poor two-way voice communications quality due to excessive time delay, and should be avoided whenever possible.

Additionally, the cost of such circuits must obviously be much greater than for one-hop circuits, probably at least double because twice the capital investment and operating costs are involved.

d. Any via-point routing is inherently more costly than direct routing and should be avoided if possible. This applies equally to long terrestrial links to satellite earth stations or to multi-hop satellite circuits.

e. This alternative provides no assurance that a given nation may have access to any other nation without multiplying costs (or even regardless of cost) since no provision is made for full, worldwide interconnection nor for compatibility among various systems.

Alternative 2

Essentially all the above comments apply with the possible exception of "e."

Alternative 3

All comments of 1 and 2 apply for intercontinental traffic, though regional international traffic could presumably be adequately provided via a common satellite. Politically, the difficulties involved in organizing small contiguous groups of nations for joint programs such as this could be far more difficult than through a single global organization. Economically, even regional groupings in many areas of the world could probably not afford both a regional satellite system and access to a separate global system, particularly considering the added design and development costs of such a special purpose regional system.

Alternative 4

This is very probably the only alternative which would actually be considered in lieu of the single global system due to economic factors. It is typified by the present international communication systems based on cable and HF radio technology. A review of these systems should thus provide an insight into the performance and the unsatisfactory nature of such a satellite communication system.

There are currently four major hegemonies which handle the bulk of international communications (as well as much of the domestic communications). These are headed by Britain, France, Japan, and the United States. Besides the obvious fragmentation of areas with common interests and goals by these hegemonies, there is the added separation within a given hegemony whereby a nation may be forced to communicate with even its next door neighbor via a remote point located in the dominant member of the hegemony. Typical inequities in this via-point traffic routing, which result in greatly increased cost (even tribute in some cases) and low-quality communications include:

-- U.S. to 27 nations via London

-- U.S. to 23 nations via Paris

-- Tunisia to Libya -- via both London and Paris in series

-- Colombia to Venezuela via New York

-- Guatemala to Colombia via both Miami and New York

-- Bangkok to U.S. via Tokyo

-- Saigon to U.S. via Paris

Of all foreign nations or areas considered as being reachable by U.S. telephone service, calls to 61 percent are routed via some other nation. For smaller nations, this number is generally close to 100 percent. Such routing, with all its inequities and higher costs, could be expected to continue if satellite system hegemonies replace present hegemonies. Additionally, the quality of service can be expected to remain at a low level due to the necessity of using multiple-hop and/or excessively indirect routing.

IX. Summary and Definitions

It seems clear that a "single global system" as described in Section V. is absolutely essential if we are to accomplish the objectives set forth by the Congress and the Executive Branch for a worldwide system of satellite communications to serve the needs of all nations. Any alternative system or systems poses serious economic, routing, operational, and technical penalties on the use of this great fallout of man's efforts to conquer space as a means to conquer himself.

Accordingly, the following definition of a Single Global System is proposed for U.S. adoption:

The Single Global System:

a. Consists of a number of jointly owned space segments and nationally owned earth stations to serve the commercial satellite communications needs (both domestic and international) of all nations of the world.

b. Comprises a variety of space segment/earth station designs, as required to serve the various needs for domestic, regional, and intercontinental satellite communications.

c. Is managed by a single international consortium of nations, to which admission is accessible to all on a non-discriminatory basis and in which all have representation.

d. Provides cost sharing space segment services as required to meet the individual or common needs of nations.

e. Assures compatibility among both components and major segments of the system, to assure most economic, direct routing of international traffic.

f. Involves no preferential or discriminatory allocation of traffic among nations.

Regional Subsystem of the Single Global System:

Is part of the ownership, plan, or policy of INTELSAT;

Is under the central space segment managership of INTELSAT;

Involves no preferential or discriminatory allocation of traffic;

Provides domestic, regional, and international interconnections as directly and economically as possible;

Utilizes basic specifications and standards prescribed for the INTELSAT System; with special alterations as to capacity, antenna patterns, geographic coverage, etc., as required.

As to traffic requirements and growth to regional needs (but not for indirect routing) the vote of the regional members is controlling unless there are major conflicting factors with other INTELSAT programs or requirements.

Decisions as to the place of manufacture of domestic and regional satellites should be the prerogative of the nations for which the service is intended. Additional or excessive costs involved (over and above comparable satellite costs) should be incorporated in the per channel cost of service borne by the domestic or regional users, or levied upon them.

As a contrast, one might consider the characteristics of a separate regional system, as proposed by some highly nationalistic interests:

Separate Regional System:

A system which serves a particular group of nations normally, but not necessarily, closely associated geographically. The characteristics of such a system are separate ownership (as compared to INTELSAT), separate management, separate policy consideration as to:

a. Membership - Determined by dominant nation, probably on political basis (a la European Common Market.)

b. Admission - Ditto.

c. Ownership and Financing - By dominant member.

d. Technical characteristics.

e. Compatibility with other systems.

f. Conservation of spectrum and orbital space.

g. Rates, charges, and divisions of tolls or profits.

h. Requirements for transit fees.

i. Preferential traffic segregation into this system vis-a-vis the INTELSAT system. (Exclusivity of use)

IS THIS THE TYPE OF SYSTEM WHICH BEST FULFILLS THE U.S. DECLARATIONS OF POLICY AND INTENT REGARDING SATELLITE COMMUNICATIONS?

Meetings re Telecommunications

Tuesday, April 8

11:00 a.m. — Ted Westfall, Exec. V.P., ITT
Joseph Gancie, V.P., ITT World Communications
John Ryan, Deputy Director, ITT Washington Relations

Wednesday, April 9

2:00 p.m. — Ed Crosland, V.P., Federal Relations, AT&T
Ben Oliver, V.P., Government Operations, Washington

3:00 p.m. — Joseph A. Beirne, President,
Communications Workers of America
Louis Knecht, Assistant to the President
John Morgan, Administrative Assistant

4:00 p.m. — Vincent Wasilewski, President, National
Association of Broadcasters
Grover Cobb, Chairman of the Board

Monday, April 14

11:30 a.m. — Howard Hawkins, President
RCA Global Communications
Leonard Tuft, V.P., Washington

3:30 p.m. — General James McCormack, Chairman, COMSAT
Joseph Charyk, President

4:30 p.m. — Clifford Gorsuch, Regional Director National
Association of Broadcast Employees & Technicians
J. F. Donley, Regional V.P. of the Union (Nat. Bdcstg. Co.)
Albert Recht, V.P. of local union (Am. Bdcstg. Co.)

