23 Oct1969

REPORT OF THE ECONOMIC COMMITTEE ON DOMESTIC SATELLITES

Summary and Conclusions

The Committee found that initially the most promising and probably the first application of domestic satellites will be in the provision of broadcast distribution. Very likely, data exchanged along the lines of the GE proposal may be profitable. Point to point trunking of telephone messages seems to be somewhat less promising.

Satellite systems are expensive. A dedicated television system might cost $80 million for the space segment alone. General purpose common carrier systems might be even more expensive. Under existing technology and for any given use, we would expect some but not great economies of scale as the capacity of the system increased. In any case, economies of scale are not sufficiently great as to bar workable competition in this industry.

The Economic Committee considered two polar categories of possible policy option. The first termed "competitive entry" provides that any applicant's system would not be evaluated on the basis of either its economic viability or its economic impact on other satellite or terrestrial systems. However, the FCC would consider whether the

applicant had sufficient resources to carry forward its' proposed project. Moreover for some types of applicants, such as AT&T and any joint television network combine, special rules might be imposed to insure fair competition in the operation of satellite systems or in other sectors of the economy. The FCC would also insure that no one applicant was granted a predominant portion of the desirable orbital space.

The other category considered was that of a chosen instrument which could be either single ownership or a common user system. Clearly, any chosen instrument would have to offer common carrier services as well as any specialized service.

Each of these categories was evaluated on the basis of how well they satisfied five criteria for market organization. The first criterion was flexibility in providing alternative services desired by the public; competitive entry was judged to provide the greatest flexibility. On the criterion of efficiency, competitive entry was thought to be about as efficient as a chosen instrument. On thecriterion of providing low rates that are closely related to costs, competitive entry was likely, especially in the long run, to be most satisfactory. On the criterion of promoting innovation in satellite technology and uses, the competitive entry option was found to be the best. The

final criterion -- that of learning about costs and potential services -- would be most satisfactorily met by the competitive entry option.

The Committee found that the potential entrants in this industry are, Comsat, AT&T, one or a combination of the networks, and possibly GE. Since the number of potential entrants at this point in time is so small, the Committee believed that it would be undesirable to completely exclude any of these companies. Therefore the Committee felt that, if the competitive entry option is chosen, AT&T should be allowed to establish a system limited to serving public message telephone requirements. This restriction is necessary to reduce the possibility of cross subsidization that could lead to Bell domination of satellite communications. Bell, however, could lease circuits from other satellite operators for its specialized service offering. The subcommittee also felt that if a combination of networks were to enter the industry, a separately incorporated company should be formed to run and own the satellite system and service all users having similar television requirements on a non-discriminatory basis.

The Committee concluded that under the competitive entry option economic regulation should be the minimum required by law. Under

a chosen instrument, however, users of dedicated services should not be denied at least partial ownership of the ground stations serving them. Under the competitive entry option rates would be largely regulated by competitive forces. Terrestrial charges clearly set a maximum on rates. Thus under competitive entry the chief duty of the FCC would be to insure that the quoted rates are available to all on a non-discriminatory basis.

The FCC would of course have to allocate and license the use of spectrum. This would involve them in approving the location and characteristics of satellites as well as ground stations.

In any satellite system there are two problems of access that need consideration. First, the Committee concluded that non-discriminatory access to the system must be guaranteed to all users of a given class. Thus if the networks establish a satellite system, this must be available to new networks, CATV operators, independent broadcasters, and non-commercial television broadcasters on a non-discriminatory basis. Second there is the problem of interconnection between the ultimate users point of origin and the earth station.

This interconnection will in most cases be provided by the local communications utilities. It is important therefore to require utilities to furnish this interconnection and access to earth stations at reasonable non-discriminatory rates.

The Committee believed that since there was a number of unanswered questions in this area, whatever option is chosen should be considered to be on trial. At the end of the trial period, the results of the option chosen should be carefully evaluated in order to determine whether that option should be continued.

Under competitive entry both AT&T and Western Union terrestrial network can be affected. AT&T may lose its long distance carriage of network transmissions. Such a loss will be very minor in comparison to AT&T total revenues. Western Union on the other hand might in fact find that a specialized data exchange system would cut severely into its business. However, the Committee felt that the thrust of a market system is that companies that are insufficiently innovative may suffer. In other words, no carrier should be protected from competitive forces.

The Committee believed that any satellite system might lead to claims by terrestrial carriers that such a system was cream skimming.

Having looked over past claims of cream skimming and evaluated the arguments involved, the Committee concluded that if the satellites cut into a more profitable business by reducing rates, this was in the public interest and that the cream skimming argument should not be used to protect terrestrial carriers from the competition of satellite systems.

Any satellite system is likely to face some problem of interference with other satellite systems or terrestrial microwave facilities. Generally, the Committee believed that the burden of adjusting to potential interference should be placed on the new system and that the two parties involved should be encouraged to settle the problem through negotiations. However, if negotiations failed, and if the new company believed it has made an offer that would fully compensate the existing system, appeal to the FCC or to the courts should be possible.

The Committee concluded that a competitive entry option was feasible and likely to result in significant public benefits. With rules limiting AT&T, this option would be likely to result in increased competition in the communications industry bringing about greater innovation and lower costs.

10/23/69

FINAL DRAFT

TECHNICAL ASPECTS OF DOMESTIC SATELLITE COMMUNICATIONS

A Report by the

Technical Committee

of the

Domestic Satellite Working Group

CONTENTS

SUMMARY

PURPOSE OF REPORT

An Ad Hoc Working Group on Domestic Satellite Communications was established by the White House on August 5, 1969 to assist the staff in developing Administration views on the use of satellites for domestic communications. The Working Group formed two committees (economic and technical) to examine the issues involved is using satellite communications in the domestic scene. This report, prepared by the Technical Committee, treats some of the more important technical aspects of implementing satellite communications technology in the domestic telecommunications environment. Some of the reference material which provided the background for the Technical Committee is listed in Appendix Tab A.

The Technical Committee membership included: Chairman, Dr. Russell Drew, Office of Science and Technology; Colonel W. T. Olsson, (USAF) Office of Telecommunications Management; Dr. Richard Marsten, NASA; Mr. Richard Beam, Department of Transportation; Mr. Wilbur Serwat, Post Office Department; and Mr. Walter Hinchman, White House Staff. Mr. William Watkins, Federal Communications Commission participated in an ex officio capacity.

SUMMARY CONCLUSIONS

The principal conclusion reached by the committee is that technical considerations, though of great importance in the detailed engineering, operations and economics of particular systems, are not controlling with respect to basic policies governing the ownership or mode of operation (single or multi-purpose) of such systems. Specifically, the committee concludes that:

Multi-purpose vs. Single-purpose Systems

-- technically, there is little difference between multi-purpose and single-purpose operation of present day communication satellites; these are merely relay stations containing transponders designed for specific frequency bands, inherently capable of handling voice, data, or video signals with equal facility;

-- there are, however, technical differences in the design and operation of earth stations for multi-purpose and single-purpose operations; e.g., use of receive-only stations for program distribution vis-a-vis transmit/receive stations and greater time-sharing opportunities in multi-purpose systems;

-- these technical and operational differences lead to both economies of scale and offsetting economies of specialization; the committee has no adequate basis for determining which of these -- if either -- will dominate.

Within the presently allocated 4 and 6 GHz bands

-- available spectrum and orbital resources are adequate to accommodate several U. S. domestic satellites, which could, in turn, be part of one or several domestic satellite systems;

-- it should be technically feasible to site from one to several transmit/receive earth stations capable of working with these satellites in or near most urban centers; the exact number and location would be a subject for detailed engineering studies on a case-by-case basis;

-- it should be technically feasible to site a much larger number of receive-only stations in the same areas particularly if users of satellite distribution services were willing to accept a reduced quality of service relative to that identified as CCIR/CCITT relay quality.

Future Trends and Opportunities

-- Future growth in the demand for communication services via satellite (fixed, mobile or broadcast) are expected to create the need to accommodate additional satellites and associated earth station facilities in the U. S.

-- future technological developments should make possible more intensive use of existing spectrum allocations as well as the effective use of other frequency bands, to accommodate the growth in demand. For example, multiple antenna beams and greater effective radiated power from satellites, improved modulation techniques, more versatile earth stations, development of improved multiple-access techniques, etc. are foreseen.

-- it is technically feasible for future satellite systems to use certain other frequency bands not now available to such systems, on either a shared or exclusive basis. Plans for expansion of spectrum resources for satellite services are presently well advanced, and will be the subject of the Space World Administrative Radio Conference to be convened in mid-1971 under the auspices of the International Telecommunications Union.

-- the opportunity for continued exploitation of satellite communications technological innovations appears to be promising in light of the healthy programs pursued by Government and a wide spectrum of competing private industrial organizations.

OVERALL EVALUATION

Domestic communications satellite system(s) are technically feasible. The United States has the opportunity to exploit the demonstrated technical capability of satellite communications technology in providing useful applications in the domestic telecommunications environment. Such satellite system(s) -- which can be implemented to be compatible, interoperable and integrated, where appropriate, with the existing and projected national telecommunications complex -- should provide long-term benefits to private, public and Governmental users in both quality and economy of services.

There are, however, inherent technical risks in establishing satellite system(s) and uncertainty exists as to the extent of the specific benefits, accordingly, THE TECHNICAL COMMITTEE BELIEVES IT IS TECHNICALLY IMPERATIVE THAT THE UNITED STATES PURSUE A CAREFULLY PLANNED, ORGANIZED AND ENGINEERED EVOLUTIONAR PROGRAM FOR THE INTRODUCTION OF THIS NEW TECHNOLOGY INTO THE DOMESTIC TELECOMMUNICATIONS NETWORK.

II

INTRODUCTION

The United States possesses a highly developed and valuable telecommunications infrastructure which provides a wide diversity of telephone, telegraph, telex, television, radio, facsimile and data exchange services for the nations' private, public and Government uses. These services are provided through an intricate complex of private and Government-owned facilities and systems including; (a) radio and television broadcast stations and receiving sets; (b) an integrated public switched telephone network, including common carrier transmission systems (wire, cable and radio); (c) fixed radio networks; and (d) mobile radio networks (vehicular, aeronautical and maritime). For example, the United States has more than 110,000,000 telephones, 6,700 radio broadcast stations, _____mobile radio transmitters, 200,000,000 miles of voice equivalent circuits interconnecting vertually every town and city, and 3,893 local and toll switching centers in the public telephone network.

The vast domestic telecommunications complex is an all pervasive resource that profoundly affects each individual person, the commercial world, the Government, and national security and emergency preparedness stature.

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The challenge ahead is to assure the timely introduction of satellite communications technology as a complementary and or alternative component of the domestic telecommunications environment and to assure full benefit to the public of the service and the economic potential of this new technology.

Satellite communication technology benefits from the substantial research and development accomplished by the Communications and Electronics industry, by educational establishments, and by Government laboratories. The fundamental capability for establishing practical satellite communications technology flows

from United States space research and development programs accomplished by the Government (principally NASA and DOD) and a broad sector of U. S. industry. The development of hardware for satellite communication applications is accomplished by private firms in the Communications and Electronics and Aerospace industries and consists of engineering the technology flowing from the efforts outlined above.

With the development of geostationary orbital capability and the demonstration of communications relay techniques utilizing satellites in this orbit, a new era opened for long-distance communications. This capability was soon utilized on an operational basis internationally through INTELSAT and its potential for providing of domestic telecommunications services has been the subject of wide interest. But the use of domestic satellite systems poses a number of challenges because of the comprehensive nature of the existing domestic telecommunications network, international interactions, uncertain economics, and lack of policy guidelines. Nevertheless, a number of entities have indicated an interest in the establishment of various types of domestic satellite systems.

Technical considerations which affect the ability to accommodate one or more of these proposals are important as a basis for informed policy decisions to enable timely introduction of domestic satellite services. Policy decisions on the introduction of satellites must also take into account potential future requirements and must not unduly restrict or foreclose expansion of these services if this expansion is in the public interest. For these reasons, a Technical Committee of the Domestic Satellite Working Group was established.

This Committee was asked to identify and evaluate the importance of those technical factors which affect (1) the uses, numbers and types of domestic satellite systems, (2) operation of these systems, and (3) their related economics.

While the committee did not limit its deliberations to particular communication services nor to short-term issues, it recognized the urgent need to provide guidance for immediate policy decisions dealing with the introduction of satellites for primarily fixed (i. e., point-to-point and multi-point) long distance services. Accordingly, important questions relating to the use of satellites for mobile and direct broadcast services were not treated in detail. The Committee urges that these potential uses be kept in mind, and that further study be given to the technical, economic, and policy issues involved.

Because of the limited time available, the Committee has based its conclusions on work already completed and reported elsewhere and on the technical judgment of its members. Where uncertainties exist, the Committee has attempted to identify additional work that needs to be done. The Committee considered a number of specific questions which were intended to span the range of technical points of interest in this study, and used the answers to these questions as background for the conclusions and recommendations of the report. The questions and the detailed answers are included as Section V.

III

TERMINOLOGY

This report is only concerned with use of "satellite communication systems" for domestic purposes, including fixed and mobile communications services. The distribution of signals destined for redistribution to the public either by broadcasting stations or by microwave relay, wire or cable networks is included. Domestic communication satellite systems may have one or more interfaces with international systems.

"Single-purpose satellites" are those satellites which are used for a single type of communications. For example, single-purpose satellites could provide services like television and radio distribution or data exchange or TV and voice broadcast.

"Multi-purpose satellites" are those satellites which are used for providing more than one type of communications. For example, a given mutli-purpose satellite might be used simultaneously for transmission of any mix of data, telephony, telegraphy, television distribution or broadcasting, radionavigation, aeronautical mobile radio service, etc. Although a multiplicity of services may be provided by multi-purpose satellites in domestic satellite systems, some services may be precluded from certain frequency bands as a matter of International Regulations or U. S. policy. For example, multi-purpose satellites operating in the 4 and 6 GHz bands may operate only in the communication-satellite service as that service is defined internationally.

IV

CONCLUSIONS

A. Technical Feasibility

1. General

The Committee concluded that demonstrated capability exists for the establishment of domestic satellite systems compatible with the terrestrial radio relay systems, and compatible with other projected requirements on the geostationary orbit. With proper system design - modulation technique, frequency, satellite orbital location, operating rules, ground station siting and antenna capability - a small number of domestic satellite systems may be accommodated. The number of systems which can be accommodated will depend upon the characteristics of the systems in question, e. g., numbers and location of satellites and earth stations, antenna directivity, bandwidth needs, etc. The Committee finds no problem of technical compatibility with the terrestrial network operation.

The Committee concludes that technical constraints are not the controlling factor in policy decisions governing authorization of initial domestic satellite systems.

2. Specific

Assuming the use of 30 foot antennas at earth stations, it appears that at least 16 common frequency satellites operating in the 4 and 6 GHz bands could be accommodated within that portion of the geostationary orbit simultaneously visible from the contiguous 48 States with angles of arrival of 5^{o} or greater. Under these conditions,

several U. S. domestic satellites can be accommodated in addition to planned Canadian and/or other Western Hemisphere domestic and international satellites. Only five of the possible 16 satellites would be properly located in the orbital arc to provide simultaneous coverage to Alaska and Hawaii in additon to the 48 contiguous states. Service to Puerto Rico can be provided by any satellite capable of serving the 48 contiguous states.

It should be technically feasible for radio relay networks and communications satellite systems, each potentially involving large numbers of stations, to share the same 4 and 6 GHz frequency bands. In order to share these frequency bands, careful siting of earth stations and terrestrial stations will be required.

Although it is technically feasible to site earth stations at major urban areas in the U. S., certain communication hubs will require special attention and may involve significant additional costs.

B. Frequency Allocations

The amount of electromagnetic spectrum presently available within the 4 and 6 GHz bands is adequate for initial domestic uses (500 MHz in each band).

It is technically feasible to share the two 500 MHz space communication bands at 7 and 8 GHz which are not now available to commercial communication-satellite systems. Whether or not sharing should be permitted in these bands is a policy matter not within the scope of this report. Present national policy is that they should not be shared for national security reasons.

It also is technically feasible to share other bands both above and below 10 GHz which are not now available for use by satellite communication systems due to treaty restrictions. Significant growth in the demand for domestic satellite communication services will create requirements for additional frequency spectrum allocations. In anticipation of such a development, the allocation of additional spectrum space should be and presently is being discussed within the U. S. organizations concerned. Plans for expansion are presently well advanced. There will be a world radio conference dealing with this matter in mid-1971, under auspices of the International Telecommunication Union.

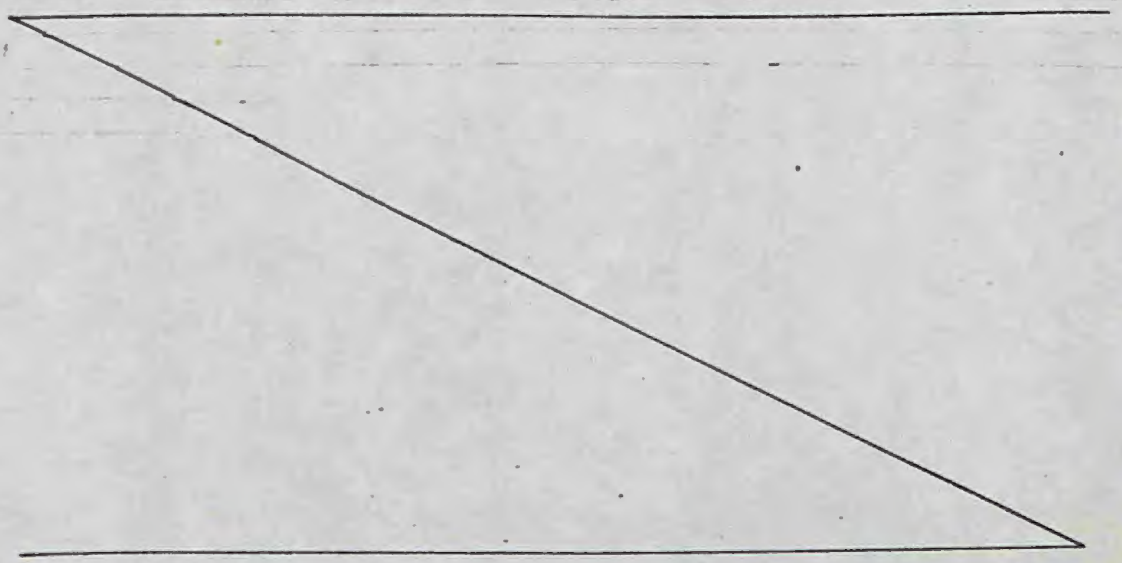
C. Regulation

The Committee has concluded that regulatory control is needed in the establishment domestic satellite systems, to promulgate procedures, standards, and regulations concerning frequency sharing. For the earth station, regulation is needed for antenna locations, antenna directivity, effective radiated power, maximum permissible interfering signals, and frequencies employed. For the space segment, regulations are needed to govern satellite spacing and station keeping antenna directivity, effective radiated power and frequencies employed.

The coordination and interference computational techniques and criteria to protect both terrestrial radio relay systems and other satellite communication systems, existing and planned, are

contained in CCIR documentation. FCC regulations contain most of the CCIR criteria for sharing between communication-satellite and radio relay systems and these regulations can be readily implemented to cover sharing among satellite communication systems. The FCC regulations should be responsive to the engineering portions of the latest CCIR output.

There can be no prior policy determination that one user has priority rights over another since the 4 and 6 GHz bands are allocated on a co-equal basis to the common carrier fixed service and the communication-satellite service. With respect to the hardship imposed on the terrestrial system by the siting of earth stations, there is merit in exploring the provision of reasonable compensation by the satellite communications operator for expenses incurred by the terrestrial system operator in the installation of additional shielding required to protect the terrestrial system or in the rerouting of existing radio relay links.



Sharing criteria at present are conservative, but further work on interference mechanisms at the various relevant frequencies and under a diversity of weather conditions will be required before significantly better criteria can be established.