Wednesday, April 16

2:00 p.m. — Al Hardy, Director of Radio, TV & Recording Div.,
International Brotherhood of Electrical Workers
Lawrence Rimshaw, Bus. Mgr. for Local Union 1200

Friday, April 18

9:30 a.m. Earl Hilburn, V. P. and Spec. Asst. to the President, Western Union Telegraph Co.
Richard Callaghan, V. P., Congressional Liaison

Tuesday, April 22

11:30 a.m. Don Rodgers, Mgr., Missile and Space Field Operation, General Electric Company
Don Atkinson, Mgr., Aerospace Market Development

Wednesday, April 23

4:00 p.m. James Karayn, Washington Bureau Chief
National Educational Television

Friday, April 25

11:45 a.m. McGeorge Bundy, President
Ford Foundation

Tuesday, April 29

3:30 p.m. Robert King, IBM, Government Relations Consultant
Fred Warden, Communications Policy Directorate

Wednesday, April 30

10:00 a.m. Henry Catucci, V. P., Western Union International, Inc.
R. E. Conn, Senior Vice President, Law and Administration
Tom S. Greenish, Executive Vice President

Friday, May 2

11:00 a.m. Dr. A. D. Wheelon, Vice President, Engineering, Hughes Aircraft

Thursday, May 8

4:30 p.m. Richard Gifford, General Manager (Communications Products, Dept., General Electric Company, Lynchburg, Va

Tuesday, May 27

10:30 a.m. Fred W. Morris, Jr., President, Tele-Sciences Corp.

Wednesday, June 11

4:00 p.m. Frederick W. Ford, President
National Cable Television Association, Incorporated

Telecommunications

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WASHINGTON

3/5

Bill Duke called;

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Copy for Mr. Whitehead

domestic satellite

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WASHINGTON, D. C. 20008

ABBOTT WASHBURN

CALLE RIO SENA NO. 63-A
MEXICO 5, D. F., MEXICO
PHONE: 14-55-21

February 26, 1969

Dear Martin,

Thanks for your kind note in response to mine of January 31.

Earlier this month Bob Ellsworth asked me if I would help on the INTELSAT Conference, which opened this week. I am a member of the U. S. delegation and doing my best to monitor this complicated affair, working on a day-to-day basis with Tom Whitehead of Bob's office.

Since domestic satellites are up for discussion at the Conference, the outcome will have an influence on the ultimate decision and timing vis-a-vis a U. S. domestic satellite.

With all best wishes,

Sincerely,

Abbott

Abbott Washburn

Professor Martin Anderson
Special Assistant to the President
The White House
Washington, D. C. 20500

THE WHITE HOUSE

WASHINGTON

February 19, 1969

Mr. Abbott Washburn
Washburn, Stringer Associates, Inc.
4622 Broad Branch Road, N. W.
Washington, D. C. 20008

Dear Abbott:

Thank you for your letter of January 31 in regard to the domestic satellite project. I have sent a copy of your correspondence to Robert Ellsworth, who is working in this area. I am sure it will receive very careful consideration.

Sincerely,

Martin Anderson

Martin Anderson
Special Assistant to
the President

COMSAT

COMMUNICATIONS SATELLITE CORPORATION

ROBERT E BUTTON
The Special Assistant to the Chairman

February 19, 1969

The Honorable Thomas Whitehead
Staff Assistant to the President
The White House
Washington, D.C. 20500

Dear Tom:

I enclose a briefing note on one of the subjects of our discussion at lunch today.

Sincerely,

atc.

February 19, 1969

Pending release, publication, or other action on the final report of the President's Task Force on Communications Policy, the matter of the domestic pilot model satellite system could be moved to an action phase independently of the report.

The domestic satellite system was the most generally accepted chapter of the report. The expressed intention was to start it up in experimental form under a trusteeship managed by COMSAT but with all ultimate ownership questions held in abeyance.

The Federal Communications Commission was ready to proceed before the Task Force came into existence. The creation of the Task Force caused the Commission to sit back and await Administration policy guidance.

Should the new Administration indicate to the chairman of the Commission that it has no basic objection to setting the domestic system in motion under the restraints and qualifications already understood by all parties, the Commission is believed to be ready to go ahead with its authorization within three weeks of being so advised.

On the other hand, the Senate Committee on Commerce is considering questions for hearings in its proper sphere for this spring, one of which will be on why the domestic pilot system has not yet been authorized, particularly in the light of the considerable activity on this subject in other countries, such as Canada and the USSR.

Although there will be energetic debate over ownership of ground environment and access to the pilot system, the "trustee" concept justifies going ahead with the planning of the system with the participation of all concerned.

From our point of view the go-ahead would be appropriate at any date subsequent to the end of the first four-week session of the Intelsat Conference.

July 11, 1968

Domestic Satellite Paper

Robert Mr. Lowe

Robert Starr
Communications Task Force Staff

As I explained to you by telephone and as Oscar Gray has indicated in conversations with you, I have reservations about the domestic satellite proposal of the central staff. Along with those reservations, I would like to advance an alternative proposal.

You will recall DOT's position during Task Force consideration of the original paper on the domestic pilot. We urged that the pilot be put up by NASA and operated as an extension of the ATS series. I would like to urge again the appeal of that approach. And, looking beyond the pilot, I would like to suggest that this approach affords us an opportunity to make longer range recommendations affecting domestic satellite communications. I am simply suggesting that the space segment, and the space segment alone, of the domestic system be retained in public ownership on a permanent basis.

If one is prepared to conceive of the communications satellite as merely a functional extension of spectrum capability over distances unattainable through terrestial facilities, then one can examine the possibility of allocating and managing that resource in much the same way that the spectrum itself is to be allocated and managed.

In this way, the scalar trunking and resource allocation economies inherent in high capacity satellites could be enjoyed, while the system is utilized by any number and variety of operating entities from the ground. Just as spectrum is used simultaneously by a variety of users; commercial and non-commercial, common carrier and non-common carrier, experimental and operational; the domestic space segment could retain this flexibility if it is owned by the government and the privilege of access to it regulated by the government.

On the face of it, this proposal may seem inconsistent with established traditions of private ownership of commercial communications systems. It may seem strikingly similar to the position of some opponents of the Satellite Act of 1962. But, I submit that is not the case. Senator Kefauver, for example, proposed exclusive govenment ownership

and operation of satellite communications systems including ground stations. My proposal is far less radical than that. It is no more radical, in fact, than providing facilities by the government for operation of commercial and non-commercial, common carrier and non-common carrier, and any variety of other vehicles upon our public highways.