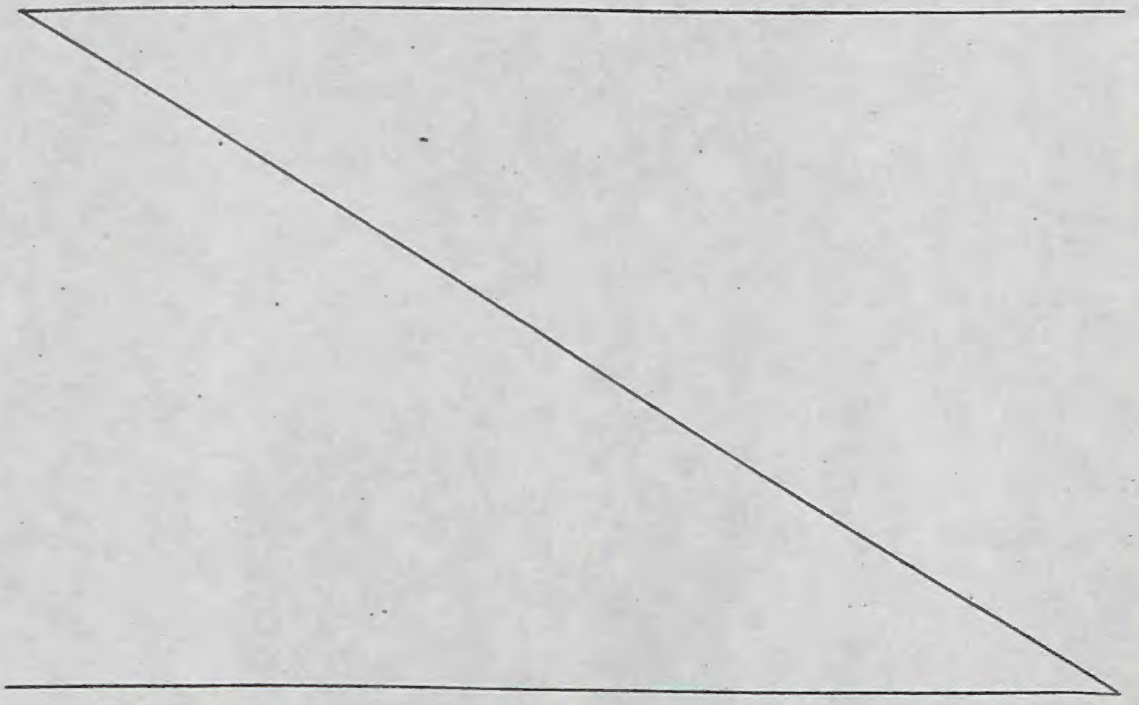
It will be desirable to set the minimum performance capability of earth station antennas to ensure accommodation of an adequate number of satellites for western hemisphere use, but exceptions may be necessary to accommodate special requirements, e. g., in the 4 GHz band, receive-only earth stations smaller than approximately 30 feet can be used with no penalty in terms of numbers of satellite accommodated, if a slightly lower grade of service can be accepted by the stations concerned. Use of less than 30 foot antennas for transmitting in the 6 GHz should be considered only in exceptional circumstances.

D. Implications of New Technology

New technology is becoming available in design and operation of both satellites and earth stations that will improve reliability, quality and cost of service. New techniques are being developed (narrow-beam and multiple-beam satellite antennas, greater effective radiated power, and improved earth station antennas) that will permit better utilization of limited the orbital space and the allocated spectrum now available.

The eventual use of frequency bands higher than the 4 and 6 GHz bands will allow progressively smaller earth station antennas to be used without penalty, both for reception and transmission, since antenna directivity improves directly with increasing frequency.

New technology is also becoming available in terrestrial systems and this technology will be influencing the relative attractiveness of satellite systems for many uses within the contiguous 48 states. At the present time it is not possible to predict with confidence what the mix of satellite and terrestrial services will be in the future, although it is obvious that terrestrial distribution systems are needed which will interface with the earth stations. No strong trend favoring one or the other technology can be identified, and there is expected to be a mixture of both services in the future.



E. Technical Criteria

1. System Design and Deployment -- There are many important basic technical factors which serve as constraints in the formulation of a specific design for a Domestic Communications Satellite System. A complex set of technical considerations are applicable to various sub-system elements and therefore serve to influence the trade-offs in establishing an optimum system configuration. Tab B illustrates the inherent complexity of a communications satellite system. The important elements related to system design and deployment include the following:

(a) Space Segment -- The space sub-system known as the space segment is comprised of the launch vehicle (booster), the spacecraft, and the Tracking, Telemetry and Control complex.

-- Launch Vehicle -- The placing of active repeater communication satellites in geostationary orbit is a very sophisticated technical operation which requires a flight qualified launch vehicle, a suitable launch facility, e.g., Cape Kennedy, including a range complex, and a sophisticated Tracking, Telemetry and Control network. A limited range of launch vehicle types is available for launching communications satellites into geostationary orbit.

Some of the more suitable launch vehicles are identified below:

Class	Range of Satellite in-orbit weight (geostationary position)	Time Period
Delta	420 - 470	Current
Delta	480 - 650	1972
Atlas Centaur	1000 - 1600	Current
Atlas Centaur	1100 - 1900	1974
Titan III C	2000 - 2200	Current
Titan III D/Centaur	7000 - 8000	1973
Saturn V	50,000 - 55,000	Current

The spacecraft designer is constrained to fit his satellite configuration within the step function performance limits of these launch vehicles, if a reasonable cost per pound in-orbit is to be realized. In addition it appears doubtful that geostationary satellite launch vehicles will achieve dramatic cost reductions in the foreseeable future.

-- Spacecraft - Detailed design of communication satellite spacecraft requires an integration of the airframe, stabilization devices, telemetry and communications electronics, antennas, propulsion, apogee kick motor (if required) prime power and other components needed to create modern, high capacity, long life communication satellites. One of the important tradeoffs in the design of the initial domestic system is that between life in-orbit versus obsolescence brought about by the rapidly advancing technology. The Committee believes that the pace of technology advance should permit economies of scale in successive generations of communications satellites.

Tracking, Telemetry and Control (TT&C). Deployment of satellite systems require the availability of a network of earth stations equipped with a TT&C sub-system. The TT&C sub-system is used to control the injection of satellites into geostationary orbit, to maintain station-keeping and inclination, to reposition the satellite, and to maintain technical control of the operational elements of the satellite. System managers should give early consideration to requirements for adequate TT&C support for domestic satellite systems.

b. Earth Station Networks The deployment of earth stations involve several fundamental technical tradeoffs in performance characteristics between the space segment and the earth station complex. In addition, it is necessary to assure interconnection between remotely located earth stations and the terrestrial plant. Conceptually, it seems reasonable to assume that the applications of satellite communications in the domestic environment may include earth stations ranging from a very large, high capacity and costly transmit/receive type to a small low-capacity receive-only type deployed in networks structured around various user groups. To maintain the integrity of any communications satellite system deployed domestically and to assure no harmful interference with the terrestrial plant, it is necessary to site earth stations in a careful and fully engineered manner.

2. System integration. There are no known technical limitations which would prevent the integration of satellite systems with the domestic terrestrial telecommunications complex.

Further evaluation will be required of added "time delay" along with the "echo" introduced by use of satellite in the domestic communications environment.

The question of compatibility between a U. S. domestic satellite system and a co-regional system, such as a Canadian or South American system or the INTELSAT system, should not be neglected. Experience in the last few years has demonstrated that it was in the U. S. national interest as well as INTELSAT's interest that NASA's Application Technology Satellites were, to some extent, compatible and interoperable with the INTELSAT system. On frequent occasions NASA provided backup coverage for certain events when INTELSAT was unable to provide this coverage. Therefore, questions relating to compatibility such as frequency allocation, mutual interference and the ability of Alaskan earth stations to work with a Canadian or other regional system must be studied before a final system configuration is determined.

3. System reliability

V

ANSWERS TO SPECIFIC QUESTIONS

QUESTION 1: Is it technically feasible to accommodate planned INTELSAT and Canadian domestic satellites plus one or more satellites for U. S. domestic services, using the 4 and 6 GHz spectrum bands presently allocated for commercial communication satellite services? If so, approximately how many U. S. satellites could be accommodated, assuming present and near-future technology and design possibilities?

STATEMENT: Existing technology will permit the accommodation of a small number of communication satellites in geostationary orbit capable of serving the 50 States and Puerto Rico, using the existing frequency allocations at 4 and 6 GHz. A larger number of communication satellites can be accommodated when the coverage required is limited to the contiguous 48 States. The specific number of 4 and 6 GHz geostationary satellites that could serve domestic communication requirements depends on factors such as earth station antenna size, modulation techniques, required quality of service, bandwidth needs, etc.

Assuming the use of 30 foot earth station antennas at 4 and 6 GHz and present frequency modulation techniques, it is estimated that 16 common-frequency communication satellites can be accommodated in the 60^{o} - 135^{o} W orbital range which provides full visibility of the contiguous 48 States with a 5^{o} minimum angle of elevation at the earth stations. When coverage of the 50 States is required the

orbital range is between to 115° W and 135° W (5° minimum angle of elevation at earth stations), and it is estimated that 5 communication satellite can be accommodated in this ranges. The above satellite spacing of 5° should permit CCIR/CCITT quality voice, data and video services. The use of larger antennas or more interference-resistant modulation techniques -- or the adoption of lower quality service -- would decrease required inter-satellite spacing; hence, increase the possible number of satellites. Conversely, smaller antennas or less interference-resistant modulation techniques e. g., single side-band would increase required inter-satellite spacing and reduce the possible number of satellites. An important observation is that the effectiveness with which various techniques for spectrum/orbit conservation can be exploited depends to a considerable extent on the "homogeneity" among adjacent satellites. This cautions against too great an intermingling of satellites having significantly different characteristics in the geostationary orbit, and emphasizes the need for coordination among systems with respect to system characteristics and orbital locations.

Not all the satellites which the 60° - 135° W orbital region can accommodate can be counted on for U. S. domestic services. Canada has indicated a desire to deploy several domestic satellites and INTELSAT may desire one or more for North/South America traffic. On the other hand, regions outside this orbital sector will be useful for some U. S. domestic services where full coverage of

the contiguous 48 States is not essential.

This analysis should not be misconstrued as indicating that all domestic communication satellite services and requirements for the future can be accommodated using the present 4 and 6 GHz bands. Assuming the economic viability of domestic satellites, as well as the feasibility of large-scale earth station deployment compatible with terrestrial radio relay facilities, additional frequency allocations will probably be required. The U. S. is presently seeking the international allocation of several additional frequency bands for communication satellite services in the 1971 World Administrative Radio Conference. Meanwhile, the 4 and 6 GHz bands can accommodate initial systems development under known radio propagation conditions and using proven, state-of-the-art technology.

QUESTION 2: Is it technically feasible to accommodate one or more domestic earth stations within or near typical major metropolitan areas, again assuming use of 4 and 6 GHz spectrum allocations, under various combinations of the following alternative deployments ?

(a) all stations operate in send/receive mode

(b) most stations are receive only

(c) each station uses entire spectrum allocation

(d) most stations use only small fraction of spectrum allocations

(e) minimum earth station antenna size is 15, 30, 60, or 90 feet

(f) only highest grades of telephone and video service is acceptable

(g) lower grades of service are acceptable

(h) limited orbital arc.

STATEMENT: Rather than attempt a single, definitive answer to this question, the committee considers it more appropriate to discuss several possibilities in terms of varying confidence levels recognizing the risks involved in the accommodation of a number of earth stations in or near any metropolitan area:

High Confidence: At least one full transmit/receive station at 4 and 6 GHz in or near most metropolitan areas; a few receive-only stations in any metropolitan area, particularly if lower than CCIR/CCITT relay quality of service is acceptable.

Good Confidence: At least one full transmit/receive station in or near any metropolitan area (including major communication hubs); a few (e. g., 1 - 4) transmit/receive stations in most areas; and several receive-only stations in any area.

Low Confidence: Several transmit/receive stations in or near any metropolitan area; many receive-only stations in any area.

The degree of coordination required to accommodate the number of stations indicated will, of course, depend on the local environment, including topography, meteorology, earth station design, and deployment and characteristics of radio relay systems in the area. This will clearly affect the cost of satellite systems

operations, though to what degree one cannot determine at this time. Studies and experiments now being designed are expected to provide further information as to the feasibility of more extensive sharing.

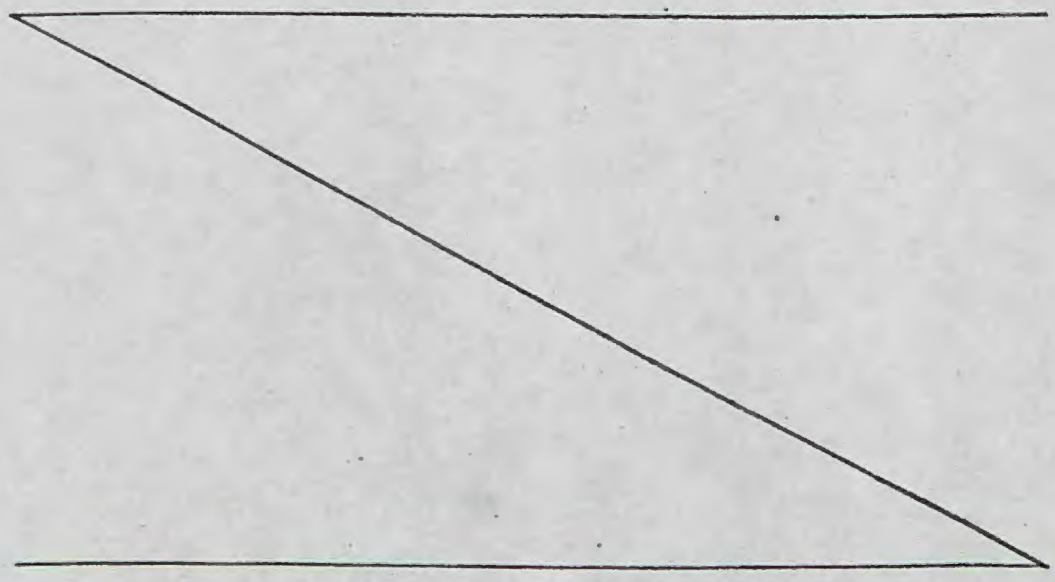
While we do not address the specific configurations (a through h) set out in the question, they are implicit in the above answers. Thus, a partial basis for the conclusion that greater numbers of receive-only stations can be accommodated is that these will not only be small enough (e. g., 15 - 30 foot maximum) to be sited near schools, broadcast stations, etc., but will also find lower grades of service than CCIR/CCITT quality acceptable. Also, conclusions that several transmit/receive stations may be possible in some instances is partially based on the assumption that relatively few stations in the initial systems will at first use the full 500 MHz bandwidth, since typically, this will be shared among the several stations comprising a specific system.

QUESTION 3: To what extent is it technically feasible to use other spectrum bands not now available to commercial communications satellite services (e. g., 7 and 8 GHz communication satellite allocations now reserved for government use) on a shared basis, or to achieve greater use of any of these spectrum bands through multiple antenna beam technology, reversal of up-and-down link frequency assignments, etc? What multiplication of the basic communications capacity indicated in (1) above appears likely through such techniques, assuming there were no policy or other impediments to their exploitation?

STATEMENT: The amount of electromagnetic spectrum presently available within the bands at 4 and 6 GHz is adequate for the initial use of domestic satellites (500 MHz in each band).

It is technically feasible to share portions of the space communication bands at 7 and 8 GHz which are not now available to commercial communication-satellite systems. Whether or not sharing should be permitted in these bands is a policy matter not within the scope of this report. Present national policy is that they should not be shared for national security reasons.

It also is technically feasible to share other bands both above and below 10 GHz which are not now available for use by satellite communication systems due to treaty restrictions. Significant growth in the demand for domestic satellite communication services will create requirements for additional frequency spectrum allocations. In anticipation of such a development, the allocation of additional spectrum space should be and presently is being discussed within the U. S. organizations concerned. Plans for expansion are presently well advanced. There will be a world radio conference dealing with this matter in mid-1971, under auspices of the International Telecommunication Union.



Reversed Frequency Bands -- The use of reversed direction on the up-and-down link frequency assignments can, in principle, nearly double the number of satellites and communications capacity which a given orbital sector can accommodate. In exclusive frequency bands this technique may be used to advantage. In the shared bands, the use of this technique would depend on coordinating the siting, deployment and operation of earth stations with terrestrial systems and other earth stations sharing the same frequency band. The exposure of radio relay systems to interference from satellites operating in those frequency bands between 1 and 10 GHz which are at present used only for the up paths of satellite links would unlikely be accepted by countries whose systems are particularly susceptible to this mode of interference.

The present International (ITU) and United States policy is that the reversed frequency technique will not be used in bands shared between terrestrial and space systems.

Multiple Antenna Beam Satellites -- Multiple antenna beam satellite technology advances should enable a single satellite to "reuse" the allocated frequency band. This added capability should help to overcome the inherent bandwidth-

limited case of high powered satellites. However, there is need for more research and development to be carried out to determine the capabilities and limitations of this technique.

QUESTION 4: Is it technically feasible to provide communications service to Alaska and/or Hawaii and/or Puerto Rico through separate antenna beams on a satellite designed for service to the contiguous 48 States? Would this materially alter the reliability and total cost (combined earth and space segment) of (a) service to the contiguous states and (b) service to and within Alaska, Hawaii, or Puerto Rico (as compared with provision of the same service through INTELSAT or Canadian satellites, for example)?

STATEMENT: Using existing and projected technology, it should be technically feasible in the future to provide communications service through a single geostationary satellite -- configured with multiple antenna beams -- simultaneously to Alaska, Hawaii, Puerto Rico, and the contiguous 48 States. This would provide certain operational advantages and potential cost savings for service to outlying areas when compared with separate systems or the use of INTELSAT facilities:

-- The higher effective radiated power obtainable from separate, highly directive antennas would permit the use of lower-cost earth stations than are required when present INTELSAT satellites are used.

-- The use of multiple highly directive antenna beams at the satellite could provide, through spectrum reuse, a substantially greater number of simultaneous channels per satellite at a low incremental cost.

-- Direct satellite links to locations throughout the contiguous 48 would be possible, which INTELSAT satellites cannot provide from their present mid-ocean location.

-- Cost sharing of R&D, launch, operating, spare, and maintenance services could provide significant economies.

Quantitative estimates of potential savings cannot be made in the absence of specific systems design models. Both costs and performance vary considerably with system configuration and size, percent of fill, service quality objectives, satellite spare and replenishment doctrine, R&D base, procurement source, etc.

This statement should not be misinterpreted as implying a technical need for a single, integrated system for all U. S. domestic services. The need or desirability of such an approach can be decided on its own merit; any satellite developed for service to the contiguous 48 States -- whether specialized or multi-purpose -- could serve as a vehicle for a full communications service to and within outlying areas, with all the potential advantages cited above.

? OTM FCC

QUESTION 5: Which design and/or operating characteristics of domestic satellite systems require standardization and/or coordination to insure compatibility among systems and adequate growth potential? To what extent are these standards and coordination likely to be worked out among the parties concerned, under present FCC rules and regulations, and to what extent will it be essential that the Government exercise regulatory control of such proceedings? What alternative steps could be taken to encourage resolution of these issues directly by the parties concerned? Specifically, would it be technically feasible for one party or another to either operate with reduced quality of service or adopt appropriate design changes to accommodate a potentially interfering service, if there were effective rules for and means of compensation?

STATEMENT: It appears essential that regulatory control be exercised regarding any domestic satellite system(s) to the extent of establishing procedures, standards, and regulations concerning frequency sharing and efficiency to spectrum utilization. To achieve these objectives it will be necessary to regulate earth station antenna locations, antenna directivity and station operating characteristics, etc. With respect to the space segment, regulatory control should be maintained over satellite spacing and associated station keeping, antenna directivity and polarization and effective radiated power.