This approach affords the opportunity to derive far greater dividends from the pilot program and retain the important option of flexibility of policy affecting industry structure in the future.

There are inconsistencies imposed upon the pilot as you envision it. You wish it to yield valuable scientific and operational experimental data. On the other hand you want it to be a commercial success. These goals are difficult if not impossible to reconcile when imposed upon COMSAT, a single commercial entity, whether as trustee or upon a more permanent basis.

There are proven aspects of this communications mode which offer promise of immediate commercial success. As your paper recognizes, commercial television networking and high density telephone trunking can be afforded without further experimentation and each will most certainly pay their own way.

But, there are other exciting operational opportunities, worthy subjects of experimental trial, which can only tax and most likely would destroy the profit potential of a single commercial entity operating the entire system. The obvious example is public television networking. When we speculate about affording these stations free communications, what is it they will receive free? Are we speaking merely of the opportunity costs for access to the space segment or do we expect to burden the profit opportunity of the commercial entrepreneur by requiring it to provide terminal facilities free as well? The paper is not clear on this point. But, I suspect the educational stations will be expected to defray all or a substantial portion of the cost of terminal facilities dedicated to their use.

Why not divorce this aspect of the domestic satellite from commercial endeavors? Simply permit educational and instructional television (and perhaps later, the institutional operator of a "network for knowledge") free access to specified channel capacities in the space segment. Then challenge them to develop their own terrestial systems serving stations, cable systems, schools, libraries, hospitals, special seminars, and perhaps homes with signals broadcast direct from the satellite to terminals wholly apart from the commercial communications system.

Another exciting opportunity for domestic satellite service is found in the non-contiguous areas of this nation; Alaska, Hawaii, Puerto Rico, and the Virgin Islands. Your paper recognizes this opportunity and suggests that service to these areas be considered in the design of the pilot. However, the realization of this opportunity in a place like Alaska, for example, much like the provision of free service to educational station, can only be achieved by COMSAT at the expense of profit opportunity from the more lucrative portions of the system. Indeed, COMSAT in its proposal for a pilot program pending at FCC specifically excluded Alaska.

Yet, in terms of operational experimentation, Alaska affords more exciting and various systems opportunities than any other state in the nation. The existing communications facility in Alaska affords a physical model of communications in lesser developed countries generally. Due to population distribution, alien terrain and climate conditions, vast distances between communications points, and economic restraints, existing terrestial transmission links are sketchy and primitive. There is no real-time television networking capacility. The state is largely isolated from the communications heart beat of the nation.

Instead of merely suggesting a study of the inclusion of Alaska in the pilot, why don't we strongly recommend that this opportunity be afforded Alaska as a condition of the pilot? If COMSAT is required to do so, economic penalty will surely dilute the commercial attractiveness of the entire project. But, why can't we look upon Alaska as special case and look upon her as a worthy subject for government subsidy. Such a program could be undertaken if we removed the institutional inflexibility posed by a pilot operated by COMSAT alone. Like the educational stations, specified channels in a government owned satellite could be allocated to Alaskan communications service, apart from channels allocated to commercial services in the 48 states offering high promise for profit.

I will not burden you by suggestion of a detailed institutional structure to accomplish the Alaskan objective. Perhaps TVA might offer an analogy. By the same token, I am not suggesting that commercial carriers be forced out of the Alaskan market. Their operations can be accommodated in an institutional environment dependent upon federal subsidy just as exists in the domestic electric power market structure today, and to some extent in telephony.

A program for Alaska would provide two substantial benefits. It would afford that state a much needed communications capability and it would serve as a proving ground to develop communications systems which could be adapted to LDC's around the world who are without any existing terrestial system.

In summary, it is my belief that no pilot program or future mature system which is dominated by a single commercial entity can afford us the flexibility in use of satellite technology which the American public deserves. The satellite can be the instrument which affords us a new and unique opportunity for competition in commercial communications. But what is more, it can afford us the flexibility to accommodate a variety of uses including many which are not likely to be commercially attractive for years to come. Yet, in my view, we cannot retain that flexibility if we are prepared to grant the space segment to a single non-government entity, whether it be COMSAT as temporary trustee or AT&T as ultimate owner-operator in fee simple absolute.

On the other hand, that flexibility can be retained if the Federal Government reserves ownership and control of the space segment along with the valuable frequencies it consumes, and permits all worthy candidates in the future whether commercial or non-commercial, common carrier or non-common carrier, access to specific channels in the space segment.

Original signed by
Robert M. Lowe

DOMSAT 6/67 — 7/30/69

CHECKED FOR PERTINENT PAPERS ✓

NOTES WRITTEN ✓

COPIES XEROXED FOR CTW ✓

Thursday 7/31/69

2:50 In answer to questions from the following people, we advised that we do not know which agencies will be represented at the domestic satellites conference:

Katherine Johnson, Aviation Week Magazine 737-6630

Tom Malia 347-2654

FCC

Org.

July 22, 1969

To: Chairman Hyde

From: Tom Whitehead

Attached is the draft I mentioned.

When you have read it, please give me a call. We want to get it out today.

Attachment

July 22, 1969

MEMORANDUM FOR

Mr. Rosel Hyde
Chairman
Federal Communications Commission

In our review of the telecommunications problems facing the Nation and their implications for Government policy, we have found ~~that~~ the provisions for introducing communications satellites into U. S. domestic communications to be especially important.

Communications satellite technology has dramatically altered the shape of international communications. However, precisely because the United States enjoys such a sophisticated and effective network of telecommunications services the optimum use and corresponding benefits to the Nation of satellites in domestic communications may be quite different than is the case internationally. Furthermore, the policies we adopt here will inevitably set a precedent for how we are to encourage the benefits of rapid technological change without counterproductive disruption.

To assist the Administration in further reviewing this area, we are establishing a small working group and invite the FCC to participate in any way you deem appropriate. Our objective will be to formulate within about sixty days whatever Administration suggestions or comments may be appropriate. We will be concerned, of course, with the general structure and direction of the industry and not with specific applications pending before the Commission.