The present FCC rules can and should be modified and updated to cover the communication-satellite service so as to insure compatibility between terrestrial systems and space systems, and among space systems sharing the same frequency bands. The FCC regulations should be responsive to the engineering portions of the latest CCIR output.

The question of operating systems with reduced quality of service or with appropriate design changes in order to avoid interference should be explored. In some instances it will be

technically feasible for a system to operate with reduced quality of service or adopt appropriate design changes to accommodate a potential interfering service. A decision which affect the quality of service should not normally be left at the discretion of the parties concerned when the public interest is involved.

To permit an optimum number of common frequency satellites to occupy the geostationary orbit, it is desirable that earth station antennas have as much horizontal discrimination as is economically feasible. Lacking any existing framework within which the economically optimum size can be resolved, it may be necessary as an interim measure to establish minimum antenna discrimination standards. Inasmuch as the potential demand for satellite space is not uniform along the geostationary orbit, these discrimination standards should vary with satellite location, as well as with geographic area served.

Receive only stations may operate with less than minimum standard antenna discrimination providing the operators are willing to accept a quality of service somewhat inferior to the CCIR/CCITT radio relay standard. Permitting the use of less than standard antenna discrimination for transmit antennas should be approached very cautiously and permitted only after a thorough consideration of the desirable and undesirable effects.

QUESTION 6: (a) What significant developments in either technology or technical information are foreseen during the next ten years which might result in major improvements in the cost and capacity of satellite communications, greater and more efficient utilization of the radio spectrum resource, or the operational scope and effectiveness of satellite communications?

(b) What are the significant developments foreseen in terrestrial communications?

(c) How will the cost effectiveness of terrestrial communications compare with satellite communications in the next decade?

STATEMENT ON QUESTION 6(a): There are numerous technological advances forecast for the next decade which will provide significant enhancement of satellite communications capabilities and economy of service. These include (a) larger, longer life, higher capacity and more powerful 3-axis stabilized geostationary, multiple-purpose satellites; (b) more efficient modulation subsystems; and (c) more efficient, reliable and higher capacity earth stations, in fixed, transportable and mobile configurations.

The developments that offer the greatest potential improvements for satellite communications are:

(a) The use of multiple narrow, shapped and steerable beams from satellites. This could significantly increase the circuit capacity of each satellite for a given bandwidth, and could greatly reduce the cost per circuit.

(b) Subject to treaty limitations, the use of much larger effective radiated power from satellites this could be used to decrease the cost of earth stations for a given level of service, and permit the economical proliferation of their use.

(c) The use of more versatile and better discriminating earth antennas. When earth stations need to be in simultaneous contact with a number of satellites the development of earth antennas with multiple independent beams will become important in the total system cost. Also, the design of the antennas can be made to provide greater system discrimination between wanted and unwanted signals for a given size or cost of antenna.

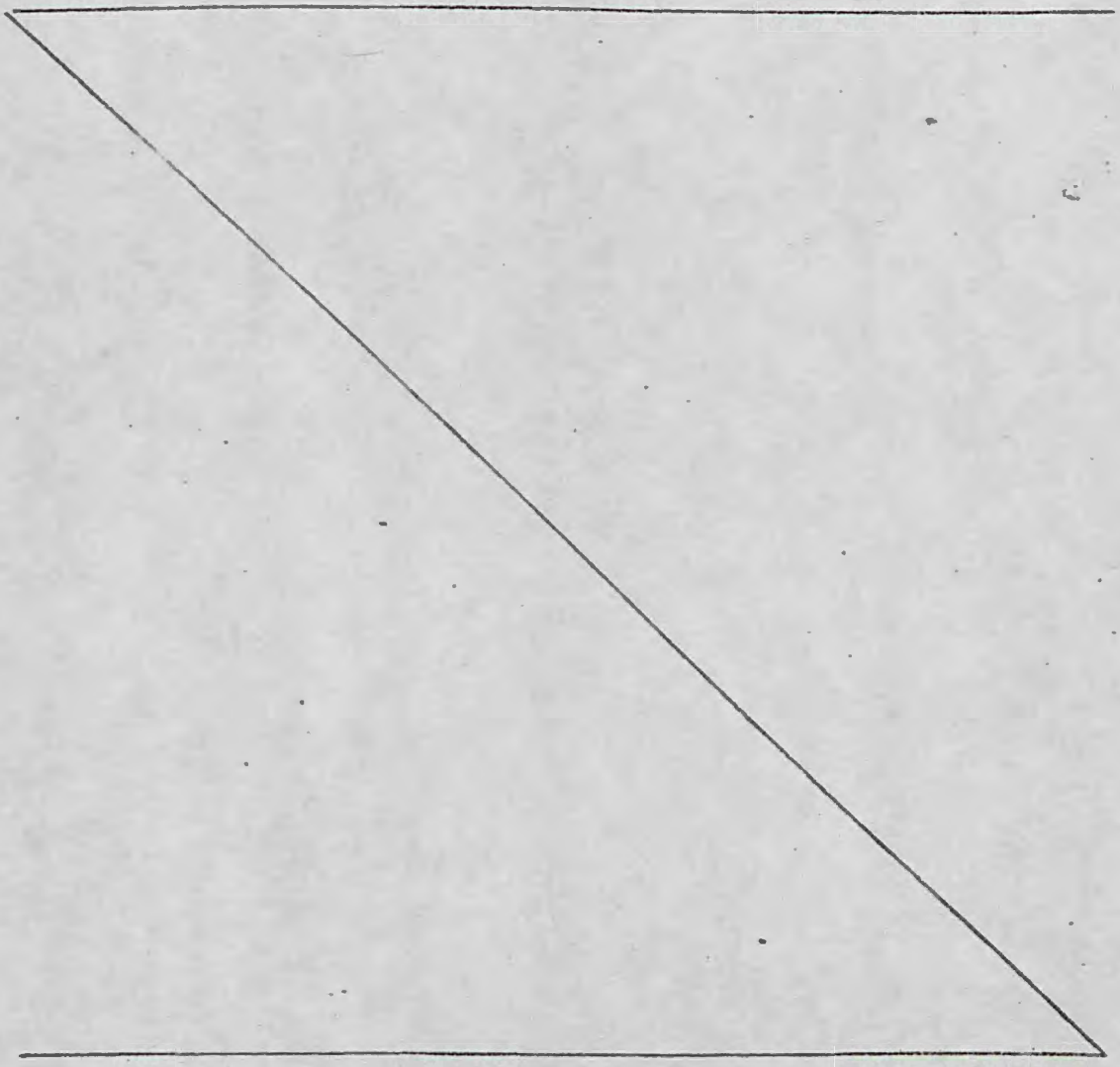
(d) Development of techniques and hardware including solid state devices which will permit: (1) increased spectrum sharing between satellite and terrestrial systems; and (2) useful exploitation of the higher frequency domains, including optical frequencies.

(e) Better understanding of radio propagation and interference factors. For example, will more information on radio propagation and interference it will be possible to design systems with smaller margins for such contingencies and hence with greater capabilities or less cost.

(f) Further development of multiple-access techniques will improve system effectiveness. For example, the ability to assign satellite circuits "on-demand" will improve circuit utilization and provide the ability to allocate circuits flexibly among many routes to meet variations in demand. This multiple-access feature is economically attractive for servicing thin (low-traffic) routes.

(g) Development of enhanced satellite performance. For example, developments are proceeding which should lead to improved in-orbit life-time, more accurate spacecraft stabilization and orbit repositioning capability, and more efficient prime power supply.

(h) Development of other advanced techniques. For example, the introduction of improved digital modulation techniques would facilitate data transmission as well as increase the immunity to interference from other systems.



STATEMENT ON QUESTION 6 (b)

Some examples of Bell Telephone Laboratory research and development programs applicable to terrestrial telecommunications systems follow: (Bell Telephone Laboratory programs used as an example)

Coaxial Cable

The L-5 Coaxial Cable now in the final stages of development will permit the transmission of both analog and digital information. It will provide 90,000 two-way voice conversations on 20 coaxial tubes in a single cable. Each coaxial tube has a bandwidth of 60 MHz. Additionally, it will contain one service protection channel in each direction which will permit the restoral of 9,000 channels in each direction in the event of service failure.

Wave Guides

Millimeter Wave Guide Transmission Systems are being developed and an experimental link is being established. The 2 1/2 inch diameter precision waveguide is buried at least 4 foot deep. The operating frequency band of the waveguide is 30 - 300 GHz. This system should provide more than 240,000 voice channels per wave guide.

Microwave Systems

Since 1952 TD microwave systems have expanded from 2400 to 12,000 channels using the same 500 MHz bandwidth. A new development known as the TD-3 is presently undergoing field trials in Arkansas and Oklahoma. The TD-3, as are the other

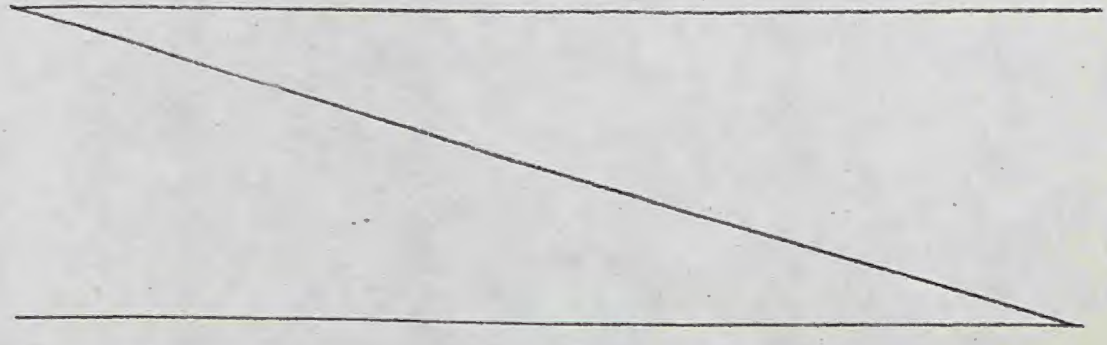
TDs, operates on the 4 GHz part of the spectrum. The TD-3 has the same 12,000 channel capability as the TD-2; however, there are lower investment costs, higher reliability and reduced maintenance.

TH-3: The TH-3 is the equivalent of the TD-3 but utilizes the 6 GHz part of the frequency spectrum. It has a 10,800 voice channel capability. Its field trial is underway in a few places in the United States.

A new system called the "Pole Line System" is presently in test bed operation in New Jersey. This concept includes mounting small suitcase size packages atop 60-90 foot aluminum poles to be located three miles apart. This system operates in the 18-20 GHz part of the spectrum and has a capacity of 32,000 voice channels.

Digital Transmission

Digital transmission provides one answer to the problem of economically handling the growing volume of communications. Systems now in use can carry 24 simultaneous one-way conversations on two pairs of wire in a cable. The Digital T-5 Transmission System is in final stage of development and will provide 80-90,000 voice channels. Now under development are systems operating at near 300 million bits per second which one day may carry thousands of voice channels, several TV channels and high speed computer data on the same channel.



STATEMENT TO QUESTION 6 (c): The relative cost effectiveness between satellite communications and terrestrial communications in the future will depend on the specific application under consideration and the rate of technological advance of each transmission medium. The Committee believes that satellite communications should offer advantages: (a) in applications requiring simultaneous relay to a large number of geographically dispersed points or areas; (b) in applications employing multiple-access to widely dispersed low-traffic areas; (c) in applications involving mobile terminals, and (d) in applications where a quick reaction capability is needed, particularly in remote areas. The projected growth of terrestrial micro-wave, coaxial cable and guided wave systems indicate a continued advantage for these means, particularly in high density trunk routes. Since there are technical and economic advantages in both satellite communications and terrestrial facilities depending on the specific application, it is reasonable to expect a complementary mix of facilities in the dome stic telecommunications environment.

Cost estimates for proposed satellite communications system(s) should consider the cost of terrestrial interconnections to the user. No comprehensive and authoritative economic analysis has been brought to the attention of the Technical Committee which would have enabled the Committee to compare the relative cost/benefit tradeoffs between satellite communications techniques and terrestrial techniques in providing new or expanded telecommunications services.

If such a study is not available, it is the opinion of the Technical Committee that a rigorous economic analysis of proposed programs for incorporating satellite communications into the domestic telecommunications complex should be accomplished. Such an analysis would, among other things, take into account the performance and economic trends of modern telecommunications technology, need for in-orbit spare satellites and redundant earth station facilities when continuity of service is required, impact of dedicated or multiple-purpose satellite approaches, and a cost/benefit evaluation of a alternative terrestrial approach.

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QUESTION 7:

(a) If a domestic communications satellite system is implemented what will be the long-term impact on the quality and economy of telecommunications services made available to users, both private and Government? (b) Is the quality and reliability of service from satellite communications now or likely to be obtainable adequate to satisfy user needs?

STATEMENT ON QUESTION 7 (a)

The Committee believes that implementing a properly structured Domestic Satellite Communications program -- integrated, where appropriate, as an integral part of the national telecommunications system complex -- could have a long-term benefit to private and Government users in quality and economy of services. An enhanced versatility of Domestic telecommunications should be realized by the introduction on another means of transmission and distribution capability. There would be a desirable synergistic effect by the availability of a diversified and complementary mix of means of telecommunications in day-to-day services and during emergency situations.

STATEMENT ON QUESTION 7 (b)

The pace of satellite communications technology has demonstrated a steady growth in the quality and reliability of service and our forecasts project continued advances. However, Domestic Satellite Communications will require sufficient redundancy and flexibility in its space segment (e. g. in-orbit spare) and earth station complex, if it is to provide the same grade of service available to users of the highly developed terrestrial network.

The early generations of operational communications satellites have demonstrated a long-life reliability in-orbit. Generally there have been some service impacting anomalies of the first satellite in each new generation and few anomalies in later quantities of a specific series. Operating experience indicates the wisdom of establishing, as doctrine ,, a concept of placing in-orbit at least one spare satellite for a system composed of four or five operational satellites. Early operating experience also shows the need for adequate redundant sub-systems in the earth-station and the need for toll-grade quality interconnection between the earth station site and the terrestrial complex.

One qualitative characteristic of satellite communications that has not been demonstrated in Domestic Telecommunications on a broad scale is the phenomenon of "time delay" and "echo suppression". Actual operating experience will be needed to determine the commercial acceptability of satellite communications for domestic telephone and certain kinds of data service.

APPENDIX
TAB A
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TAB
B

APPENDIX

TAB B

Design Considerations

For

Satellite Communications Systems Applications

There are important mission requirements and technical constraints imposed on any satellite communications system designer. An authoritative treatment of this subject is found in Mueller and Spangler's book "Communication Satellites". The following extract from their book describes and illustrates the complexity of the design considerations:

> Clearly, the design of a system begins with the establishment of its over-all requirements. In establishing requirements, two types of considerations are involved (see Table 20): those derived from the
>
> ***Table 20.*** *System requirements*
>
> | Mission-Derived Requirements | Equipment and Facility Constraints |
> |---|---|
> | Ground station location | Booster performance |
> | Communication channel capacity | Booster availability |
> | Communication standards | Launch pad availability |
> | Maximum acceptable waiting periods | Subsystem performance limits |
> | Minimum acceptable service periods | Component performance limits |
> | Reliability/cost | |
>
> mission of the system in such areas as coverage and quality of communications, and those provided by the constraints or limitations of existing equipment and technology. Successive approximations need to be made, then, in defining the system, accepting compromises between what is desired and what is possible and trading performance in one area for benefits in another, always with the total system definition in mind, i.e., examining tradeoffs and accepting compromises with complete knowledge of the results throughout the system. In

reaching decisions concerning the orbital parameters, for example, the immediate effects of period, inclination, eccentricity, and nodes need to be ascertained on shielding requirements, coverage, satellite lifetime, environmental torques on the satellite, booster requirements, communication net control, and reliability. The further effects of these factors in turn on communication capacity, power requirements, antenna directivity, thermal control, and the like must then be ascertained. To systematize the process of system design, flow charts like the one diagrammed in Figure 100 have been developed. Thus the ramifications of each decision can be followed throughout the system, successive approximations being made until the complete system has been defined. [1]

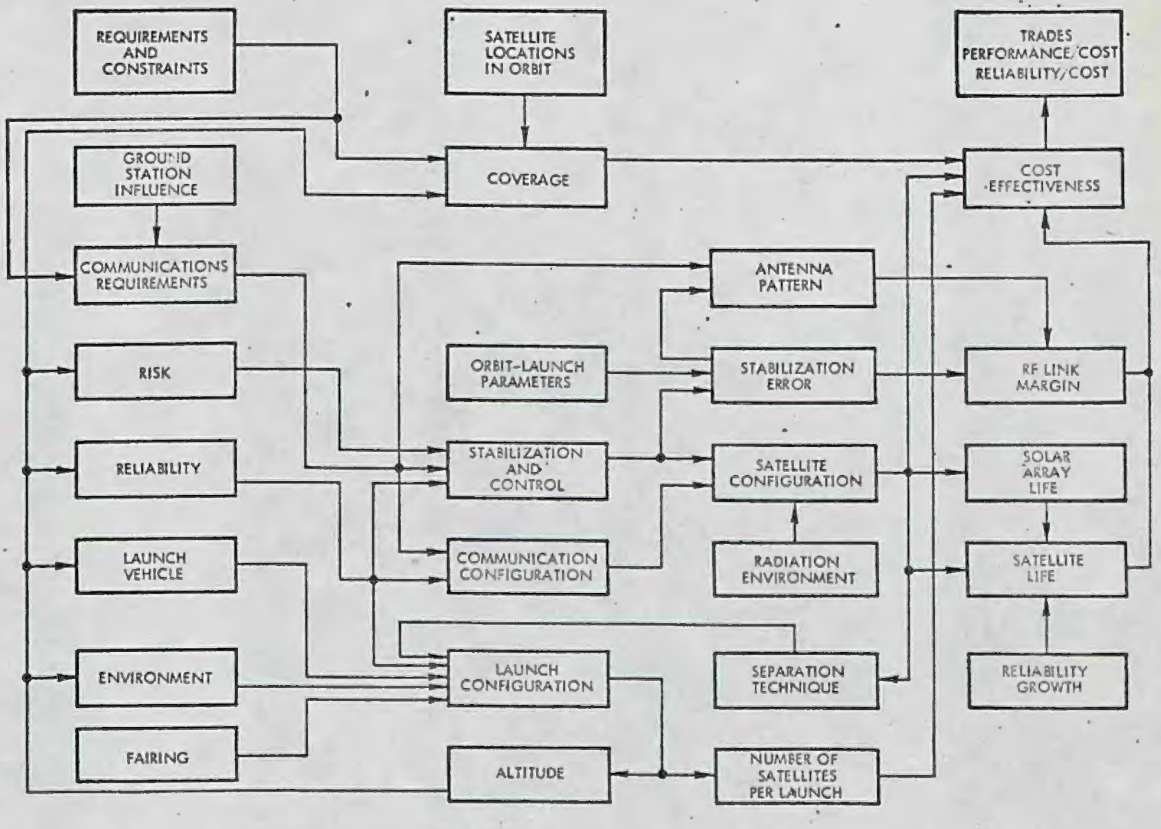

Fig. 100. Typical satellite system tradeoffs. [2]

[1] George E. Mueller and Eugene R. Spangler, Communication Satellites, (New York: John Wiley & Sons, Inc., 1964), pp. 192-193.

[2] Ibid., pg. 194.

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. . . from the editors

See page 229

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Tuesday, October 21, 1969 Page 227 11th Year, Vol. 46, No. 36

NASA WANTS SPACE BASE DYNAMIC MODEL

Continuing with its stepped up contracting of advanced development studies for the space shuttle/station/base, the Manned Spacecraft Center plans to issue an RFP today for development of a space base dynamic model. Proposals will be due Nov. 20.