Clay T. Whitehead
Staff Assistant

cc: Mr. Flanigan
Central Files

CTWhitehead:ed

OPTIONAL FORM NO. 10
5010-103

UNITED STATES GOVERNMENT

Memorandum

cy sent back to Dr. Lyons

TO : Dr. C. T. Whitehead DATE: 30 July 1969

FROM : IOP/PA - William N. Lyons L

SUBJECT: Attached

As requested

N.B. Eva - I may well have to sit in review on any Agency reply that is made to this, so either Xerox it or send it back when CTW is finished.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF TELECOMMUNICATIONS MANAGEMENT
WASHINGTON, D.C. 20504

OFFICE OF THE DIRECTOR

IOP/P
IBS has action: to be cleared by IOP. per BMW 7/8/69

July 22, 1969

Memorandum for: Members, Panel 1
Ad Hoc IntraGovernmental Communications
Satellite Policy Coordination Committee

This Office is concerned about views, voiced recently in Congressional hearings on the gaps that are reputed to exist in U. S. policy on direct broadcasting. Consider, for example, the following quotations from Hearings of the House Subcommittee on National Security and Scientific Developments, May 13-22, 1969, Clement J. Zablocki, Chairman:

From the "Analysis & Findings," page 3R:

"Although the United States has much at stake in the international political decisions which soon may be made regarding satellite broadcasting, the subcommittee found an appalling lack of Government policy.

"To date, U. S. policymakers have chosen to temporize on the issues involved in satellite broadcasting. Emphasis has been placed on the far-off nature of the technology. When problems have arisen they have been handled on a case-by-case basis."

"The lack of policy guidelines was nowhere more clear than in the arrangement made between the United States Government and the Government of India to allow the latter to use an ATS-F satellite, scheduled for launching in 1972, as the basis of an instructional television system..."

From page 33, Mr. Zablocki:

"I am wondering why India was selected, over an area of our own country. Alaska would be more in NASA's area and would not bring the international aspect into the NASA operations."

"Let me restate the question."
"According to my knowledge, there is no well-defined U. S. Government space broadcasting policy. Nothing is very clear, even during the hearings here today, as to the policy of the United States in the area of satellite broadcasting..."

From page 118

Mr. Zablocki: "Mr. Secretary (Mr. De Palma, State Department) in what areas do you think further study in depth must be undertaken by the State Department, or as Mr. Marks has suggested, by an interdepartmental task force, before we can arrive at some U. S. policy, and have some instructions for the U. S. delegation at the U. N. meeting in July?

"After all, it is just a little over two months before the meeting will be held. If there is an absence of policy, a policy vacuum, how effective will our delegation be at the ITU? That is the question that comes to my mind.

Additional examples in the same vein could be cited from these hearings.

It is clear that there is need for development and dissemination of comprehensive U. S. policy regarding satellite broadcasting. Some of the elements of such a policy have already been established by the action of government agencies. How can the policy gaps be closed and how should these policies be promulgated?

First, it should be noted that this Office has, among other things, responsibility to "...advise and assist the President in connection with ...provisions of (the Satellite) Act" and to "...Coordinate the activities of governmental agencies...so as to insure...compliance...with policies set forth in the Act..." (E. O. 11191). Other responsibilities are set forth in E. O. 10995.

We would like to offer our good offices to develop answers to the questions cited above. Panel 1 of the Ad Hoc IntraGovernmental Communications Satellite Policy Coordination Committee appears to be a good forum in which to discuss these questions. Therefore, we

propose that this Panel be reconvened for the purpose of arriving at a consensus on what U. S. policy should be regarding broadcasting satellites.

We would welcome your agreement to a panel meeting on these questions. I would suggest initially that we address the following questions and issues:

1. What priority should be attached to the various satellite broadcasting services in comparison with the other needs of developed and developing nations?

2. How does satellite broadcasting rank in comparison with alternate means of supplying these services in other countries both in an economic sense and in terms of its effectiveness?

3. What is the priority or ranking of various regions or countries for initial broadcast satellite systems?

4. What changes in the Communications Satellite Act of 1962 might be necessary or desirable to permit or encourage these systems?

5. What changes might be necessary or desirable in the Radio Regulations regarding frequency allocations, definition of services, interference avoidance criteria and procedures, etc.

6. What should be the views of the U. S. regarding control of programming, unwanted reception of "foreign" broadcasts, and jamming? How can these concerns be resolved?

7. How should such systems be coordinated and regulated to prevent harmful interference, the proliferation of systems and harm to other space efforts such as INTELSAT?

8. Should aid be given to countries desiring such systems? How would such aid be provided?

9. What is the technological state-of-the-art for "community" and "direct" broadcast systems?

10. What additional questions should be considered by Panel 1 in the hope of arriving at elements of an agreed U. S. policy on broadcast satellites?

An early meeting appears most desirable. An initial response to question 10 above would also be welcome.

In cases where previous Panel 1 members have left their respective agencies, this memorandum is being directed to the head of those agencies with a request that it be directed to an appropriate staff member.

J. D. O'Connell

Distribution:
OST - Dr. Lee A. DuBridge
NSC - Dr. Henry A. Kissinger
USIA - Mr. Frank J. Shakespeare
NASA - Dr. Willis Shapley
NASC - Mr. Roman V. Mrozinski
State - Mr. Frank E. Loy
OASD - General Harold Grant
Justice - Mr. Don Baker
FCC - Mr. Bernard Strassburg
GSA - Mr. Marvin H. Morse
FAA - Mr. John H. Shaffer

POST OFFICE DEPARTMENT
OFFICE OF THE GENERAL COUNSEL
WASHINGTON, D.C. 20260

July 30, 1969

Dr. Clay P. Whitehead
Staff Assistant
The White House
Washington, D. C. 20500

Attention: Mr. Richard Gabel
Room 110
Executive Office Building

Re: FCC Docket 16495, Establishment of Domestic Non-Common Carrier Communication-Satellite Facilities by Non-Governmental Entities.

Dear Dr. Whitehead:

I am enclosing three copies of a pleading filed on behalf of the Postmaster General in the above-entitled proceeding. As is evident from the enclosed pleading, the Postmaster General is a vitally interested government party. We hope you will furnish us copies of any further formal or informal communications submitted to the FCC in this proceeding.

Sincerely yours,

Thomas F. Meagher, Jr.

Thomas F. Meagher, Jr.
Assistant General Counsel, Transportation

Enclosures (3)

POST OFFICE DEPARTMENT
OFFICE OF THE GENERAL COUNSEL
WASHINGTON, D.C. 20260

May 15, 1969

Re: FCC Docket No. 16495

TO ALL PARTIES:

Enclosed are the comments of the Postmaster General in the above proceeding. It will be appreciated if each party will serve two copies of any subsequent filings in this proceeding upon the undersigned at Room 4226, Post Office Department, Washington, D.C. 20260.

Thomas F. Meagher, Jr.

Thomas F. Meagher, Jr.
Assistant General Counsel, Transportation

BEFORE THE

FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, D.C. 20554

In the Matter of Establishment of Domestic Non-Common Carrier Communication-Satellite Facilities by non-governmental Entities	))))	Docket No. 16495

COMMENTS OF THE
POSTMASTER GENERAL

By Order of the Federal Communications Commission, adopted February 29, 1969 and released March 3, 1969, interested parties were accorded the opportunity to file comments not later than April 14, 1969, on material filed by the General Electric Company dated February 19, 1969. The Postmaster General, through counsel, requested an extension of time to submit appropriate comment and the Commission granted an extension by letter dated April 28, 1969.

The Postmaster General, through his undersigned counsel, hereby submits the following comments:

Acknowledging the intitial application of American Broadcasting Companies, Inc., for a satellite authorization in the Auxiliary Radio Broadcast Services for television broadcast distribution purposes, the Federal Communications Commission's intervening Notices of Inquiry, the comments of interested parties in response thereto, and particularly the comments of General Electric Company under date of February 19, 1969, the Postmaster General considers it appropriate to address his remarks to the policy decisions currently before the Federal Communication

Commission, involving potential electronic transmission of domestic communications material presently carried in the U.S. Mail. While it does not appear that such transmission inherently precludes other systems from being advanced, the theory of "Telemail" is of major concern to the Post Office Department in the concept proposed by General Electric Company.

Telemail would initially handle business-to-business transactions but would have the potential, as suggested by General Electric, of reaching many more users than the current Telex, TWX, and Private Wire Systems. As envisioned by General Electric, increased economies developed over the ensuing years would produce a cost and ultilization factor which would have a noticeable effect upon the U.S. Mail. While the Telemail concept appears, under its proposed description, not to come within the classification of transportation of letters for others over post routes, as set forth in Section 901, Title 39 U.S. Code, and as defined in Part 152, Title 39 Code of Federal Regulations, a determination in this regard can not be made until such a concept has become a practical reality and the specifics of its mechanics have been authorized and developed for use.

General Electric suggests that:

> "In the relatively distant future it is likely that a substantial portion of first class and air mail can be handled electronically. It is, however, immediately apparent that transmission of a significant portion of all mail by electronic means would necessarily entail the availability of an exceedingly large number of subscriber terminals at individual homes, offices, etc.

> Nevertheless, there are certain types of communication now handled by mail which would be suceptible in the immediate future to electronic transmission. 1/

General Electric further suggests that one such communication segment is that of business-to-business mail representing 26% of all mail, and that, of this percentage, 76% is first class or air mail, citing the statistics contained in the reports of the President's Commission on Postal Organization, June 1968, Annex II.

In this connection the Cost Ascertainment Report of the United States Post Office Department for Fiscal Year 1968 2/ shows that there were 78.713 billion pieces of domestic mail handled during the fiscal year of which 43.183 billion or approximately 54% constituted first class mail and 1.949 billion pieces or approximately 2.5% constituted domestic airmail. This report further reflects that the average weight of both the domestic first class and domestic airmail was .7 of an ounce per piece, indicating that the average piece of this class mail, be it letter or post card, would be of the relatively short message category coming within the contemplated "Three pages, 600 word" record message transmission service proposed by General Electric. 3/ Conceivably, then, upon ultimate refinement of the concept, all letter mail, or approximately 56.8% of all mail pieces, could be supplanted by a tele-mail system.

- -

1/ Additional comments of the General Electric Company in Docket No. 16495, dated February 19, 1969, pp. 16, 17.

2/ Dated March 9, 1969, p. 20, Exh. III, Summary: Mails and Services... Total and Average Revenues, Pieces, Weights and Transactions

3/ General Electric additional comments, p. 23.

Such a dramatic diversion admittedly may not be attained in the reasonably near future. Nonetheless, such a diversion represents approximately 55% of revenues realized from domestic mail.

Such competitive indications underscore the vital interest the Post Office Department has in any technological advances in electronic communications. Moreover, the Department has, as always, a continuing interest in improving the transmission of business and personal communications. As recently as March 27, 1969, the Post Office Department announced the inception of a study to develop operating procedures and cost data concerning a combination telegram-letter, whereby the telegram-letter would be routed through the telegraph system to a receiving machine in a post office and delivered to the addressee by regular mail service.

Under these circumstances, therefore, the Postmaster General requests that the Federal Communications Commission consider the potential impact its decision may have upon the Postal system and fashion its decision in such a way that the Post Office Department is neither precluded at some future date from acquiring its own electronic communication system, or restricted to dealing with a sole licensee, in the event that the Department decides to operate an electronic postal service system.

Respectfully submitted,

(Signed) David A. Nelson
David A. Nelson
General Counsel

(Signed) Thomas F. Meagher, Jr.
Thomas F. Meagher, Jr.
Assistant General Counsel
Transportation

(Signed) Robert A. Scherr
Robert A. Scherr
Deputy Assistant General Counsel
Transportation

For the General Counsel.

Filed: MAY 15 1969

CERTIFICATE OF SERVICE

I hereby certify that a copy of these Comments have been filed upon the interested parties or their counsel this date.

(Signed) Robert A. Scherr
Robert A. Scherr

Dated: MAY 15 1969

MEMORANDUM

THE WHITE HOUSE

WASHINGTON

Exports

Need for comm carrier reg.
Unique satellite uses (incl. UHF)
New " technology (multi-beam, etc.)

Ownership

Authorized users / access
Consortium vs. individual owners of pieces
Single vs. multiple systems; multi vs spec purpose
Modal competition
Precedent + looking in vs. pre reign

Management

Broad vs. narrow mgt + representation
Advisory committee — FCC chair? EB participation
Relative roles:
govt; adv cttee; equity interests; users
Extent of outside "second-guessing"

Urgency / need

Freq congestion / re-use

congestion vs. regulation
single test for interference

Competition

Protection from loss?
" "uneconomic" systems?
{ Administered tfr splitting
Require Comm Carrier use?