MSC is also planning to procure studies of: 1) a space base digital command system; 2) a space base multiple signal model; 3) control moment gyroscope applications to space base wobble damping and attitude control; and, 4) in-flight maintainability and repair concepts for a space base auxiliary propulsion system. (See SPACE Daily, Oct. 20.)

The space base is to be constructed from modular space station segments. Under program options presented to the President, NASA would develop and orbit a 50-man space base in either 1980 or 1984 (SPACE Daily, Sept. 22).

SIX SELECTED FOR DTRM COMPETITION

Six companies have been selected by the Naval Ordnance Systems Command to compete for a multi-year production contract for the Mk 56 Mod 0 Dual Thrust Rocket Motor (DTRM). RFTP's (step two) are being issued to:

1. Aerojet-General
2. Atlantic Research Corp.
3. Hercules-Allegany Ballistics Lab.
4. Thiokol-Huntsville Division
5. North American-Rocketdyne
6. United Technology Center

Eleven companies had submitted proposals under step one of the procurement, with unsuccessful bids made by Baldwin Electronics, Whittaker Corp., Olin Mathieson, Talley Industries and Northrop-Carolina. (See SPACE Daily, April 29 and June 10.)

SATELLITES SHOW COST ADVANTAGE OVER CABLES IN NAE STUDY

Use of satellites for communications in the Atlantic Basin for the 1976-85 decade shows a marked cost advantage over use of cables, according to a case study conducted by the Committee on Telecommunications of the National Academy of Engineering.

As the basis for its study, the committee took a ten and a twenty percent expansion rate of the Atlantic communications demand forecast for the 1968-75 time period by the Joint World Plan Committee of the ITU meeting in Mexico City in 1967. The study included six alternative communications models, starting with an all-satellite system (plus existing, and planned cables such as TAT-5) and then systems with an increasingly greater use of cables.

The committee found in its study that alternatives which included a higher percentage of satellite facilities "always cost less." A comparison of the all-satellite system versus one cable/satellite model is shown below:

System	Cost
Ten Percent Expansion	
85 percent satellite (all-satellite)	$42 million
48 percent satellite	$80 million
Twenty Percent Expansion	
93 percent satellite (all-satellite)	$54 million
74 percent satellite	$81 million

The comparison cost study is contained in an NAE publication, "Reports on Selected Topics in Telecommunications." John M. Richardson is executive secretary of the Committee on Telecommunications.

NR FAVORS TWO-STAGE WINGED SHUTTLE

North American, like the Boeing/Lockheed team, favors a two-stage design for the planned Integral Launch and Reentry Vehicle space shuttle.

The conceptual vehicle designed by NR's Space Division is a fixed-wing configuration standing approximately 290 feet high and weighing about three to four million pounds. According to Dale D. Myers, manager of NR's space shuttle program, the booster vehicle would be about 256 feet long and the orbiter vehicle, about 180 feet long.

NR said the shuttle would use heat radiative structures rather than the ablative types and would be capable of flying every two weeks with minimum maintenance and little ground support and checkout.

MCDONNELL GETS SPACE STATION EXPERIMENTS STUDY

McDonnell Douglas has received a $1.25 million contract from Langley Research Center for the Earth orbital experiment program and requirements study it was selected for last summer (SPACE Daily, June 25). The study will involve a determination of the feasibility, economy and relative advantages of experiments in such areas as manned space flight, space medicine, space astronomy, space physics, communications & navigation, and Earth survey. McDonnell is to assemble a listing of priority experiments by bracket, along with a cost estimate for each experiment.

RPL OPENS THROTTLING STUDY

The Air Force Rocket Propulsion Laboratory is planning to contract for a program to develop a continuous deep-throttling capability for monopropellant hydrazine and bipropellant nitrogen tetroxide/monomethylhydrazine attitude control engines. The study is to include consideration of technology in such areas as fluidics, hydraulics and electro-mechanical devices.

AMC AWARDS DEPLOYMENT STRATEGY STUDY

Lambda Corp. has received a 13-month Army Missile Command contract for a deployment strategy study.

AF ORDERS STUDY OF PROPELLANT STRESSES

Air Force Rocket Propulsion Laboratory is contracting with Lockheed Propulsion Co. to build a highly-instrumented inert solid rocket motor to be used for learning more about stresses that build-up in propellant grains. Tiny sensors implanted throughout the motor will measure stresses.

LSS HEAT REJECTION SYSTEM SOUGHT

Preliminary design investigation of a heat rejection system for an advanced environmental and thermal control life support system (ETC/LSS) is called for in a request for proposal being issued by the Manned Spacecraft Center tomorrow. Bids will be due Nov. 12.

GD/HUGHES SELECTED FOR SEEKER TEST PROGRAM

Holloman AFB is awarding 12-month contracts to Hughes Missile Systems Division and General Dynamics/Pomona for support of captive flight tests of air-to-air missile seekers.

MCDONNELL GETS ARMS CONTROL STUDY

McDonnell Douglas has been selected by the U. S. Arms Control and Disarmament Agency to conduct a study of arms control implications of strategic offensive weapons systems.

TRW GETS NAVTRAFSAT RECEIVER CONTRACT

A prototype model of an L-band receiver system which will utilize signals from satellites to provide navigation information to aircraft will be built by TRW Systems Group under a $500,000 contract from NASA-Cambridge. The system employs a company-developed technique (binary optimum ranging) to measure range by using the time of arrival of satellite-transmitted signals.

COMSAT REPEATS READINESS TO INITIATE DOMESTIC SATCOM

The Communications Satellite Corp. says it has the money and is ready to start now on a domestic communications satellite system, which, among other functions, would carry programming of the television networks. ComSat detailed its plans in a report to Clay T. Whitehead, who is heading a White House study on domestic satellite communications (SPACE Daily, Oct. 16). Initiation of a domestic satcom is awaiting a ruling by the Federal Communications System on how the system should be operated and who shall do the operating.

LUNAR DRILL READIED FOR APOLLO 13

With preliminary analysis of lunar rock samples showing "nothing to dictate a design change" in the Apollo Lunar Surface Drill (ALSD), work on the drill is proceeding on schedule, according to Martin Co., ALSD prime.

Scheduled for first operational use during the APOLLO 13 mission next March, the drill will be used to bore two ten-foot-deep holes in the lurain. Sensor probes will be lowered into the holes to measure heat flow, temperature profiles, and sub-surface soil thermal characteristics. If time permits, astronaut Fred W. Haise Jr., will also drill a third hole with a special core bit to bring back to Earth a sample of the Moon's interior.

MULTI-SOYUZ MISSION ENDS WITH PRECISION

SOYUZ 8 was returned to Earth early Saturday afternoon, October 18, bringing to an end the first group flight of manned spacecraft on a mission which demonstrated an operational precision unparalleled in Soviet manned space flight history.

While the flights of the three SOYUZ did not run up any new manned spacecraft endurance records or perform any new spectaculars during their stay in orbit, they provided evidence that the mission was the successful fulfillment of a major milestone in the Soviet manned space flight program.

SOYUZ 8 landed 90 miles north of Karaganda, in the Karaganda-Akmolinsk recovery area (See SPACE Daily, Oct. 20.), at 2:10 PM Baykonur Time (5:10 AM EDT), Oct. 18, 118 hours and 41 minutes after launch from Baykonur Cosmodrome on October 13.

SOYUZ 7 landed 96 miles northwest of Karaganda at 2:26 PM Baykonur Time (5:26 AM EDT) Friday, Oct. 17, also 118 hours 41 minutes after launch from Baykonur Cosmodrome on October 12.

SOYUZ 6 landed 112 miles northwest of Karaganda at 2:52 PM Baykonur Time (5:52 AM EDT) Oct. 16, 118 hours 42 minutes after launch from Baykonur Cosmodrome on October 11.

The launch of the three spacecraft at approximately 24-hour intervals was a demonstration of the outstanding pad turn-around capability for the RD-107C carrier rocket and SOYUZ spacecraft combination. While three launching pads may have been utilized for the launch of the three spacecraft, it is highly possible that the three were launched from the original two pads earlier available at Baykonur for the RD-107A-C carrier rocket launched missions. SOYUZ 8 may have been launched on Monday, Oct. 13, from the same pad used for SOYUZ 6 only 48 hours before. There is evidence that the RD-107 rocket may have a minimum pad time of less than 24 hours.

All three SOYUZ came down inthe Karaganda-Akmolinsk corridor within a triangle footprint whose base was approximately 15 miles and extending approximately 70 miles to the northeast.

The launch, orbit, near and preliminary-to-docking rendezvous, duration in orbit, and recovery, are all basic and primary pre-requisites to any planned program of assembly in Earth orbit of various modules for extending and projecting the capabilities of cosmonauts in the near-Earth, cislunar or interplanetary regimes.

Soyuz Group Flight Objectives. The Soviets stress two major objectives for the triple SOYUZ mission--1) the demonstration of simultaneous flight control by Earth and in-flight command (SPACE Daily, Oct. 15) and, 2) an evaluation of the cosmonauts' ability to manually control the spacecraft independent of Earth control.

The stressing of manual control by the cosmonauts is a new one for the Soviet program which in the past has repeatedly emphasized and relied mainly on automatic control. The "chief designer" said last week that: "This group flight by three spaceships has as its aim to further work out the crafts' systems as well as the methods of controlling them; also perfecting the command and measurement complexes... It is much more difficult to control three crafts than one or two. It requires preliminary organizational work and training."

The chief designer added: "The experiment is a long-term one. There will come a time

when large groups of spaceships will fly in space for research aims. Our second task is to ascertain new possibilities of the SOYUZ series craft."

The three SOYUZ spaceships carried out more than 30 maneuvers which provided new challenges to the seven orbiting cosmonauts and the ground control: The maneuvers introduced "as always happens, unforeseen situations" which were "new for both the cosmonauts and the control center." The maneuvers involved those controlled by ground control and those which the cosmonauts performed without command from ground control.

The chief designer, explaining this development of extended cosmonaut control, said: "Whatever the level of automation might be, the primary role in controlling (manned spacecraft) remains in the hands of men. This is not a question of man opposed to automatic devices, but a search for more rational ways of making complex use of human possibilities and automatic equipment."

Evidence of Space Station Attempt Lacking. Regardless of the disappointment evident in many reports which earlier had speculated that the Soviets would construct a space station during the SOYUZ group flight, there yet is no evidence that the mission was anything less than a success and a major milestone for the Soviet program.

The SOYUZ spacecraft, even if all three had joined together, could not fill the role of a space station. The SOYUZ spacecraft's Earth orbit staytime is only 10-20 days, as a direct function of the limitation of the consumables aboard. Further, the orbit used for the triple mission was a short duration orbit, safety oriented and programmed for early natural decay.

The SOYUZ must yet demonstrate that it has as much capability for endurance as the GEMINI spacecraft which acquired a record of almost two weeks in orbit with two astronauts almost four years ago. Also, the Soviets have not demonstrated a manned spacecraft endurance capability necessary to complete even a 6-7 day circumlunar mission.

SOYUZ has demonstrated an attractive capability for an initial space shuttle system necessary for initial space station development. The precision in launch and in recovery, demonstrated by the recent flights, may also have improved further the winter manned spaceflight activities capability. Last winter, for the first time, manned missions were launched in mid-winter, with the launch of SOYUZ 4 and 5 in January.

Now facing a Soviet program reaching for the implementation of its first space station and flights of its cosmonauts to the Moon is a demonstration of the integration of the RD-107C/SOYUZ combination with the capabilities of a non-manrated lunar ZOND-type carrier rocket.

The Soyuz Missions

SOYUZ 1	4/23/67- 4/24/67	124.9/139.2 miles, 51.7 deg., 88.6 min., 26.6 hrs.
SOYUZ 2	10/25/68-10/28/68	115.0/139.2 miles, 51.7 deg., 88.5 min., 70.8 hrs.
SOYUZ 3	10/26/68-10/30/68	127.4/139.8 miles, 51.67 deg., 88.6 min., 94.85 hrs.
SOYUZ 4	1/14/69- 1/17/69	107.5/139.8 miles, 51.7 deg., 88.25 min., 71.23 hrs.
SOYUZ 5	1/15/69- 1/18/69	124.3/142.9 miles, 51.7 deg., 88.7 min., 72.76 hrs.
SOYUZ 6	10/11/69-10/16/69	115.6/138.9 miles, 51.7 deg., 88.36 min.,118.7 hrs.
SOYUZ 7	10/12/69-10/17/69	128.6/140.4 miles, 51.7 deg., 88.6 min.,118.68 hrs.
SOYUZ 8	10/13/69-10/18/69	127.4/138.6 miles, 51.7 deg., 88.6 min.,118.68 hrs.

PENTAGON CITES DECLINES IN DEFENSE BUSINESS

Defense Secretary Melvin Laird announced yesterday that the Pentagon's anti-inflation budget reductions are taking effect. He cited the following results of the DOD's budget cutting campaign:

---Total military prime contract awards are the lowest since September 1965. (He noted that missile and space system spending has declined less sharply than other areas such as aircraft, weapons and ammunition, and electronics and communications.)

---Gross obligations being incurred by DOD are the lowest in three years.

---Industry obligations incurred for defense are the lowest since Sept. 1963.

---Unfilled defense orders are the lowest since 1967.

---Employment in defense industries is the lowest since June 1967.

---Weekly man-hours in defense industries and average overtime show "tendencies toward a slowing down."

MILITARY EFFECTS OF ATMOSPHERE PHENOMENA TO BE STUDIED

A program to study physical and chemical processes in the upper atmosphere--with particular emphasis on controlled or inadvertent modifications and geophysical parameters that have potential military significance--is being readied by the Air Force Electronic Systems Division.

The program will involve the release of chemical payloads to study the effects of controlled perturbations on the ambient ionospheric structures. Experiments will be designed to learn more about natural or uncontrolled disturbances--with application to early warning, penetration aid and over-the-horizon programs.

AF WANTS HIGH ENERGY PROPELLANT

Letters of interest are being sought by the Air Force for development and test of a practical high-energy propellant--aluminum hydride defluoramino. Emphasis will be placed on scale-up of processing and cure, stabilization of propellant by a novel means and improvement of shelf life. Ballistic properties are to be characterized in motors of up to 50 pounds. Contracting is being directed by the Rocket Propulsion Laboratory at Edwards AFB.

ECI CONTRACTED FOR COMMAND/SATELLITE RADIO

Fabrication of advanced development models of a UHF command/satellite transceiver will be carried out by Electronic Communications Inc. under contract to the Air Force Avionics Laboratory. The system could serve as a basic command radio and as an airborne satellite terminal. Functioning in the 225-500 MHz range, it will have a 100-watt output in the FM band and 25 watts in the AM band. The 30-pound unit will occupy some 750 cubic inches. Design goal of 2000 hours mean time between failure.

JOHNS HOPKINS GETS $6.8 MILLION FOR SURFACE MISSILE STUDY

Two contracts totaling $6.8 million have been awarded to Johns Hopkins Applied Physics Laboratory by the Naval Ordnance Systems Command for continued advanced research on surface missile systems.

LTV AWARDED ADVANCED ELECTRICAL POWER SYSTEM STUDY

NASA-Houston is contracting with LTV for a study of advanced spacecraft electrical power systems using solid-state circuit breakers.

SOVIETS LAUNCH OPERATIONAL MONITOR REPLACEMENT

The Soviet Union has launched on schedule its October replacement for its operational satellite network which may be using its sensors for gathering military intelligence as well as for monitoring solar radiation.

KOSMOS 303, launched Saturday, October 18, from Plesetsk, is expected to replace KOSMOS 295, launched on August 22, and had been anticipated (SPACE Daily, Aug. 26). An overlap of approximately 30 days is provided in the system, with each satellite having about a 90-day operating lifetime. KOSMOS 303's replacement would be launched sometime in December.

KOSMOS 303 is the 15th mission in a program that was initiated on March 17, 1967. It is the 6th mission of the program to be launched this year, one of which was either a new development flight or a malfunction. The satellite is the 859th world space mission and the 371st by the Soviet Union. A total of 55 missions have been orbited by the Soviet Union in 1969, as compared with 57 for the same period last year.

COMSAT'S REVENUES UP/PROFITS DOWN

For the first nine months and third quarter of 1969, the Communications Satellite Corp. recorded increased revenues but decreased profits from the similar periods last year. The company's income from satellite operations, however, was up in the nine-month period.

For the nine months, the company had a net income of $4,947,000 equal to $. 49 a share on operating revenues of $33,528,000. A year ago, earnings were $5,054,000 or $. 50 a share on revenues of $21,821,000. Income from satellite operations increased from $795,000 to $843,000. The remainder of profits came from interest.

In the third quarter of 1969, net income dropped to $1,446,000 or $. 14 a share, from $1,750,000 and $. 17 a share, while revenues increased to $11,760,000 from $7,569,000. Net operating income was $128,000, compared to $237,000 a year earlier.

At Sept. 30, a total of 1364 full-time circuits were being leased, an increase of 522 over the 842 circuits being leased a year ago. Atlantic traffic accounts for 859 of the current circuit lease total, Pacific, 505.

SPACE MANUFACTURING CONFERENCE OPENS TODAY

A two-day conference on space processing and manufacturing opens today at Marshall Space Flight Center. Some 250 government, industry and educational officials are expected to attend the meeting, with more than 30 technical papers to be presented.

MARTIN RECEIVES $19.3 MILLION FOR PERSHING

A $19. 3 million contract for development of the PERSHING missile and power station is being awarded to Martin-Orlando by the Army Missile Command. The contract covers a 33-month period.

NAVY ORDERS STUDY OF CVAN SELF-DEFENSE WEAPONS

Vitro Laboratories has been selected by the Navy for a five-month study to determine optimum self-defense weapons for CVAN attack carriers. Contract was let by the Naval Ordnance Systems Command.

COMSAT ADVANCES SATELLITE TV PLAN

Would Supplant A.T.&T. as Prime Carrier of Shows in Bid to Ease Congestion

By JACK GOULD

The Communications Satellite Corporation has informed the White House of its immediate readiness to construct and operate a domestic satellite television system that would serve commercial and noncommercial TV networks and ease the mounting congestion in the nation's communications facilities.

James McCormack, chairman of Comsat, successfully appealed to Clay T. Whitehead, special assistant to President Nixon, to declassify the plans so that he could discuss its details this week with the presidents of the Columbia Broadcasting System, the National Broadcasting Company, the American Broadcasting Company and the Corporation for Public Broadcasting. The meeting may be held on Wednesday, probably in New York.

Stanton Proposal

A major feature of the Comsat plan would be to supplant the American Telephone and Telegraph Company as the prime carrier of TV shows from coast to coast, but Dr. John V. Charyk, president of Comsat, predicted that the utility's ground relay facilities would be quickly occupied by other communications requirements.

Mr. McCormack went to the White House after learning last Wednesday morning tthat Dr. Frank Stanton, president of C.B.S., would recommend that evening that the TV industry construct its private satellite relay system rather than submit to the demands of A. T. & T. for an increase of $20,000,000 a year for the distribution of TV shows.

Even before Dr. Stanton spoke before the Audio Engineering Society at the New York Hilton, A. T. & T. issued a statement of its corporate position, saying that it was not immediately intereested in constructing a new domestic satellite and suggesting that it would be "wise public policy" to entertain applications from all comers.

A. T. & T. has been the prime relayer of broadcasting material since radio's earliest days and its unexpected statement clearly augured a major electronic upheaval in American communications.

A. T. & T. is known to be sensitive over consumer complaints about the efficiency of its existing service to individual subscribers and business concerns. The company was said to be anxious to correct that condition beforee assuming new and highly complex ventures.

At the White House, Mr. Whitehead agreed to the declassification of the Comsat plan, originally submitted on Sept. 8, with the proviso that its contents be made known only to the broadcast presidents meeting with Mr. McCormack. Neither Comsat nor the TV networks would divulge or discuss the text, but a copy was obtained through other sources in Washington after the declassification.

Told that the plan had become independently known, Dr. Stanton said that the Comsat proposal had appealing financial features.