Comments on FCC Paper

Pg 4 - ~~Trigger~~ International -- understated

Pg 5 - #11 -- timing / urgency

Pg 5 -- merger

Pg 6 -- above 10 GHz

Pg 7 -- gut issue, single mgmt vs participation

Pg 7 -- conservatism on experiments

Pg 8 -- " " authorized user

Pg 10 -- single multi-purpose system / protection from economic loss or ~~real~~ interference

Pg 11 -- gut issue again.

Pg 12 -- selection of Comsat as manager owner of space segment and TT&C
Carriers in gnd station w auto Comsat
Others in special facilities

Pg 13 -- Rule out others - (wrong)

Pg 13 --- Urgency again

Pg 14 -- Advisory committee and structure

Pg 15 -- Planning coordinator

Pg 16 -- modest progress on authorized user

Pg 17 -- PTV subsidy

Pg 17 -- waffle on direct access

Pg 17-18 -- waffle on people's dividend

Pg 19-20 -- spectrum conservatism

Pg 21 -- #~~4~~ won't accept results

Pg 22 -- nation-wide test

Pg 23 -- direct access waffled

Pg 23-24 -- efficiency criteria on multi-beam; also defer in/b if needed

Pg 27 -- 3 year period of operation perhaps too long -- alternate of 2 years

Pg 28 -- timing problem

Pg 28 -- FCC Chairmanship is pretty fouled up.
No exec branch (e.g. NASA)

Pg 29 -- Comsat coordinates relationship to advisory committee

Gut Issues

1. Single management with narrow participation vs. broad participation (Pg 7, 10, 11
2. Spectrum congestion problem
3. One satellite system vs two or more in demonstration stage
4. Comsat vs other managers (e.g. NASA)
5. Ownership of pieces
6. Advisory committee vs. equity interests vs joint ventures
7. Free access (??)
8. Duration of demonstration phase. (??)
9. People's Dividend (??)

Criteria

1. What proposal gives the maximum opportunity for experimentation?

2. Which proposal allows normal economic forces (the market) to determine the outcome as opposed to administrative second guessing?

3. Which proposal least prejudges the long range institutional arrangements?

4. Which proposal best illuminates the question of whether domestic satellites should be a common carrier function or a open system (i.e. monopoly vs competition)?

5. ~~Which~~ Assuming ~~some~~ the demonstration phase, which proposal provides the most workable solution in the real world?

6. What is the best way or achievable way to settle the technical arguments, particularly with respect to spectrum use and congestion?

MEMORANDUM

THE WHITE HOUSE

WASHINGTON

Proceed

FCC prop order
Out of date filings
Whether WH intervenes

FCC system

asserts a priori comm carrier regl auth

Issues

comm carrier or free access; antitrust.
freq compat regl or civil compensation
single system vs spec purpose
apportn
exacerbates modal compet betw ATT & Comsat
flag-waving & urgency.

MEMORANDUM

THE WHITE HOUSE

WASHINGTON

~~Use~~

Use

Useful expectations—

Constructive instl competition

Speed

→ Exp w/ learning; incentives

Relatively unconstrained mgt.

Relative freedom from regulation

~~Economic viability~~

Non-predatory competition

protect from loss from uneconomic USG set demands

ALTERNATIVES FOR INTERIM POLICY ON DOMESTIC COMMUNICATION SATELLITES

There are wide-ranging alternatives which are possible as an interim policy for the domestic communication satellite program. Five of these alternatives are outlined below. It should be apparent that the separate features of these alternatives can be ~~permitted in~~ combined into different arrangements. However, each alternative is intended to reflect its own internal coherence, varying from a virtual free market possibility to a full regulated monopoly approach at the other extreme.

Alternative 1: Free Entry for All

(a) Organization. Free entry and defined ownership rights subject to technical restraints. Competitive or complementary satellite operation on non-predatory basis.

(b) Technical. Uncertainties with regard to spectrum and space slots to be resolved by privately financed experiments with responsibility for avoiding harmful interference on the operating entity. FCC radio licensing.

(c) Participation. Open to any user or carrier who foresees economic application and agrees to stand financial risk.

(d) Public Role. FCC continues authority over frequency licensing. NASA to provide technical advice.

(e) Plan Tenure. Indefinite. No need for pilot. Market forces would evolve permanent assignment.

Alternative 2: Pilot Free for All

(a) Organization. Free entry and defined ownership rights subject to NASA-FCC coordination for technical compatibility. Either multi-purpose, special purpose systems or both.

(b) Technical. Project proposers to have wide discretion on design subject only to NASA technical ~~revised~~ REVIEW and coordinated use. NASA to contribute through parallel technical efforts.

(c) Participation. Open as in alternative 1.

(d) Public Role. NASA to provide technical coordination role. FCC licensing and regulatory authority. Rate-making function governing carrier operations would recognize high risk features of undertaking.

(e) Plan Tenure. Set for fixed period. Thereafter, permanent arrangements to be determined.

Alternative 3: Controlled Multiple Project Pilot

(a) Organization. ~~(~~Free~~)~~ entry by potential users and suppliers ~~under COMSAT coordination~~ selected by FCC/DTM to offer largest potential for learning & use. Design and ownership of satellite and earth stations the responsibility of experimenters. Multiple-purpose and special purpose systems permitted.

(b) Technical. Coordination by ~~Comsat~~ FCC/DTM with NASA providing assistance upon request. FCC licensing authority.

(c) Participation. Open to all subject to ~~Comsat coordinating role.~~ & FCC/DTM determination of usefulness. spectrum/orbit capacity

(d) Public Role. FCC over spectrum assignment, and common carriers regulation. NASA provides assistance in ensuring technical coordination.

(e) Plan Tenure. A demonstration program with ultimate ownership rights to be determined thereafter.

Alternative 4: Single Pilot Project (FCC Staff Proposal)

(a) Organization. A two-stage approach. First, development of technical-operational plan; ownership arrangements deferred to second stage but not made permanent until pilot completion. Comsat to be system coordinator responsible to an advisory committee composed of major suppliers, operators and users. Committee chaired by FCC commissioner.

(b) Technical. Determined through advisory committee, ~~though Commissioner favors~~ within single multiple purpose system constraints.

(c) Participation. Nominally open to all users and operators.

(d) Public Role. FCC aegis through chairmanship of advisory group. Standard licensing and regulatory functions. NASA for advice.

(e) Plan Tenure. To be a demonstration project of predetermined duration with property rights established thereafter with permanent working arrangement on conclusion of the pilot.

Alternative 5: Direct Common Carrier Regulation

(a) Organization. Single monopoly carrier to be identified and asked to proceed with own program.