The networks would be spared the initial construction investment, which he had placed at about $100-million, and relieved of the cost of training maintenance crews.

In New York, the passive A.T. & T. attitude was explained by a high official on the ground that the thousands of miles of cable and microwave facilities now leased on a wholesale basis to the television industry might be used on a retail basis for individual customers. The earnings potential was described as possibly greater than the $65-million a year sought from relaying TV.

The chief feature of the Comsat plan would be to enable all users of a domestic satellite system to gain direct access to the system without going through the established commercial carriers ,a policy that applies to the international use of satellites.

Eliminating the so-called "middleman" and his charges would make Comsat a full carrier in its own right and able to offer its domestic service not only to TV but to press associations, cable television networks if they are eventually authorized, and other industrial users. If the ground facilities of A.T. & T. should become overcrowded, Dr. Charyk told the White House, Comsat would be in a position to lend a helping hand in carrying long-distance calls.

With the present state of satellite communications techniques, Comsat believes the domestic system could carry with reliability 14 TV channels, any one of which would be available to handle simultaneouly as many as 1,800 telephone calls in an emergency.

Both domestic and international political considerations entered yesterday's developments. Isolated objections have been voiced to network domination of a private satellite television system, although Dr. Stanton had specifically acknowledged that the system would be open to all rivals. Comsat, on the other hand, is a private organization chartered by Congress.

Ironically, A.T.&T. holds an excess of 20 per cent of Comsat stock but the shares are also widely held by the public.

Dr. Charyk specifically observed that transfer of United States domestic traffic to a United States domestic satellite system would lead to reduced ownership dependency on Intelsat, the international group controlling satellites in global use.

This step, he said, would alleviate foreign concern over United States domination of space communications, a sore point with many countries lacking the economic and technical resources for launching satellites.

The COMSAT plan dovetails closely with many of the hopes of the commercial networks and of the possible users.

For the efficiency of the whole system, COMSAT said that it believed it should own those ground stations that would send and receive signals to and from satellites. These might be placed in or near strategic cities generating the largest volume of television programs or other informational matter. For broadcasters

interested only in receiving programs from the satellites, the operation could be a matter of choice, with either the owner or the satellite service assuming the job of maintenance.

The Comsat plan stresses that there will be continuing need for ground communication facilities, such as those operated by A. T. & T. But the corporation adds that not many more years can be wasted in putting into operation new space facilities capable of coping with the expected deluge of computerized data transmission, facsimile and other forms of recorded materials, as opposed to TV programs intended for general public consumption.

OUT

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Box 8 (Jackie's labels), Folder "Telecommunications (Domestic Satellites) October 1969-December 1969"

3) Chart, hand-annotated "Domestic Satellites," with footnotes, 9 pp., "Confidential"

AGENDA

DOMESTIC SATELLITE WORKING GROUP MEETING

OCTOBER 17, 1969

1:00 p.m. - Room 401

1. Discuss interactions between Technical and Economic Committee reports.

2. Consider the structure and content of a final report by the Working Group.

3. Discussion of replies to Mr. Whitehead's letter of August 19, 1969 to industry and other non-government groups.

4. Establish schedule for submission of draft report to the Working Group.

5. Announce date of the next meeting of the Working Group.

W. E. Kriegsman
Executive Secretary

Tone - This is a general memo commenting on Morris's paper.

The 2nd page discusses the problems of establishing a Bell subsidiary and an alternative solution. If it needs further clarification please call me.

Ron Gabel

MEMORANDUM

THE WHITE HOUSE

WASHINGTON

October 16, 1969

FOR Tom Moore

FROM Richard Gabel

SUBJECT Draft Report - Economic Committee, Domestic Satellite

On Page 40, et seq, there is a discussion of the importance of switching costs in the public message services. The statement that "approximately 80% of average overage costs is attributable to switching costs" is erroneous. The most recent available breakdown of telephone plant investment in the interstate public message service was supplied by AT&T in FCC Docket 16258 (Staff Ex. No. 25). The data indicates that about 15% of total public message investment consists of dial and manual switching systems. A breakdown of the information is shown in the following table.

DISTRIBUTION OF INTERSTATE MESSAGE TOLL INVESTMENT FOR BELL ASSOCIATED COMPANIES, 1969 BY MAJOR PLANT CLASSES:

Land and Buildings	13.3
Circuit Equipment	27.6
Local Dial Switching	5.0
Other Switching	10.0
Station Equipment	13.9
Exchange Outside Plant	14.5
Toll Outside Plant	13.4
General Equipment	2.3
	100.0%

The inference drawn in the succeeding discussion is that major reductions in transmission costs will have minimal effect on overall costs of message toll service. The opposite is the case. Transmission costs, including the associated overheads of land and buildings, make up close to half the total costs of interstate message toll service. Satellite technology should be viewed as a significant potential competitor for long-haul message services just as microwave supplanted "K" carriers.

At Page 23, the draft paper proposes that AT&T be required to establish a separate domestic satellite operating company. This proposal is intended to accomplish the objective of permitting balanced competition, preventing cross-subsidization; in reality, it will operate as an anesthetic, dulling policy into an appearance of activity, hence accomplishment. The satellite is basically a transmission medium. It must be pieced out with landline transmission facilities, in some instances, and almost invariably with local distribution facilities to provide a complete end-to-end customer service. Since 1956 (the outset of the private line case), the FCC has sought to obtain a breakdown of investment categories and related expenses by service classifications. It still has not succeeded. The reasons are manifold: tariff nomenclature is designed to conceal not enlighten; regulatory philosophy encourages pricing on a "value" rather than cost basis; facilities are employed interchangeably for many service classifications so that the identification of plant investment by service is like hitting a moving target. All these, as well as other problems, converge under conditions of partial competition where two companies compete for a market in a given service offering, and one of the companies is in a position to provide the entire offering, while the other only a segment of the facilities. The motivation for obscuring and re-defining costs becomes compounded.

As an alternative proposal, it is suggested that we explicitly recognize the difficulty, if not impossibility of resolving costs and avoiding cross-subsidization of services. Then, deny the right of satellite companies to provide terrestrial plant for private line services, and conversely, deny the irght of terrestrial carriers to furnish satellite services for private line services. Both groups would have offsetting obligations: (1) non-discriminatory access by way of lease of facilities to each other; (2) obligation to interconnect; (3) obligation to provide facilities and service at established points of connection. This proposal will clearly not eliminate the possibility of cross-subsidization -- the message toll ratepayer may still bear a portion of private line telephone costs. It

would only ensure that the landline carrier would not also be the beneficiary of advantageous satellite costs and leave the satellite firm in a market position to execute whatever cost advantages and innovations he can develop with the new technology. Since the demonstration program is only contemplated for an initial period of say, 5 years, and the AT&T Company has said they see no immediate economic advantages of satellite transmission, the company could not reasonably lament being excluded from a field which, their studies indicate, has no immediate economic advantage over terrestrial services.

On page 20, "all three networks have sufficient resources to develop a system." This is questionable. The gross assets of the three major networks, you note elsewhere, is about $257 million. A risk venture of the order of $100 million for any one of the three companies is probably an excessive undertaking. Rephrase as: The combined efforts of the major networks will probably find adequate resources to develop a system.

On page 24, the reference to "prohibiting any entity from using more than two orbital slots" was agreed for modification. The significant parameter is the number of degrees of angle of satellite radiation. While the reference in the text is primarily to AT&T, the principal of maintaining some freedom of access of the more desirable orbital position is still worth retaining. The objective might be obtained if the Commission were to deny a single entrant from occupying more than 5 degrees of consecutiveorbital radius. The possible design penalties which such prohibitions could entail is warranted for the economic objective.

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. . . from the editors

See page 207

Donald

SPACE BUSINESS Daily

FIRST DAILY MANAGEMENT NEWS SERVICE FOR THE MISSILE / SPACE INDUSTRY

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Thursday, October 16, 1969 Page 206 11th Year, Vol. 46, No. 33

ALASKA TO INITIATE EXPERIMENTAL DBS-TV SYSTEM SOON

The way has been cleared for the state of Alaska to initiate an experimental direct television broadcast satellite (DBS-TV) system, possibly within the next thirty days.

At the request of Sen. Mike Gravel (D-Alaska), NASA has agreed to allow use of its orbiting ATS-1 satellite for the experiment, which will involve broadcast of educational television to four areas in Alaska, with particular emphasis on reaching the state's native population. With an estimated one-year lifetime remaining, the ATS will be made available to Alaska for about two to six hours a day.

For the experiment, the state hopes to install 42-foot antennas at Fairbanks and Kodiak, and 16-foot antennas at Fort Yukon and Nome. RCA Alaska Communications Inc. has agreed to provide one of the 42-foot antennas free of charge, and Alaska is asking the Communications Satellite Corp. to provide a second 42-foot antenna which ComSat has stored in Manila. The state also hopes to have the two 16-foot antennas donated for the experiment.

Senator Gravel has been urging the establishment of an operational Alaskan television broadcast satellite as part of a U. S. domestic educational television system utilizing satellites.

USE OF SATELLITES FOR COMMERCIAL/EDUCATIONAL TV URGED

The establishment of a satellite system for transmitting commercial and educational television programs to broadcasting stations around the country has been recommended by Dr. Frank Stanton, president of CBS.

Stanton proposed that a "broadcast satellite corporation"--jointly run by the three major television networks--be established to operate the satellite transmission system, which he said could be in operation by 1972. Stanton said the satellite system would also provide channels free of charge to educational television broadcasters.

The CBS president estimated that the system would cost approximately $100 million, with each network putting up one-third of the cost.

The new satellite system would replace conventional telephone line transmissions of television programs in the continental U. S., Stanton said, adding that his proposal was prompted by projected increases in telephone line charges by American Telephone & Telegraph Corp., which will cost the networks an estimated $20 million next year.

PRESIDENT TO GET DOMESTIC SATCOM REPORT SOON

President Nixon is expected to get a staff report in the next few weeks on the use of satellites for domestic communications.

The Communications Satellite Corp., established as the U.S. communications entity for worldwide satellite communications, has long asked authority to run a domestic satcom system, but there has been no decision by the Federal Communications Commission. (See SPACE Daily, June 17.) Meanwhile, other organizations--such as the television networks--have been asking for permission to set up their own domestic communications satellite.

The White House study on domestic communications satellites has been underway for just over a month now by a small working group headed by Clay T. Whitehead, a Presidential staff assistant.

BLAGONRAVOV SAYS MANNED FLIGHT IS ESSENTIAL

Academician A. A. Blagonravov said recently that "the active participation of a man studying space ought to be recognized as essential." The Soviet scientist said that while automatic flights "must of necessity" precede manned exploration, there are problems in space research where the solution can be obtained only by man.

The chairman of the USSR Academy of Sciences Space Research and Utilization Commission said the exploration of Mars and the search for forms of life on the planet needs the participation of man in order to obtain reliable data.

Blagonravov said that automatic spacecraft can "detect and register only indications of life, while with the help of television transmissions from the Martian surface one can assemble certain notions as to its biological forms. But," he adds, "this information will be incomplete and fragmentary. Reliable data about the forms of life on planets will only be received with the direct participation of a man in the flight."

DEEPER CORE SAMPLES SOUGHT ON APOLLO 12

NASA will probably use a redesigned core tube on the APOLLO 12 Moon landing mission next month in order to get deeper samples of lunar soil with less disturbance to the sample. Use of the deeper core instrument has been recommended by the Soil Mechanics Investigation Team at NASA-Marshall, headed by Dr. Nicholas Costes. The Investigation Team is charged with learning as much as possible about lunar soil mechanics to help plan and design future activities on the Moon, including projects such as lunar roving vehicles.

ROHM & HAAS TO STUDY BMD PROPULSION

Army Missile Command is planning to contract with the Redstone Research Laboratories of Rohm & Haas for a feasibility and performance analysis of Ballistic Missile Defense (BMD) propulsion.

12TH MINUTEMAN III TESTED

The Air Force launched its 12th MINUTEMAN III at 0416 PDT yesterday from Vandenberg over the Western Test Range. It was the 4th test from Vandenberg. The 11th MINUTEMAN III test was completed on September 24 from Cape Kennedy (SPACE Daily, Sept. 29).

SOYUZ 6 NEARS SOVIET MANNED ORBIT RECORD

SOYUZ 6, apparently playing a minor role in its flight with SOYUZ 7 and 8, will mark up a new, if not sensational, Soviet record if it stays in orbit past 4:00 PM Baykonur Time (7:00 AM EDT) today. It will then have stayed in orbit more than the record holding VOSTOK 5, piloted by Lt. Col. Valeriy Bykovskiy, which totaled 119. 1 hours in space in mid-June 1963.

The United States holds the record for the longest manned flight, attained by GEMINI 7, with Frank Borman and James A. Lovell Jr., in December 1965, when it stayed in orbit for 330.58 hours.

Yesterday, all three SOYUZ spacecraft were orbiting under manual control with at least SOYUZ 7 and 8 in visual contact. The crew of SOYUZ 8 "observed the maneuvering and orientation to the Sun of the spaceship SOYUZ 7."

The day before, on Tuesday, in the second day of the group flight, SOYUZ 7 and 8 performed close maneuvers, including passing and repassing each other twice. They orbited within 500 yards of each other while SOYUZ 6 observed.

SOYUZ 6's initial orbit was changed from 115. 6/138. 9 miles (186/223 kilometers), 51. 7 degrees, 88. 36 minutes, to 120. 6/142. 9 miles (194/230 kilometers), 51. 7 degrees, 88. 6 minutes, shortly after SOYUZ 7 was launched into orbit on Sunday, Oct. 12, and not during SOYUZ 6's 32nd revolution, as earlier reported (SPACE Daily, Oct. 15).

It is noted that the latest SOYUZ orbits, regardless of any advancement of experiments being performed, are still remaining relatively close to the original SOYUZ 1 and subsequent SOYUZ orbits. The SOYUZ missions, their initial orbits, and durations:

SOYUZ 1	4/23/67- 4/24/67	124. 9/139. 2 miles, 51. 7 deg., 88. 6 min., 26. 6 hrs.
SOYUZ 2	10/25/68-10/28/68	115. 0/139. 2 miles, 51. 7 deg., 88. 5 min., 70. 8 hrs.
SOYUZ 3	10/26/68-10/30/68	127. 4/139. 8 miles, 51.67 deg., 88. 6 min., 94. 85 hrs.
SOYUZ 4	1/14/69- 1/17/69	107. 5/139. 8 miles, 51. 7 deg., 88.25 min., 71. 23 hrs.
SOYUZ 5	1/15/69- 1/18/69	124. 3/142. 9 miles, 51. 7 deg., 88. 7 min., 72. 76 hrs.
SOYUZ 6	10/11/69-	115. 6/138. 9 miles, 51. 7 deg., 88.36 min., -
SOYUZ 7	10/12/69-	128. 6/140. 4 miles, 51. 7 deg., 88. 6 min., -
SOYUZ 8	10/13/69-	128 /139 miles, 51. 7 deg., 88. 6 min., -

SOYUZ Cosmonauts

SOYUZ 1	Col. Vladimir Komarov (Pilot of VOSKHOD 1) Killed in flight
SOYUZ 2	Unmanned target for SOYUZ 3
SOYUZ 3	Col. Georgiy Beregovoy
SOYUZ 4	Lt. Col. Vladimir Shatalov (Returned with Yeliseyev and Khrunov)
SOYUZ 5	Lt. Col. Boris Volynov, commander Aleksey Yeliseyev, flight engineer (Transferred to SOYUZ 4) Lt. Col. Yevgeny Khrunov, research engineer (Transferred to SOYUZ 4)
SOYUZ 6	Lt. Col. Georgiy Shonin, commander Valeriy Kubasov, flight engineer
SOYUZ 7	Lt. Col. Anatoliy Filipchenko, commander Vladislav Volkov, flight engineer Lt. Col. Viktor Gorbatko, research engineer
SOYUZ 8	Col. Vladimir Shatolov, commander (Pilot of SOYUZ 4) Aleksey Yeliseyev (Engineer of SOYUZ 5, returned with SOYUZ 4)

MORE

The Soviet Union has orbited a total of 21 cosmonauts, three of which have made two flights, during 15 manned missions in 8-1/2 years.

SOYUZ 8 was the 856th world space mission and the 368th by the Soviet Union. It was followed into orbit by INTERKOSMOS 1-2, launched Tuesday, Oct. 14 from Aktubinsk-Kapustin Yar (SPACE Daily, Oct. 15), bringing the total number of Soviet missions in 1969 to 53, as compared with 55 for the same period last year.

The launch of the INTERKOSMOS satellite, which contained instruments built by the Soviet Union, Czechoslovakia and East Germany for the study of solar radiation, was directed by a group of Soviet, East German and Czechoslovakian specialists. Observer countries include Bulgaria, Hungary, East Germany, Rumania and Czechoslovakia.

The satellite launching at the scientific site, not far from the Volga River, was observed by representatives of the participating countries. The first INTERKOSMOS (KOSMOS 261) was launched from the northern military cosmodrome at Plesetsk.

SOVIET SEES DIFFERENCE IN U.S./SOVIET SPACE PROGRAMS

Dr. Vladimir Denisov of the Soviet Academy of Sciences said this week that the Soviet and United States space programs, once following the same course, are now taking different directions.

Denisov said that "during the first years of space building the Soviet and United States goals were similar. Today they differ in the problems they tackle and the methods by which these problems are solved. The Soviet space probes lay stress on automation, since unmanned vehicles are cheaper and are capable of transmitting information from areas where it is either difficult or impossible to send men. The Soviet Union consistently tests new space vehicles capable of long manned flights."

SOVIET CITES BENEFITS OF EARTH RESOURCES SATELLITE

Use of orbiting Earth satellites for various observations of the Earth's resources promises immense benefits in the future, according to Kirill Kondratyev, a member of the Soviet Academy of Sciences.

He said satellites could be used to: 1) survey and forecast such natural phenomena as hurricanes, floods and dust storms; 2) forecast high water by observing and distinguishing between snow and ice caps; 3) determine soil conditions and related phenomena for evaluating harvests; and, 4) observing and locating optimum fishing areas.

Kondratyev cited two examples of the ability of space cameras/sensors: 1) He said photographs from ZOND 5 taken at 55,900 miles made it possible to make much more exact geobotanical and geomorphological maps of Africa; and, 2) He disclosed that Soviet satellite cameras had been able to see to the bottom of a 164-foot deep transparent lake in Central Asia.

The Soviet scientist noted that photography of geological and geographic objects is in the program of Soviet spaceships SOYUZ 6, 7 and 8.

LTV AEROSPACE NAMES MISSILE/SPACE DIVISION ASSISTANT

LTV Aerospace Corp. has appointed Lawrence M. Weeks as vice president and assistant to the president of its Missiles and Space Division. He has been with IBM's Electronics Systems Center.

Under a recently announced reorganization (SPACE Daily, Oct. 1), LTV Aerospace plans to establish three major subsidiaries--Vought Aeronautics Corp., Synetics Inc. and LTV Education Systems Inc. --with Dr. Gerald M. Monroe, president of M&SD becoming president of Synetics. That firm will include M&SD, the recently created Kinetics International Division, and Kentron Hawaii Ltd.

LTV Aerospace will offer up to 1.8 million shares of its common stock plus cash in the reorganization. The company has 3.55 million shares of common stock and 3.239 million shares of Class B (common) stock outstanding. Ling-Temco-Vought Inc. owns 1.08 million shares of the common stock.

BOEING LRV WEIGHS 910 POUNDS

The Lunar Roving Vehicle (LRV) designed by Boeing weighs 910 pounds fully loaded with a two-man crew and experiments (or about 150 pounds on the Moon). Boeing is competing with Bendix for development of four LRV's, with contractor selection expected soon.

The open-cockpit, buggy-like LRV designed by Boeing will ride on four wire-mesh wheels powered by separate electric motors. The motors are operated independently to guarantee that a power failure on one or more of the wheels won't affect the driving power. Power is supplied by chemical batteries which may be recharged on the Moon. GM's AC Electronics Division is teamed with Boeing on the LRV bid, and recently received a $50,000 NASA contract to design and build wheels for a lunar surface vehicle (SPACE Daily, Oct. 14).

The first LRV is scheduled to be carried to the Moon aboard the Lunar Module of the APOLLO 17 mission in September 1971. The LRV will have a top speed of about 10 mph and will travel up to 18 miles within about a 3-mile radius from the LM. The vehicle will be left on the lurain.

FORMER AMES DIRECTOR TO RECEIVE GUGGENHEIM MEDAL

H. Julian Allen, director of NASA's Ames Research Center until last year, has been selected to receive the 1969 Daniel Guggenheim Medal, awarded annually for notable achievement in the advancement of aeronautics.

To be presented Oct. 21 during the AIAA's Annual Technical Meeting at the Anaheim Convention Center, the medal cites Allen "...for personal contributions to outstanding research and development leading to vastly improved reentry bodies, missiles, satellites and spacecraft, and for leadership in directing and inspiring a large group of research men at Ames Laboratory.

GD GETS TACTICAL MISSILE STRUCTURES STUDY

Naval Air Systems Command is contracting with General Dynamics/Pomona for a study of the structural dynamic properties of tactical missile joints. Award is based on an unsolicited proposal.

GOVERNMENT CONTRACTING TO BE FEATURED AT EIA MEETING

Six panel discussions on various aspects of government contracting will be featured at the Fifth Annual Meeting of the EIA's Government Procurement Relations Department to be held Nov. 2-4 at the Camelback Inn, Scottsdale, Ariz. Sen. Barry Goldwater (R-Ariz.) will address the meeting at a dinner on Nov. 3.

The panel programs will cover: uniform cost accounting standards; management systems; independent R&D; Defense Contract audit agency, contractor, defense contract administration services; cost principles in ASPR Section XV; and the data, copyright and patent areas-software and hardware.

Government officials participating as panelists will include William A. Newman Jr., special assistant to the comptroller general of the U.S.; B.B. Lynn, deputy director of the Defense Contract Audit Agency, David H. Moran, director-management systems control in the Office of the Secretary of Defense, and George Vecchietti, director of procurement for NASA.

BOEING SAYS IT CAN SELL 500 SST'S BY 1990

The United States can sell 500 Supersonic Transports (SSTs) by 1990--representing more than $20 billion of the total acticipated SST market of $25 billion--according to Boeing Co., prime contractor for the proposed aircraft. The firm said that about 270 of the 500 U.S. SSTs would be purchased by non-U.S. airlines.

Boeing estimated that peak employment during design, development and test of two prototype SSTs will be about 20,000, growing to about 50,000 during the production program, with a peak annual payroll of half a billion dollars.

ITEK FINANCES UP FOR NINE MONTHS

Itek Corp. recorded increases in both sales and earnings for the first nine months of 1969 but said its government operations have not reached the levels anticipated earlier in the year. Government contract backlog at Sept. 30 was $61.8 million, compared with $88.4 million a year earlier.

Nine month sales jumped from $89.7 million last year to $110.4 million this year, while net income reached $3 million or $1.30 a share from $590,000 or $.26 a share a year ago.

Third quarter profits were $1 million or $.45 a share on sales of $32.5 million, which compares with earnings of $630,000 or $.28 a share and sales of $29.7 million. (The firm also had a non-recurring income of $645,000 or $.28 a share last year.)

NERVA ENGINE WEIGHT PUT AT TWENTY THOUSAND POUNDS

The NERVA I nuclear rocket engine will weigh about 20,000 pounds, including a shield of some 3000 pounds. Thirty-four feet long and 10 feet in diameter (largest point), the engine will contain a 1500-megawatt reactor with a core diameter of about 3 feet. Design goal of the engine is a specific impulse of approximately 825, which compares to about 450 for the best chemical rocket engine.

SCIENTISTS WOULD LIKE TO RETRIEVE SURVEYOR CAMERA

If the APOLLO 12 astronauts can get to the SURVEYOR III spacecraft (See SPACE Daily, Oct. 2 and 14.), the most significant item to be retrieved is the spacecraft's television camera, according to Dr. Edward T. Hawthorne of Hughes, former manager of SURVEYOR.

He pointed out that the camera contains small motors and gears and certain metals and lubricants which should offer good data on the effects of exposure to the lunar environment. Other objects of interest include the scoop portion of the digger; a section of the aluminum insulation blanket; a thermal switch; a section of solar panel; and the tip of the omni-directional antenna. Hawthorne noted that the retrieval program will also provide information on the survivability of micro-organisms.

NASA hopes the APOLLO 12 Lunar Module can land from 500 to 1200 feet from SURVEYOR III, which rests at 2.94 degrees south latitude and 23.34 degrees west longitude on a 10-degree slope about 150 feet from the lip of a small crater. The unmanned lunar satellite landed on the Moon April 19, 1967.

ABMDA LETS DISCRIMINATION/WAKE STUDIES

The Army's Advanced Ballistic Missile Defense Agency is awarding contracts to: 1) Concord Research Corp., for discrimination system studies; 2) TRW, for a wake velocity study; and, 3) Syracuse University Research Corp., for study of a "sidelobe canceller (SLC) program."

AF WANTS HARDENED SOLAR CELL STUDY

Air Force Materials Laboratory is planning to contract for a study of manufacturing methods for the production of integral cover-slipped radiation-hardened silicon solar cells. Letters of interest are due Nov. 3 at the Deputy for Engineering, W-P AFB, Ohio.

FAIRCHILD GETS F-14 CONTRACTS TOTALING $90 MILLION

Fairchild Hiller Corp. has received contracts totaling $90 million from Grumman for production of aft fuselage sections, tail fins and integrated armament control systems for the Navy's F-14 air superiority fighter.

ERC LETS MICROELECTRONICS STUDY

NASA's Electronics Research Center is ordering a study to identify critical problem areas in the microelectronics field from Moore-Peterson Associates, Washington, D. C.

AMC CONTRACTS FOR SMALL MOTOR CASES

Design and manufacture of small diameter rocket motor cases will be carried out by United Technology Center under a contract being negotiated with the Army Missile Command.

MICROCIRCUIT MANUFACTURING FIRM ESTABLISHED

J. W. Microelectronics Corp., a new company organized to design and build thick film hybrid circuits for the electronics industry, has opened for business in Philadelphia. The firm is headed by J. J. Williams Jr.

Domsat

Thursday 10/16/69

3:40 Per Tom's request, called Mrs. Vermillion of McGraw Hill Publications and told her that we have taken the informal position that we are treating all the letters we receive as privileged; therefore we could not make them public or comment on them in any way.

Reporters

Thursday 10/16/69

12:50 Lds Vermillion (McGraw Hill) would like a call. 737-6630
Has talked with Hale Montgomery of the Public Affairs Office at Comsat about the letter Comsat sent to you. He suggested she call you -- as it is your letter. Says she doesn't know how you feel about reporters, but whatever you want to tell her, she'd appreciate it.

Preliminary Draft 10/16/69

TECHNICAL ASPECTS OF

DOMESTIC SATELLITE COMMUNICATIONS

A Report by the

Technical Committee

of the

Domestic Satellite Working Group

CONTENTS

I. SUMMARY

The principal conclusion reached by the committee is that technical considerations, though of great importance in the detailed engineering, operations and economics of particular systems, are not controlling with respect to basic policies governing the ownership or mode of operation (single or multi-purpose) of such systems. Specifically, the committee concludes that:

Multi-purpose vs. Single-purpose Systems

-- technically, there is little choice between multi-purpose and single-purpose operation of present day communication satellites; these are merely broad-band relay stations, inherently capable of handling voice, data, or video signals with equal facility;

-- there are, however, technical differences in the design and operation of earth stations for multi-purpose and single-purpose operations; e.g., use of receive-only stations for program distribution vis-a-vis transmit/receive stations and greater time-sharing opportunities in multi-purpose systems;

-- these technical and operational differences lead to both economies of scale and offsetting economies of specialization; the committee has no adequate basis for determining which of these -- if either -- will dominate.

Within the Presently Allocated 4 and 6 GHz Bands

-- available spectrum and orbital resources are adequate to accommodate several U. S. domestic satellites, which could, in turn, be part of one or several domestic satellite systems;

-- it should be technically feasible to site from one to several transmit/receive earth stations capable of working with these satellites in or near most urban centers; the exact number and location would be a subject for detailed engineering studies on a case-by-case basis;

-- it should be technically feasible to site a much larger number of receive-only stations in the same areas without harmful interference, particularly if users of satellite distribution services were willing to accept a higher level of co-channel interference than do present radio-relay system operators.

Future Trends and Opportunities

-- Future growth in the demand for communication services via satellite (fixed, mobile or broadcast) are expected to create the need to accommodate additional satellites and associated earth station facilities in the U. S.

-- Future technological developments should make possible more intensive use of existing spectrum allocations as well as the effective use of other frequency bands, to accommodate the growth in demand.

-- It is technically feasible for future satellite systems to use certain other frequency bands not now available to such systems, on either a shared or exclusive basis. Plans for expansion of spectrum resources for satellite services are presently well advanced, and will be the subject of the Space World Administrative Radio Conference to be convened in mid-1971 under the auspices of the International Telecommunications Union.

I. INTRODUCTION

With the development of geo-stationary orbit capability and the demonstration of communications relay techniques utilizing satellites in this orbit, a new era opened for long-distance communications. This capability was soon utilized on an operational basis internationally through INTELSAT and its potential for augmentation of domestic telecommunications capability has been the subject of wide interest. But the use of domestic satellite systems poses a number of challenges because of the comprehensive nature of the existing domestic telecommunications network, international interactions, uncertain economics, and lack of policy guidelines. Nevertheless, there are a number of entities presumably ready to establish various types of domestic satellite systems.

Technical considerations which limit the ability to accommodate one or more of these proposals are important as a basis for informed policy decisions to enable timely introduction of domestic satellite services. Policy decisions on the introduction of satellites must also take into account potential future requirements and must not unduly restrict or foreclose expansion of these services if this expansion is in the public interest. For these reasons, a Technical Committee of the Domestic Satellite Working Group was established. This Committee was asked to identify and evaluate the importance of those technical factors which affect (1) the uses, numbers and types of domestic satellite systems, (2) operation of these systems, and (3) their related economics.

While the committee did not limit its deliberations to particular communication services nor to short-term issues, it recognized the urgent need to provide guidance for immediate policy decisions dealing with the introduction of satellite for primarily fixed (i.e., point-to-point and multi-point) long distance services. Accordingly, important questions relating to the use of satellites for mobile and broadcast services were not treated in detail. The committee urges that these potential uses be kept in mind, and that further study be given to the technical, economic, and policy issues involved.

Because of the limited time available, the Committee has based its conclusions on work already completed and reported elsewhere and on the technical judgment of its members. Where uncertainties exist, the Committee has attempted to identify additional work that needs to be done. The Committee constructed a number of specific questions which were intended to span the range of technical points of interest in this study, and use the answers to these questions as background for the conclusions and recommendations of the report. The questions and the detailed answers are included as Section IV.

II. TERMINOLOGY

This report is only concerned with use of "satellite communication systems" for domestic purposes, including communications handled by the fixed, mobile, and radionavigation services as well as wire or cable networks, etc. The distribution of signals destined for redistribution to the public either by broadcasting stations or by microwave relay, wire or cable networks is included. Domestic communication satellite systems may have one or more interfaces with international systems.

Where "multi-purpose satellites" are discussed, the term refers to the use of a single communication satellite for the purpose of providing many different types of communications. For example, a given multi-purpose satellite might be used simultaneously for transmission of any mix of data, voice messages, telegraphy, television distribution or broadcasting, radionavigation signals, aeronautical mobile radio service, etc. Although a multiplicity of services may be provided by multi-purpose satellites in domestic satellite systems, some services may be precluded from certain frequency bands as a matter of International Regulations or U. S. policy. For example, multi-purpose satellites operating in the 4 and 6 GHz bands may operate only in the communication-satellite service as that service is defined nationally and internationally.

"Single-purpose satellites" are those satellites which are used for a single type of communications. For example, single-purpose satellites could provide services like television and radio distribution or data exchange or TV and voice broadcast.

III. CONCLUSIONS

A. Technical Feasibility

1. General

The committee concluded that demonstrated capability exists for the establishment of domestic satellite systems compatible with the terrestrial communications network, and compatible with other projected requirements on the geo-stationary orbit. With proper system design - modulation technique, frequency, satellite orbital location, operating rules, ground station siting and antenna capability - a small number of domestic satellite systems may be accommodated. The number of systems which can be accommodated will depend upon the characteristics of the systems in question, e.g., numbers and location of satellites and earth stations, antenna directivity, band width considerations, etc.

The committee concludes that technical constraints are not the controlling factor in policy decisions governing authorization of initial domestic satellite systems.

2. Specific

Assuming the use of 30 foot antennas at earth stations, it appears that at least 16 common frequency satellites in the 4 and 6 GHz bands could be accommodated within the portion of the geo-stationary orbit simultaneously visible from the contiguous 48 states. Under these conditions, several U. S. domestic satellites can be accommodated in addition to planned Canadian or other Western Hemisphere domestic and international satellites. Only five of the possible 16 satellites would be properly located in the

orbital arc to provide simultaneous coverage to all fifty states instead of to only the 48 contiguous states. Service to Puerto Rico can be provided by any satellite capable of serving the 48 contiguous states.

It should be technically feasible for radio relay networks and communications satellite systems, each potentially involving large numbers of stations, to share the same 4 and 6 GHz frequency bands. In order to share these frequency bands, careful siting of earth stations and terrestrial stations will be required.

Although it is technically feasible to site earth stations at major urban areas in the U. S., certain communication hubs will require special attention and may involve significant additional costs.

B. Frequency Allocations

The amount of electromagnetic spectrum presently available within the bands at 4 and 6 GHz is adequate for initial domestic uses (500 MHz in each band). It is technically feasible to share the two 500 MHz space communication bands at 7 and 8 GHz which are not now available to commercial communication-satellite systems. Whether or not sharing should be permitted in these bands is a policy matter not within the scope of this report. Present national policy is that they should not be shared for national security reasons.

It also is technically feasible to share other bands both above and below 10 GHz which are not now available for use by satellite communication systems due to treaty restrictions. Significant growth in the demand for domestic satellite communication services will

create requirements for additional frequency spectrum allocations. In anticipation of such a development, the allocation of additional spectrum space should be and presently is being discussed within the U. S. organizations concerned. Plans for expansion are presently well advanced. There will be a world radio conference dealing with this matter in mid-1971, under auspices of the International Telecommunication Union.

C. Regulation

The Committee has concluded that regulatory control be exercised regarding any domestic satellite system, including establishing procedures, standards, and regulations concerning frequency sharing, earth station antenna locations, antenna directivity, effective radiated power, maximum permissible interfering signals, and frequencies employed. For the space segment, regulations are needed to govern satellite spacing and station keeping antenna directivity, effective radiated power and frequencies employed.

Sharing criteria at present are conservative, but further work on interference mechanisms at the various relevant frequencies and under a diversity of weather conditions will be required before significantly better criteria can be established.

It will be desirable to set the minimum performance capability of earth station antennas to ensure accommodation of an adequate number of satellites for western hemisphere use, but exceptions may be necessary to accommodate special requirements, e. g., in the 4 GHz band, receive-only earth stations smaller than approximately 30 feet can be used with no penalty in terms of

numbers of satellite accommodated, if a slightly lower grade of service can be accepted. Special situations such as stations in remote locations may make such compromise desirable. Use of less than 30 foot antennas for transmitting in the 6 GHz should be considered only in exceptional circumstances.

D. Implications of New Technology

New technology is becoming available in design and operation of both satellites and earth stations that will improve reliability, quality of service and promise better economics. New techniques appear to be approaching maturity (narrow multiple-beam, larger EIRP, better earth antennas) that will permit better utilization of limited orbital space and allocated spectrum now available.

The eventual use of frequency bands higher than the 4 and 6 GHz bands will allow progressively smaller earth station antennas to be used without penalty, both for reception and transmission, since antenna directivity improves directly with increasing frequency.

New technology is also becoming available in terrestrial systems and this technology will be influencing the relative attractiveness of satellite systems for many uses within the contiguous 48 states. At the present time it is not possible to predict with confidence what the mix of satellite and terrestrial services will be in the future. No strong trend favoring one or the other technology can be identified, and there is expected to be a mixture of both services in the future.

E. Technical Criteria

1. System integration. Domestic communications satellite systems which are compatible with the national telecommunications system would have a long-term benefit to private and Government users in both quality and economy of services. There is, however, uncertainty as to the extent of benefit and accordingly care should be exercised in introducing this new technology into the domestic telecommunications scene. Technical limitations should not restrict integration of satellite systems with the domestic terrestrial communications network.

The importance of added "time delay" introduced by use of satellites will require further evaluation in the domestic communications environment.

2. System reliability. The pace of satellite communications technology indicates a steady growth in satellite reliability. Continued advances can be expected.

A variety of techniques are available to assure high reliability, e.g., in-orbit spares and component redundancy.

3. Tracking, Telemetry and Control. Deployment of satellite systems reques the availability of a network of earth stations equipped with a TT&C sub-system. The TT&C sub-system is used to control the injection of satellites into geostationary orbit, to maintain stationkeeping and inclination, to reposition the satellite, and to maintain technical control of the operational elements of the satellite. Potential system managers should give early consideration to requirements for adequate TT&C support for domestic satellite systems.

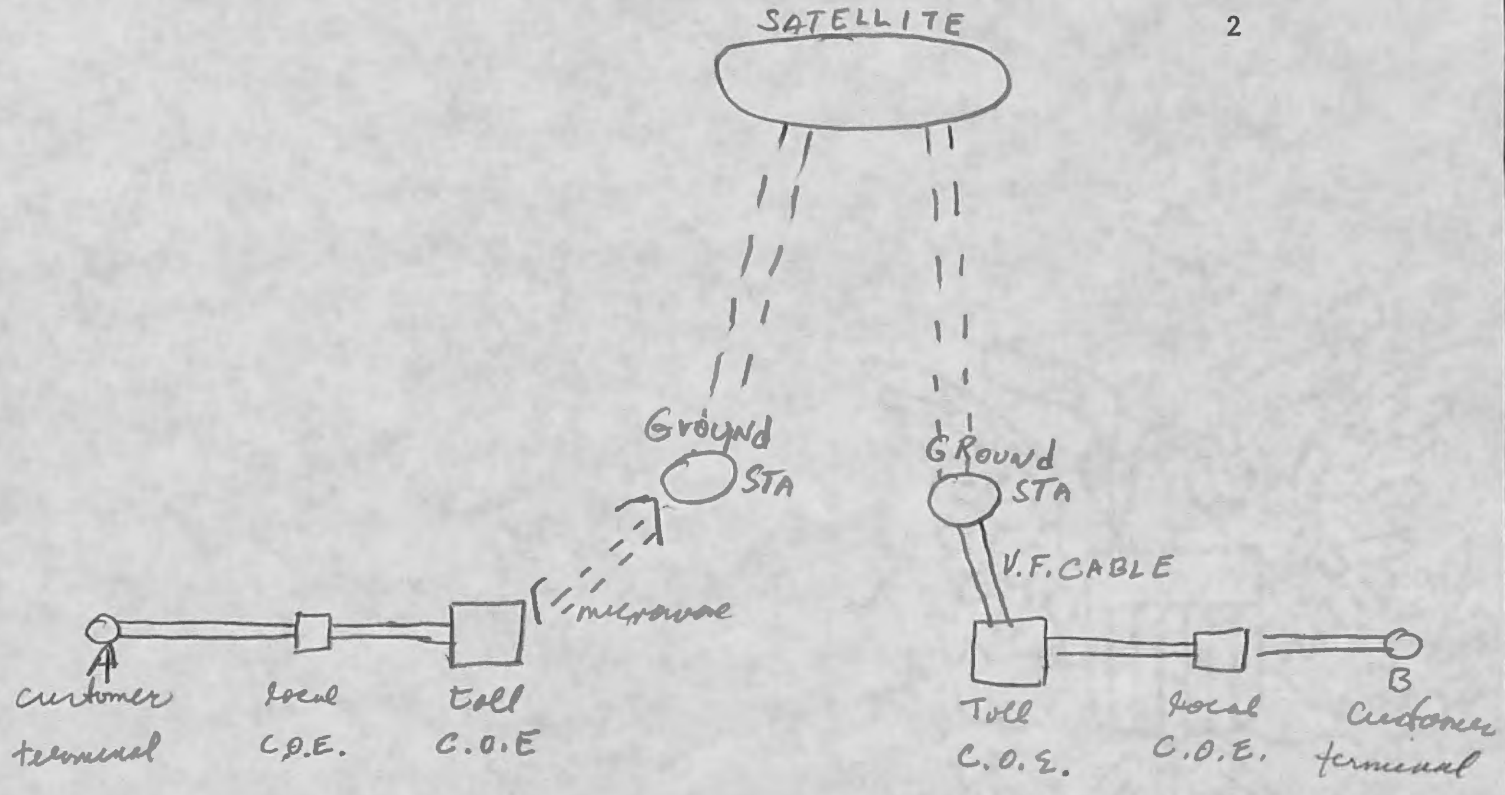
10-16-69 R. Gabel

Discussion of Cost Ascertainment for Communications Services Under Conditions of Terrestrial Facility Monopoly

The draft report of the Economic Committee, Domestic Satellite Working Group, has proposed the creation of a separate subsidiary of A.T. & T. to provide satellite service for the carrier. The reason for the separate corporate subsidiary is to permit identification of satellite investments and thereby prevent cross-subsidization of service classifications. Identification of satellite investment can be readily achieved without a separate subsidiary; it is commonplace for the Commission to order separation of specific plant accounts either under an Accounting Order for temporary purposes, or as a permanent segregation of investments, as was done for the company investment in satellite ground stations. The objective of seeking to prevent cross-subsidization of service by creation of the subsidiary will not be attained by this organizational step. The real problems are no different, with or without a new affiliate. It is the purpose of this paper to examine what some of these problems are. For discussion purposes, these will be treated as (a) problems of identification, (b) problems of tariff construction and (c) the nature of costs.