(b) Technical. A multi-purpose system with proven, off-the-shelf technology.

(c) Participation. All users desiring service would obtain through carrier and have no further operating participation.

(d) Public Role. Conventional regulatory over-view and frequency assignment by the FCC.

(e) Plan Tenure. Chosen carriers would continue indefinitely unless incapability demonstrated by future operation.

Evaluation of Alternatives

Assessment of these five alternate plans depends on what we seek to achieve out of a pilot domestic communications satellite program. Fortunately, this is reasonable concensus on objectives so that we can reasonably construe the proximity with which the alternatives meet these objectives. On this basis, alternative two is deemed the best course of action. The detailed evaluation follows. The caption headings are an abbreviated statement of goals.

1. Maximum Information. The program should provide the maximum of information concerning the technical, operating and economic aspects of satellite communications. The first and second alternatives clearly surpass the remaining three in this regard. Comsat has shown markedly little initiative in seeking new technical or operating systems. Coordination under that leadership would tend to freeze structural arrangements and minimize the foundation for learning. We could anticipate a tightly structured, relatively unimaginative program under common carrier auspices.

2. Effects on Innovation. In theory, the first plan offers the widest scope for innovation. Practically, its effectiveness is restrained by the dominance of existing (loadline) carriers which could discourage experimentation in the newer, high risk operating techniques. This restraint on the part of private initiative should be removed with

the infusion of moderate governmental power exercised through NASA, per alternative no. 2. Conversely, substantially reduced innovative effort would be anticipated under the regulated monopoly approach of alternative no. 5. It is difficult to envision novel direction in technical areas under alternative no. 4 with design by committee. While ~~nominal~~ freedom to innovate is available under the third plan, ~~Comsat acting as system coordinator, will be motivated by short-term profit considerations and will tend to trod established paths.~~ high risk projects would inevitably be expected to be at a disadvantage.

3. Least Delay. The regulated common carrier approach, the fifth alternative, would probably get under way most rapidly if it survived the political and industrial criticism which would accompany its selection. The recognized technical competence of NASA would permit early implementation under the second alternative. The free market alternative (no. 1) would provide similar latitude to a user, but without the same level of technical assistance afforded by NASA's background. Alternative 4, requiring advisory committee concensus, would invite greatest delay, while the third plan, ~~under Comsat management~~ could possibly move as rapidly as the second.

4. Public vs. Vested Interests. We should avoid the type of problems which have arisen in the Intelsat Consortium where commercial interests have restricted the full exploitation of technology to the detriment of other private benefits and public usage. This objective is more likely to be achieved under competitive market operation than through quasi-monopoly, regulated carrier leadership. The first two alternatives are common in respect to the relative freedom of market opportunities. The second is somewhat more advantageous in that it benefits from NASA technical coordination and advice. Third alternative less advantageous, but decidedly more so than fourth or fifth.

5. Ownership Options. We should attempt to keep all ownership options - including possible public ownership of some domestic satellite system - wide open. Despite endless rhetorical assurance that a trusteeship arrangement does not bind future commitments, the inference is clear that a trustee assignment will cement the carriers position as future operator. If we justify Comsat's role as trustee for domestic satellite service on the basis of "previous experience", ~~how much more difficult will~~ a reversal of this view will be much more difficult with additional background as domestic operator. The latter ~~three~~ two alternatives are faulty on this objective at the outset by naming the permanent carrier initially. Under the first alternative, potential users without the technical competence to design a satellite might easily reach for the existing common carriers for advice - again biasing future judgements as to a permanent operating role. Plans 1 and 2 are equally advantageous; plan 3 is only slightly less so.

6. Encourage Experimentation - Permit Assessment. While we want to encourage experimentation, we need to establish an arrangement whereby appropriate assessment of the results can be undertaken. While both Alternatives 1 and 2 can be equally favorable to experimental effort, the role proposed for NASA under the second plan ~~positions that organization for~~ allows continuous monitoring and evaluation of the technical and operating limitations and advantages of the experimental efforts. The third ~~and fourth~~ alternatives would ~~be conducted under Comsat coordination. In its role as a common carrier,~~ be expected to have a smaller range of coordination. In the fourth plan, Comsat would tend to promote established technology and operating methods by seeking an expanded common carrier position, and would certainly preclude wholly independent evaluation of its efforts. The fifth alternative paves the way for either Comsat or AT&T as the established common

carriers. A monopoly ~~Neither~~ organization, ~~once having collected all the marbles,~~ would not be inclined to undertake the extensive risks of high capital investment to demonstrate potential benefits from, as-yet, unproven technology.

7. Advanced Technology. We want the most advanced technology to be exploited with assurance that any technical compromise is consistent with the public interest. There can be significant efforts at experimentation (goal no. 6) without necessary resort to technological advance. (i.e., use of different operating plans for video dissemination while employing classic FM-TDM techniques) The first two alternatives are most likely to exploit more advanced technical methods if only for their reduced dependence on established common carriers. Theoretically, users could resort to advanced suppliers such as TRW and Hughes for advice under any of the alternative plans. In practice, the manufacturers would be far more diffident in response with the foreknowledge that coordination must be effected through Comsat than if ~~a commercially neuter body such as~~ NASA was performing this function. In point, this weakness is also contained in the first alternative to whatever extent users fall back on the established common carrier industry for guidance.

8. Risks on the Private Sector. Public financing has made satellite communications as a technology and as a service physically possible. The future offers many attractive commercial opportunities in the exploitation and development of domestic satellite communications. The rewards may be extensive. The risks of development, which may be equally large, should be borne at this stage by private enterprise.

which each one inflicts on the other. The test will not demonstrate the design and cost advantages of specialized satellite systems.

3. The draft Order points out that multiple systems will duplicate the space segments and back-up facilities; tracking, telemetry, control facilities and earth stations. Control terminals may be used in common for two or more satellites, provided there is compatability of design and frequency assignment. Whatever cost redundancy is introduced through multiple satellite may be offset by economies of specialized function in satellite and ground station design. These economies are not ascertainable in the absence of operating experience. So long as "major potential suppliers of satellite services are willing to make the necessary investment" (FCC Order, p. 5) there would not appear to be reason for the government to foster a monopoly supply arrangement in domestic satellite services.