Problems of Identification

To simplify the illustration, let us assume the provision of a standard private line voice facility from customer A to customer B by means of satellite and the route taken for passage of a public message toll call between the same termini (Schematic below)



Schematic Showing Physical Routing of Private Line Voice Service and Public Message Service from Customer A to B Utilizing Satellite Transmission.

Note that in the transmission of both kinds of traffic a local loop (a pair of distribution wires) is provided from the customer location to his local central office. Cost identification begins here. There are numerous kinds of local distribution plant--various cable gauges, several forms of exchange carrier with varying unit cost by type. In general, all these facilities can be employed interchangeably for the private line voice or public message loop. Further, these facilities do not remain constant once service is established but may be interchanged or substituted by other facilities with the passage of time. None of the carriers maintain a cost record by customer installation or service classification. For internal and inter-company settlement purposes an average loop plant cost is calculated. However, for regulatory and rate-making purposes the carriers prepare what is termed a "special study" using these average loop costs as a fulcrum. The modification to average loop costs is justified by logical considerations: shorter or longer average distances for a specific service classification, judgment factors introduced by company engineers that better or lower than average quality (cost) facilities are necessary for a specific service classification, etc. While extensive legerdemain is employed by the carriers in this costing operation, depending on "competitive necessity" and "market characteristics," it is physically impossible for regulatory staff or competing suppliers to adequately scrutinize the results.

Returning to the schematic. Both the public message loop and the private line loop will normally terminate in a local central office. A message toll call will utilize portions but not all of the local switching systems; the private line facility may pass through at voice frequency but utilizes a segment of those office facilities, including power supply, trunk termination bays, marker groups, senders, etc. Without entering into the detailed complexities, some of the obvious difficulties can be discussed here. The equipment employed for the different kinds of traffic is fully interchangeable in some instances; unique for certain kinds of traffic elsewhere. The components for which investment is sought is frequently much narrower than the units of property for which cost records are maintained. Compromise and approximation is called for. Where average unit costs are available, they may be inappropriate, or depending on carrier motivation, deemed so. Most equipment items are installed in reasonably larger quantities. Average location costs are the quotient derived from dividing total investment by working plant items. When the study is undertaken proximate to installation date of the equipment, there is usually considerable excess equipped capacity which is non-working. Here average costs will be higher relative to examination after growth has taken place. Discretion as to what costs to employ remain with the study company. While nominally subject to regulatory audit, the feat is impossible to accomplish meaningfully. We are considering here nationwide services. In one recent rate proceeding involving an interstate

communication service two staff members of the FCC visited the New York Telephone Company (1 of 24) to spot-check facility investments. They were courteously led to a room of 74 cabinets where the work-papers were carefully stored and requested to help themselves. The magnitude of these studies is easily overlooked. For the conduct of nation-wide rate investigations, Bell normally disengages several hundred engineers and accountants from each of the Associated Company operations, prepares extensive written instructions as well as supplementary oral directions. (It looks much easier from the outside.)

Moving on from the local office (Schematic) it can be seen that a local trunk is provided from the local central office to the toll switching office for the private line voice service and the public message call. Again we have the problems of assignment and identification of a moving object. The trunk plant is useable interchangeably for both service classifications, has quite wide variation in unit cost depending on the age, length and type of facility employed. A predatory competitor has ample opportunity for finding low costs in service offerings which are characterized by existing or latent competition, and conversely in a monopoly market condition.

The costing operation at the toll switching office is subject to many of the same infirmities discussed above with respect to the local central office. The identification and costing of the facilities used for private line services will vary widely depending upon the transmission medium employed. In the illustrative schematic, it is assumed that the

satellite ground station serving customer A is connected by means of microwave radio, and the ground station at B is connected to its toll office by voice frequency cable. Costs will vary from about $250 for circuit mile for copper open wire to about $20 per mile for TD-2 microwave. The results will vary depending on the objective of the cost study.

The private line case took place in the pre-competitive era (1954-1960). At the time the Bell System sought to justify its then prevailing three dollar a mile charge for interexchange private line voice facilities. Although, at the time, open wire made up about one percent of all Bell System transmission facilities, the inventory taken for costing purposes disclosed that nearly a fourth of private line voice services were being rendered by this means. Following the Commission's decision in the "Above 890 MC." case, opening the radio spectrum to private users, a competitive era began. In direct consequence, the telephone company filed its so-called Telpak tariff which reduced changes for private line voice services to as low as $.19 a mile. The company prepared numerous cost studies in justification of these filed changes. By coincidence, the service was rendered almost completely over coaxial cable and microwave radio, the least costly transmission plant and practically none utilizing open wire. The Commission Order in both the private line and Telpak proceedings discussed this aspect of cost development but did not effectively challenge the results in either.

Examine the possibilities of cost manipulation where say, Bell and a second entity were providing competitive satellite transmission. Following past regulatory convention and the A.T. & T's own stated objective, uniform rates for private line services would be tariffed, regardless of mode of transmission, landline or satellite. The costing of its connecting transmission plant would be found to be the lowest cost, technologically most efficient. (In practice, of course, the cost study would encompass all private line voice grade services independent of location.) Theoretically, whatever mileage rates are established would be applicable to all customers. In practice, it might not work to the equal advantage of the second competing carrier. Primary technical conditions, other than proximity of adequate Bell facilities, may govern the location of satellite ground stations, e.g., minimum radio interference, distance from radiant devices employing adjacent frequencies, etc. If requested to construct long lines facilities to accommodate a customer's requirements, "special construction" charges apply and the standard tariff is no longer applicable. As the U.S. Government has found repeatedly under similar situations, a heavy dose of "value of service" always seems to be injected into special construction charges.

Up to this point we have discussed Bell connecting plant. What of the identification of costs of the satellite and associated ground station investment? The total satellite investment can readily be identified and isolated. It can be done no more readily under a separate operating subsidiary as within the existing corporate structure. This is not the problem. The satellite channels are wholly interchangeable for private

line or public message voice services. Do we prorate total costs in proportion to the working channels in use? the number in use and reserved for growth? What if there are different rates of growth? Transponder design may vary for a number of reasons, with differing cost impact on the separate transponders. Against which services do we assess the low or high cost transponder units? We will find an innumerable number of small judgments necessary in order to develop separated costs. These judgments, vouschafed for by competent Bell engineers, will each appear logical and perhaps impervious to scrutiny. Nevertheless, the total result will appear illogical. On the other hand, we may find the channel costs of the Bell satellite assigned to the separate services well in line with those demonstrated by its erstwhile competitor. However, Bell terrestrial costs for the competitive, private line services turn out to be below the satellite charges. This will uphold Bell's contention, set forth in recent correspondence, that with present technology, it does not find significant economies of satellite transmission as against landline transmission.

The foregoing discussion may be an unduly lengthy introduction into the problems of cost allocation in the communications industry. Suffice to say that up to now regulation has not cured the principle of service cross-subsidization; only ameliorated its extent. Bell motivation for extension of historic practice will be compounded under the threat of a viable competitor using an advanced technology. The creation of a separate Bell satellite subsidiary is no cure, the same difficulties will arise in another organizational context.

(Move to Follow

SECTION III: Conditions ~~on~~ of Entry

In principle, a policy of open entry appears the most effective in promoting innovation, economy, and learning in the use of domestic satellites. This presupposes, ~~of course~~, that potential entrants are somewhat comparable in terms of capital resources, market penetration and/or control, and public policy support. The domestic communication industry, however, represents no such balanced structure, being dominated so overwhelmingly by one entity -- AT&T -- that without appropriate guidelines "open entry" could ~~be little more than an empty phrase~~ in fact mean entry of only AT&T.

The ~~wealth~~ gross assets of AT&T and the associated operating companies of the Bell System is about $~~40~~ 43 billion, making it the largest corporation in the world; by comparison, the largest potential other entrant (the three TV broadcast networks) have a combined ~~worth~~ assets of only $257 million -- the inclusion of all local TV broadcast stations would raise this to only $13 billion. Furthermore, AT&T provides through its terrestrial long-lines network over 90% of all long-distance communication services (public and private); through the local operating companies, it also controls over 95% of the local distribution facilities, the use of which are essential to many long-distance services. Finally, this position of AT&T is largely the result of a long-standing public policy that the public message telephone service, representing 90% of AT&T's operation -- and by implication, many other communication services as well -- represent a "natural monopoly" subject to public regulation rather than private competition.

Whether one endorses or challenges the rationale of this policy, its mere existence and threat of continuation poses a serious impediment to other potential entrants.

To ensure that AT&T -- or for that matter any other entity -- not enjoy an unfair advantage as a result of prior policies or entrenched position, several possibilities emerge as potential conditions on entry:

(1) Bar AT&T From Entry - AT&T would not be permitted to own or operate domestic satellite systems, on the grounds their entry would automatically discourage other potentially innovative entrants and thereby further extend their monopoly control of both public and private communication systems. AT&T would, however, be authorized to lease satellite transmission services from other entrants; and those entrants providing for-hire services in competition with AT&T (but not dedicated user systems) would be required to lease to AT&T.

(2) Require AT&T to Establish Separate Domestic Satellite Operating Company - AT&T would be permitted to own and operate a domestic satellite system, but only through a separate company geared exclusively to this function, charged with competitive procurement practices, and not subject to rate-base regulation. It is envisioned this would prevent unfair domination of the satellite hardware market by Western Electric, force AT&T to be innovative and cost-competitive in its satellite operations, and prevent cross-subsidization of this function from other Bell operations.

(3) Require that All Specialized (i. e., Private versus Public) Service Offerings be Provided Through a Separate Non-Regulated Company - AT&T -- as well as any other entity -- would be required to establish separate operating companies for public and private communication services (however provided), as a condition on entry into domestic satellite operations. The definition of private services would encompass all services except the basic public message telephone service; specifically, TV distribution, private line service, switched data exchange networks, video-conferencing and picturephone, etc. Companies providing private services (whether owned by AT&T or others) would be authorized to lease transmission service from the public message telephone network on equal terms (including rates and interconnection arrangements), but would not be required to serve or interconnect with one another even when operating as specialized (i. e., private) common-carriers.

It is envisioned this would either prevent cross-subsidization of private services by public users of the basic telephone network, or at worst result in equal and identifiable subsidization of all private services whether provided by AT&T or others. Either way, it would place the providers of private services -- for which satellite technology appears most attractive in any event -- on an equal footing and thereby promote entry and cost-saving innovation in at least this part of the communications field. It can be argued that this would also be reflected in the public telephone "natural monopoly" service as well.

In order to evaluate both the merit and probable efficacy of these alternatives, it is necessary to consider telecommunication operations, economics, and regulation in some detail. The following sections will address several specific problem areas, and attempt to relate these to the entry options described above.

A. The Cross-Subsidization Problem: As noted previously, AT&T now provides nearly all the domestic long-distance communication services, both public and private. Of these, the only truly "public" service, i.e., a service of direct social and economic benefit to the general public, is the public telephone service. Private line services, though available to any potential user on a non-discriminatory basis, are provided primarily to serve specialized business, governmental, and commercial needs above and beyond the basic telephone service. The same is true of television distribution, data exchange services, and forthcoming picturephone and video-conferencing services. However, all these services (public and private) are provided by AT&T over common or at least partially shared transmission and routing facilities.

The public telephone service is by far the largest service offering, representing nearly 90% of AT&T's total operations. Private services generally share facilities with the public telephone service on a time-available basis. Given the enormous size and complexity of the public telephone service and the network operations which provide this service,

the FCC -- and indeed AT&T itself -- openly acknowledge the impossibility of properly allocating costs among the various public and private service offerings. Therefore, it is impossible to determine whether, and to what extent, private services are subsidized by public services. Due to the disparity in service magnitude and revenues, even a minute rate of cross-subsidization can have enormous impact on private rates.

Under these conditions, any attempt by an independent operator to compete with AT&T for private services would be foolhardy, regardless of any cost-reducing innovations or market strategy. For example, AT&T recently acknowledged that its revenue from TV distribution is only half what is needed to be compensatory, based on its own admittedly questionable cost allocation procedures. Thus, without prior FCC awareness, the public message telephone service was apparently subsidizing 50% of the cost of television distribution; even the proposed new rates will not be fully compensatory. Yet, this subsidization was possible with essentially no impact on public telephone rates, since the total video and audio distribution service represents only $80 million of AT&T's $13,308 million total operating revenues (1967 figures). On the other hand, a competitor faced with the knowledge that AT&T might (inadvertently or otherwise) underprice its program distribution service by a factor of two (with no harmful overall effects) would be well advised to remain on the sidelines.

A ban on AT&T ownership and/or operation of domestic satellite services would not materially alter the situation described. Even though a potential competitor for TV program distribution found domestic satellites very attractive, both operationally and economically, he would probably need to beat terrestrial costs overwhelmingly -- by perhaps 5:1 or greater -- to be sure that inaccurate cost allocation within the AT&T package of services did not beat him on rates.

Similarly, a requirement that AT&T operate satellites as a separate, unregulated venture would not alter the situation. Cross-subsidization between different transmission technologies is not the issue -- it is cross-subsidization between complete service offerings, particularly public to private. Given its large existing terrestrial network, AT&T would be fully justified in using a mix of satellite and terrestrial facilities for its program distribution service, whatever their relative start-up and operating costs. Thus, even if they were sluggish to innovate or operated the satellite system at a loss, their rates could still be less than those of either a specialized TV carrier or dedicated system, due to misallocation of costs in the terrestrial facilities alone. On the other hand, it would be quite inappropriate to insist that AT&T provide TV program distribution exclusively via satellite, since terrestrial links may indeed be more economic in some situations.

A requirement that AT&T set up a separate company to provide private services represents a direct, rather than circuitous, attack on the cross-

subsidization problem; in fact, the domestic satellite issue would serve only as the occasion rather than the basis for such a requirement. Under this constraint, AT&T would be permitted to operate either a public or private satellite system -- or both. Since the private services company, operated without regulatory support or constraint, could also lease transmission capacity (satellite or terrestrial) from the parent organization, AT&T would not be inhibited in any way from exploiting satellite technology for both public and private services. However, since other private-service operators could also lease AT&T transmission capacity on an equal basis -- for whatever specialized private service offering they have to make -- it would serve no useful competitive purpose for the parent organization to underprice its transmission services for private use. While some underpricing might still result from the cost allocation problem this would not inhibit competitive entry or continuing innovation, as would underpricing in a single multi-service operation.

THIS IS NOT FCC POSITION (Not cleared)
JUST COMMON CARRIER BOARD VIEWS

The satellite technology provides a new and exciting departure for the handling of domestic communications within the United States. We believe that this new technology should be fully exploited without artificial restraints or limitations. Individual initiative in devising and exploiting new and different systems should be encouraged. The technology should, therefore, not be constrained by conventional modes or organizations, nor should it be forced into existing molds. On the other hand, we recognize that completely free and unlimited entry into this field is impossible. This is so because of,(a) the relative limitation of the orbital slots available to provide service throughout the continental United States and still take due account of the present and foreseeable needs of our neighboring countries and INTELSAT; (b) the limited share of the spectrum available on a shared basis for satellite communication.

Accordingly, we believe that, within the limits imposed by the foregoing constraints, there should be relative freedom for those willing to make the investment and undertake the risk, to procure, launch, and operate satellite services, provided an appropriate showing is made that there will be an efficient and economical use of the frequencies assigned, no undue interference with other satellite or terrestrial services and that a public interest function will be served.

In line with relatively free entry, we believe that regulatory activity should be devoted to the assurance of [redacted]e efficient spectrum use, prevention of discrimination, and the availability of required types and standards of service at reasonable charges.

DRAFT

MEMORANDUM TO THE FCC

Communications via satellite represents one of the most striking technological by-products of this nation's space program. Already we have seen this technology applied to international communications needs, with dramatic success. At the same time, the service and economic potential of satellites for domestic uses have become increasingly apparent.

The policies and rules governing establishment and operation of domestic communication satellite (domsat) facilities will have a profound and lasting impact on potential manufacturers, suppliers and users of communication services, independent operators, and the public interest. The Administration considers it imperative that these policies permit the freest possible interplay of ideas, technology, and economics within the private sector. Regulatory and policy concern should be limited to those non-economic considerations which significantly affect the public interest.

One non-economic issue which engendered considerable debate during the FCC's domestic satellite inquiry (Docket 16495) had to do with the technical feasibility and electromagnetic compatibility of Domsat facilities. Our studies show, however, that such technical considerations

are not of controlling importance in this proceeding. Specifically, we have found that:

-- existing spectrum allocations at 4 and 6GHz can be used extensively by both Domsat and terrestrial radio relay facilities without harmful interference, provided normal coordination and sharing criteria are observed.

-- these allocations are adequate to accommodate all foreseeable proposals for initial Domsat systems plus Canadian and/or Intelsat requirements, with ample margin for short-term growth in systems and/or services.

-- additional frequency allocations now being cleared through the International Telecommunications Union will accommodate ~~any long-term~~ projected growth in Domsat requirements.

Based on these findings, we believe policies governing ownership and operating arrangements for Domsat facilities can be established without concern for the technical issues.

Since the technical question of resource allocation is not controlling, our principal public policy concern is that three basic public interest objectives be effectively pursued. The first objective is to ensure that entities providing communication services of major public benefit directly to the public (e.g., public message telephone and telegraph

exchange services) have both the freedom and the incentives to exploit communications satellite technology wherever it is operationally and economically attractive. The second objective is to encourage innovation and efficiency in the provision of new or improved communication services to meet the special needs of business, industry, and Government, as well as unique public communications requirements. The third objective is to minimize the need for continuing economic regulatory controls of Domsat operations, maximize the opportunities for the private sector to resolve economic matters directly, while at the same time preventing anti-completive practices.