4. It is difficult to see how the creation of the Advisory Committee will advance the technical questions which confront the FCC. The Order acknowledges that the question of ownership must await formulation of a detailed operating plan. Presumably, the Commission is seeking a concensus of views from the Committee which would compromise the separate conflicts of the opposing supplier-user interests. It would be wholly coincidental if such compromise solution approximated a best public interest solution. Neither the FCC Commissioner, who would preside over the Advisory Commission, nor COMSAT acting in its coordinating capacity, has sufficiently clear ground rules to permit effective decision making.

5. We have had relatively unsatisfactory experiences with Bodies similar to the proposed Advisory Committee. Decisions are evoked from the 63-Nation Intelsat Corsortium by means of weighted voting. The Quasi-public directorate of the Comsat Corporation always seems to reach qualified decisions and is noticeably loth to pursue aggressive functions in behalf of satellite transmission services before the regulatory commission. We should not be seeking a private arm to render decisions of major public consequence.

6. Satellite technology is still in the incipient stage. There is immense future development that may be forthcoming if we establish a regulatory environment to ensure its development. The Domestic Satellite decision is the beginning of public policy making which will determine this environment. It is prudent to insist on institutional arrangements which will promote growth, stimulate research and developmental effort. A monopoly form of organization is least likely to provide this stimulus.

The Commission may view the creation of the Advisory Committee a necessary forum for airing of the issues. It is recommended that the guidelines to the Commission be modified to incorporate a multiple satellite approach in lieu of a single multiple purpose system.

Friday 7/25/69

5:35 Per Mr. Whitehead's request, called Chairman Hyde (at home) and told him that "we have authorized our Press Office to give out copies of our letter to them on the domestic satellite study. It would ease things a lot if they would also make it available to the press."

Mr. Hyde then talked with Tom.

OPEN ENTRY IN DOMESTIC SATELLITE

A. The FCC proposal leaves as much room for competition and open entry as is presently feasible for an initial system.

1. The earth station environment is open to all applicants including:

   a. Existing general or specialized common carriers.

   b. New general or specialized common carriers.

   c. Individual users or groups of users.

   d. ComSat, possibly.

2. Authorized users -- Direct access to the space segment is not limited to common carriers.

   a. Broadcast interests are assured of direct access now.

   b. Commission will entertain requests for direct access by others.

3. Space segment ownership and management is limited.

   a. Only one manager of the space segment is practicable for operational efficiency.

   b. Space segment ownership will include ComSat.

   c. Others may be added after consideration of technical plan and proposed services.

4. Number of systems --

   a. Desirable for initial program to start with one system.

      (i) Necessary now to use 4 and 6 GHz bands where equipment has been commercially developed, as use of other frequencies would entail delay for development of equipment and an international agreement on new spectrum allocations.

      (ii) Only one system appears practicable in the 4 and 6 GHz bands because of limited frequencies and the difficulties in coordinating with heavy terrestrial use.

b. If only one initial system is technically feasible in the 4 and 6 GHz bands, it should be multipurpose to provide as many services to as many users as possible.

c. Assuming more than one system is technically feasible in the 4 and 6 GHz bands, authorization of a specialized broadcaster system now would probably postpone a multi-purpose system for some time as a matter of economics.

(i) ComSat claims that the bulk volume of broadcast program distribution would be initially essential to a multi-purpose system until other uses developed, and that it would not undertake to proceed without broadcast traffic.

d. ~~Multiple~~ Specialized systems are not foreclosed for definitive arrangements, or even during the initial program if it should appear appropriate once the initial multi-purpose system is underway.

(i) The Commission has expressly not foreclosed a separate postal satellite system at any time.

(ii) Unique specialized systems such as an aeronautical system could be authorized at any time.

(iii) As many definitive systems of any kind could be authorized as may appear feasible and desirable, under the circumstances then prevailing. In other words, future open entry is not precluded.

(iv) The Commission would consider authorization of additional systems even during the initial period, if this appeared technically and economically feasible without undue prejudice to the initial multi-purpose system or otherwise desirable in the public interest.

II. Exclusion of ComSat now would have undesirable consequences.

A. Authorization now of a specialized system (e.g., broadcaster) excluding ComSat would cause a donnybrook.

1. Congress would, we believe, be forced to intervene as a result of charges by ComSat, etc.

2. A legislative resolution would take several years, and might not result in open entry.

3. After enactment, a substantial additional time would be required to achieve an operational system.

B. Delay would be undesirable.

1. The United States would lag behind other nations, perhaps to its prejudice.

2. All interested persons urging prompt action now.

3. Eager response to NASA's offer of use of its ATS satellites.

a. The proposals made are not technical experiments, but rather seek to achieve early inauguration of some operational services, e.g.:

(i) Educational interconnection

(ii) Radio network interconnection

(iii) Live news service to Alaska

b. NASA's experimental satellites (designed to push the state of the art) are not adequate for operational services, and the appropriateness of NASA's involvement in operational services on a regular basis may be questionable.

c. Use of NASA facilities to achieve some operations at an early date, would entail a large investment by ETV interests in additional earth station facilities for minimal service in comparison to what could be achieved from an initial multipurpose system where earth station costs would be shared.

4. Even if some service to some entities could be provided via NASA facilities, service desired by others now should not be delayed for an indefinite period.

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON

OFFICE OF
THE CHAIRMAN

July 24, 1969

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

Dear Dr. Whitehead:

This is in reply to your memorandum dated July 22, 1969, noting the importance of the domestic satellite field and the establishment of a small working group to assist the Administration in reviewing the area with the objective of formulating within about sixty days whatever Administration suggestions or comments may be appropriate.

We fully agree on the importance of the domestic satellite issue. As you are aware, this field has been the subject of a lengthy Commission proceeding (F.C.C. Docket No. 16495) and has also been studied extensively by the Executive (e.g., Report of the President's Task Force on Telecommunications). We believe that for a number of significant reasons, it is vital to proceed without further undue delay in the formulation of national policy in this area. At the same time we would, of course, welcome any further exchange of views or comments which the Executive might wish to make in this new field.

Your memorandum of July 22, 1969 indicates that we are in full agreement on both these objectives--a decision without further undue delay, and, at the same time, a full exchange of views so as to assure

a result most benefitting the public interest--and that the objectives are not inconsistent, but rather can and must be achieved. We look forward to the continuation of our important and useful liaison to achieve the foregoing objectives.

Sincerely yours,

Rosel H. Hyde
Chairman

Dictated over the phone by Chairman Hyde's secretary -- 7/23/69

Dear Mr. Whitehead:

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Rosel H. Hyde
Chairman