To some extent, these objectives contain built-in conflicts, due largely to past policies and regulatory practices and the resultant structure of the domestic telecommunications industry. For example, the right to own and operate Domsat facilities without restriction might provide common-carrier suppliers of public message services the greatest freedom and incentives to use satellite technology; but the admixture of such public message services with specialized, potentially competitive services can lead to anti-competitive conditions (e.g., cross-subsidization, interconnnection barriers, procurement barriers, R & D subsidization, etc.) which would prevent effective completion and innovation to evolve. On the other hand, while competition is considered more conducive to innovation and efficiency than is monopoly, any suggestion of competition

in the provision of public message exchange services -- long protected as a "natural" monopoly by public policy -- must now be dismissed due to the sheer magnitude of investments involved.

We have evaluated a number of potential guidelines for the establishment and operation of initial Domsat facilities. These ranged from completely open entry to selection of a chosen instrument for all Domsat operations. The most practical and effective guidelines for meeting the objectives cited, we are convinced, would be the following:

(1) Permit only those entities providing public message exchange services (switched telephone and/or telegraph) to establish and operate Domsat facilities (satellite and earth stations) to be used in the carriage of this class of traffic.

(2) Permit ~~only those entities who do~~ any entity which does not provide public message exchange services ~~-- e.g., specialized carriers, independent operators, common-user cooperatives, public institutions, etc. --~~ to establish and operate Domsat facilities to be used in the carriage of other than public message exchange traffic.

(3) Authorize those carriers providing both public message exchange and specialized services to lease Domsat transmission services from specialized carriers for their specialized service offerings, and require such specialized carriers to provide such

services as available at reasonable rates and on a non-discriminating basis.

(4) Authorize both specialized carriers and private Domsat system operators to lease local interconnection service to Domsat earth stations and among local users of their service, from local telecommunications utilities; and require such utilities to provide these services at reasonable rates and on a non-discriminating basis.

(5) Limit the Commission's review of applications for Domsat facilities to ensuring that:

(a) the above guidelines are observed;

(b) the proposed facilities met the Commission's technical standards, rules and regulations;

(c) the operator was financially responsible and able to carry through the proposed development;

(d) rates and service offerings of carriers were just, reasonable, and non-discriminating; and

(e) spectrum and orbital resources were,in fact, available to accommodate the facilities, and the amount of such resources required did not exceed 25% of the total spectrum/orbital capacity potentially available to the United States.

Domsat

October 15, 1969

To: Jerry Warren

From: Tom Whitehead

Attached are copies of my memorandum to Rosel Hyde and his reply.

Domsat

October 15, 1969

To: Jerry Warren

From: Eva Daughtrey

Per your discussion with
Tom Whitehead.

Copy of the 8/19/69 letter sent
to industry re domestic satellite
communications.

Comsat

October 15, 1969

To: Herb Klein
Jerry Warren

From: Tom Whitehead

There apparently is going to be a fair amount of interest stirred up by the story in the New York Times this morning regarding CBS's plans in the communications satellite area. We have a White House study under way. I have been in contact with most of the industry, and, if you get any inquiries, please check with me.

(MESSAGE PHONED TO THESE TWO OFFICES)

Dom577

Monday 10/13/69

4:00 Another telecommunications meeting has been set for Friday (10/17) at 1:00 p.m. in Rm. 401.

Cong.

10/10/69

To: Mr. Flanigan

From: Tom Whitehead

Thought you should
answer this.

Cong.

October 10, 1969

Dear Mr. Gravel:

Your letter for the President regarding the Communications Satellite Corporation has been referred to me for further consideration. We are indeed pleased to have your views. As you point out in your letter, the communications industry is very complex and very interconnected. The Communications Satellite Act of 1962 tried to grapple with many unknowns in setting up the Communications Satellite Corporation. It is entirely appropriate that seven years later we review the role of satellite communications within the United States and internationally, and consider whether or not any changes may be appropriate. The Act has been very successful in providing for rapid introduction of satellites into international communications, and this has been of great benefit in tieing the United States to the rest of the world.

Be assured that we are giving your views serious consideration.

Sincerely,

Peter Flanigan
Assistant to the President

Honorable Mike Gravel
United States Senate
Washington, D. C.

cc: Mr. Tobin
Mr. Flanigan
Mr. Whitehead ✓
Mr. Kriegsman
Central Files

CTWhitehead:cd

October 7, 1969

Dear Mike:

Thank you for your letter to the President in further reference to the matter of Alaska Satellite communications.

I know the President will be interested in having your additional views on this matter and you may be assured they will be given careful consideration.

With warm regard,

Sincerely,

Kenneth R. DeLeu
Deputy Assistant to the President

Honorable Mike Gravel
United States Senate
Washington, D.C.

bcc: w/incoming to Clay Whitehead for FURTHER ACTION

KRDeLeu:VO:ro

Thursday 10/2/69

3:10 Checked with Eloise Frayer re the letter to the President dated 9/26 from Sen. Mike Gravel re Comsat and Alaska Communications. 2317

She indicated the mail room received it last night; they just got the letter today. Mr. BeLieu will send an interim reply and will send the letter on to you for further draft reply.

Received 10/1/69
in Tod's office

1 Sept 69

United States Senate

MEMORANDUM

Dr. Clay T. Whitehead
The White House

Tom,

F.Y.I.

B. W. Poirier

MIKE GRAVEL
ALASKA

United States Senate

WASHINGTON, D.C. 20510

September 26, 1969

The President
The White House
Washington, D.C.

Dear Mr. President:

At the moment the White House has several study groups mobilized to grapple with the domestic satellite issue, the Alaska satellite requirement, and Alaskan communications generally.

I would like to bring to your personal attention some existing deficiencies. I hope you will insure that your study groups not overlook appropriate corrective action. It is extremely important that this be done in a timely manner to avoid any agreements within the International Communications Satellite Conference (INTELSAT) which would be detrimental to the United States or to any region of the United States.

The complexity of the issue precludes a detailed presentation in this letter, but a few major elements should be identified. A brief discussion will illustrate their impact on the issues and on the public's right to finally be blessed with the rewards of its investments in space research.

I feel confident your review will bring you to the conclusion that:

- the Communications Satellite Corporation is unmanageable in its present form with industrial competitors on its board of directors.

- the Communications Satellite Corporation, as now chartered, cannot serve as an international agent and act simultaneously as a responsive and successful domestic institution.

- the United States should assure that the eventual INTELSAT agreement will not impede full and free utilization of satellite technology for domestic regional or domestic national public communications.

- the widest public access to educational and public broadcasting is the highest priority in the land for domestic applications of satellite communications.

In reviewing the hearings that led to enactment of the Communications Satellite Act of 1962, the record reveals the difficulty of legislating a new technology about which so little was then known. The main thrust was to instrumentalize American leadership in international application of the new science. Today we can look on the Act with far more expertise.

The Communications Satellite Corporation (COMSAT) has been seriously hindered by foreign governmental interests in lucrative submarine cables and their inflated profits. COMSAT has on its board of directors industrial representatives of competitors who have often litigated in opposition of COMSAT. It is little wonder that public COMSAT stockholders have not enjoyed a return on their investments. Moreover, the American public which paid for the research leading to this science has yet to enjoy continuous domestic benefits.

Yet the United States by its Memorandum of Understanding with India of September 18, 1969, will provide domestic services to that country by 1972 through a NASA satellite. Without quarrelling with the generous and reasonable India project, it is paradoxical that the United States has not been able to cope with her own applications.

The domestic issue has been permitted to stick in a quagmire of competitive, vested interest of network broadcasters and communications carriers. The profit-criteria has dominated the issue through devices of international commitments, technical regulations and other machinations to keep the issue boiling in uncertainty.

This national dispute is impacting disastrously on critical needs of our society for public, cultural telecasting and for scholarly exchanges between our academic institutions. It delays vitally needed solutions for certain regions such as Alaska or our overseas possessions like American Somoa.

I urge you, Mr. President, to offer amendments to the existing law which will provide the organizational structure, independent of foreign interests, to bring domestic satellite communications to the American public.

With kind regards.

Very respectfully,

Mike Gravel

See separate folder for
replies from industry.

THE WHITE HOUSE

WASHINGTON

October 9, 1969

MEMORANDUM FOR

Dr. Russell Drew
Dr. Thomas Moore
Mr. William Morrill
Col. Ward Olsson
Chairman Rosel Hyde
Mr. Don Baker
Mr. Willis Shapley
Mr. Walter Hinchman
Mr. Robert Scherr
Mr. Richard Beam
Mr. Richard Gabel

I am attaching for your personal information, copies of the replies received in response to my letter dated August 18, 1969. These documents must be treated as privileged information, for use in conjunction with the work of the task force. I have assured the respondents that these documents will not be released by the Working Group, and I expect that each of us will respect this commitment.

Clay T. Whitehead
Chairman

1 Atch

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Washington, D. C. 20504

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60 Broad Street
New York. N.Y. 10004

Edward B. Crosland
Vice President
X American Telephone and Telegraph Co.
195 Broadway
New York, N. Y. 10007

X Indicates organizations to whom the 19 Sep letter frm Mr. Whitehead were forwarded for submission.

Note: Submissions were not received from International Brotherhood of Electrical Workers or National Association of Broadcasters.

E. A. Gallagher
X President
Western Union International, Inc.
26 Broadway
New York, N.Y. 10004

Frank Stanton
X President
Columbia Broadcasting System, Inc.
51 West 52 Street
New York, N.Y. 10019

The Ford Foundation
McGeorge Bundy
X President
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Columbus, Ohio 43215

M. G. Robertson
President
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P. O. Box 111
1318 Spratley Street
Portsmouth, Va. 23705

National Cable Television Association Inc.
X Frederick W. Ford
President
1634 Eye Street, N. W.
Washington, D.C. 20006

Mr. Ben S. Gilmer
President
American Telephone and Telegraph Company
195 Broadway
New York, New York 10007

8/22 ltr fm. Ben S. Gilmer advising Edward B. Crosland (VP - Federal Relations) to handle

Mr. Joseph Charyk
President
Communications Satellite Corporation
950 L'Enfant Plaza
Washington, D. C. 20024

9/8/69 - ltr from Joseph Charyk, in answer to our request.

Mr. Russell W. McFall, President
The Western Union Telegraph Company
60 Hudson Street
New York, New York 10013

8/28 ltr fm. Earl D. Hilburn, Exec. V. P., advising that Mr. McFall asked him to handle

Mr. Leslie Warner
President
General Telephone and Electronics Corporation
730 Third Avenue
New York, New York 10017

8/22 ltr fm. James J. Clerkin, Jr. (Will have any comments by mid-Sept. --Leslie Warner out of town)

9/16 ltr fm. James J. Clerkin, Jr. replying to our letter.

Mr. McGeorge Bundy
President
Ford Foundation
320 East 43rd Street
New York, New York 10017

Mr. John W. Macy, Jr.
President
Corporation for Public Broadcasting
1250 Connecticut Avenue, N. W.
Washington, D. C. 20036

9/8 Macy advising they will submit comments within the next several days.

Mr. Fred J. Borch
Chairman of the Board and Chief Executive Officer
General Electric Company
570 Lexington Avenue
New York, New York 10022

9/16 ltr fm. L. B. Davis, V. P., GE, 777 14th St., Wash. D. C.

Mr. T. Vincent Learson
President
International Business Machines Corporation
Old Orchard Road
Armonk, New York 10504

8/26 ltr advising they will try to cooperate as soon as possible
9/4 ltr of reply fm. Vincent Learson

Mr. Howard W. Hughes
President
Hughes Aircraft Corporation
Culver City, California

Dr. R. D. DeLauer
President
TRW Systems
1 Space Park
Redondo Beach, California 90278

9/16/69 ltr responding to oursof 8/19

Mr. George Butler
President
Electronic Industries Association
2001 I Street, N. W.
Washington, D. C. 20006

9/19 ltr from John Gayer, Chairman Satellite Telecommunications Subdiv., Ind. Electronics Div., EIA

8/20 ltr advising they will be in touch shortly with inputs
9/5 ltr fm. S. G. Lutz, Chief Scientist, Hughes Research Laboratories, div. of Hughes Aircraft Company, 3011 Malibu Canyon Rd., Malibu, Calif.

Mr. Joseph A. Beirne
President
Communications Workers of America
1925 K Street, N. W.
Washington, D. C. 20006

9/17 ltr fm. Joseph A. Beirne, in reply to our letter of 8/19.

Mr. Charles H. Pillard
President
International Brotherhood of Electrical Workers
1200 15th Street, N. W.
Washington, D. C. 20005

Mr. Vincent T. Wasilewski
President
National Association of Broadcasters
1771 N Street, N. W.
Washington, D. C. 20036

Mr. Frederick W. Ford
President
National Cable Television Association, Inc.
1634 I Street, N. W.
Washington, D. C. 20006

8/26 ltr advising he would submit comments before 10/1

General James McNitt
President
International Telephone and Telegraph
World Communications
67 Broad Street
New York, New York 10004

9/19/69 ltr of reply

Mr. Howa rd Hawkins
President
RCA Global Communications
30 Rockefeller Plaza
New York, New York 10020

Mr. Edward A. Gallagher
President
Western Union International
26 Broadway
New York, New York 10004

Mr. Charles Wyly
President
University Computing Company
1300 Frito-Lay Tower
Dallas, Texas 75234

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President
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51 West 52nd Street
New York, New York 10019

Mr. Julian Goodman
President
National Broadcasting Company
30 Rockefeller Plaza
New York, New York 10020

9/19/69 - ltr replying to ours of 8/19

Mr. Leonard Goldenson
President
American Broadcasting Company
1330 Avenue of the Americas
New York, New York 10019

9/16/69 ltr in answer to our rqest.

5/22/70

To: Central Files

From: Eva Daughtrey

We are now retaining the originals. Attached are xerox copies for your files. Please charge them to Mr. Whitehead's Office instead of Mr. Kriegsman's.

EDaughtrey:jm

THE WHITE HOUSE

WASHINGTON

August 19, 1969

The Government is considering alternative policies for the timely introduction of satellites to domestic commercial communications. Our objectives are to assure timely and full benefit to the public of satellite technology potentials and to assure maximum learning about the problems and possibilities of satellite services in domestic applications.

We are aware that your organization has had a continuing interest in this subject. While we have reviewed the public record of the last several years, your current ideas and information would be a useful addition to our review. I would, therefore, like to invite you to submit any information or comments you feel would be helpful to our working group. We expect to complete our work about October 1.

Since the Federal Communications Commission is responsible for authorizing specific operational systems, we will not be concerned with specific corporate proposals or the details of system designs. Rather, our focus will be on the economic and institutional structure of the industry, the relationships between competition and regulation, and how new uses and services can be encouraged for public benefit.

Enclosed are some of the issues we will be considering. You may wish to use these, in part, in organizing your comments. I look forward to hearing from you.

Sincerely yours,

Clay T. Whitehead
Staff Assistant

Enclosure

See separate folder for replies.

THE WHITE HOUSE

WASHINGTON

October 9, 1969

MEMORANDUM FOR

Dr. Russell Drew
Dr. Thomas Moore
Mr. William Morrill
Col. Ward Olsson
Chairman Rosel Hyde
Mr. Don Baker
Mr. Willis Shapley
Mr. Walter Hinchman
Mr. Robert Scherr
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Clay T. Whitehead
Chairman

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General Telephone and Electronics Corporation
730 Third Avenue
New York, New York 10017

8/22 ltr fm. James J. Clerkin, Jr
(Will have any comments by mid-
Sept. --Leslie Warner out of town
9/16 ltr fm. James J. Clerkin, Jr
replying to our letter.

Mr. McGeorge Bundy
President
Ford Foundation
320 East 43rd Street
New York, New York 10017

Mr. John W. Macy, Jr.
President
Corporation for Public Broadcasting
1250 Connecticut Avenue, N. W.
Washington, D. C. 20036

9/8 Macy advising they will
submit comments within the nex
several days.

Mr. Fred J. Borch
Chairman of the Board and Chief Executive Officer
General Electric Company
570 Lexington Avenue
New York, New York 10022

9/16 ltr fm. L. B. Davis, V. P.,
GE, 777 14th St., Wash. D. C.

Mr. T. Vincent Learson
President
International Business Machines Corporation
Old Orchard Road
Armonk, New York 10504

8/26 ltr advising they will try to cooperate as soon as possible
9/4 ltr of reply fm. Vincent Learson

Mr. Howard W. Hughes
President
Hughes Aircraft Corporation
Culver City, California

Dr. R. D. DeLauer
President
TRW Systems
1 Space Park
Redondo Beach, California 90278

9/16/69 ltr responding to oursof 8/19

Mr. George Butler
President
Electronic Industries Association
2001 I Street, N. W.
Washington, D. C. 20006

9/19 ltr from John Gayer, Chairman Satellite Telecommunications Subdiv., Ind. Electronics Div., EIA

8/20 ltr advising they will be in touch shortly with inputs
9/5 ltr fm. S. G. Lutz, Chief Scientist, Hughes Research Laboratories, div. of Hughes Aircraft Company, 3011 Malibu Canyon Rd., Malibu, Calif.

Mr. Joseph A. Beirne
President
Communications Workers of America
1925 K Street, N. W.
Washington, D. C. 20006

9/17 ltr fm. Joseph A. Beirne, in reply to our letter of 8/19.

Mr. Charles H. Pillard
President
International Brotherhood of Electrical Workers
1200 15th Street, N. W.
Washington, D. C. 20005

Mr. Vincent T. Wasilewski
President
National Association of Broadcasters
1771 N Street, N. W.
Washington, D. C. 20036

Mr. Frederick W. Ford
President
National Cable Television Association, Inc.
1634 I Street, N. W.
Washington, D. C. 20006

8/26 ltr advising he would submi comments before 10/1

General James McNitt
President
International Telephone and Telegraph
World Communications
67 Broad Street
New York, New York 10004

9/19/69 ltr of reply

Mr. Howa rd Hawkins
President
RCA Global Communications
30 Rockefeller Plaza
New York, New York 10020

Mr. Edward A. Gallagher
President
Western Union International
26 Broadway
New York, New York 10004

Mr. Charles Wyly
President
University Computing Company
1300 Frito-Lay Tower
Dallas, Texas 75234

Dr. Frank Stanton
President
Columbia Broadcasting System
51 West 52nd Street
New York, New York 10019

Mr. Julian Goodman
President
National Broadcasting Company
30 Rockefeller Plaza
New York, New York 10020

9/19/69 - ltr replying to ours of 8/1

Mr. Leonard Goldenson
President
American Broadcasting Company
1330 Avenue of the Americas
New York, New York 10019

9/16/69 ltr in answer to our rqest.

Dom Sat

AGENDA

DOMESTIC SATELLITE WORKING GROUP MEETING

OCTOBER 9, 1969

10:30 a.m. - Room 415

1. Discuss privileged nature of Working Group and Committee discussions and working papers.

2. Status report by Dr. Drew, Chairman of the Technical Committee.

3. Status report by Dr. Moore, Chairman of the Economic Committee.

4. Discuss schedule for submission of reports of the committees.

5. Discuss plans for future meetings of the Working Group.

6. Distribute copies of the replies to Mr. Whitehead's memorandum, dated August 18, 1969. (ADDED ANDERS)

W. E. Kriegsman
Executive Secretary

SKED

MONDAY Oct 13 DRAFT REPORTS PREPARED

THURS Oct 16 COMMITTEE DRAFTS TO WORKING GROUP

FRI Oct 17 WORKING GROUP - DISCUSS INTERACTIONS COMMITTEE REPORT DISCUSS REPLIES

Oct 21 WORKING GROUP DRAFT REPT TO W.G.

Oct 29 WORKING GROUP Mtg.- DISCUSS DRAFT REPT

MEMORANDUM

THE WHITE HOUSE

WASHINGTON

October 9, 1969

MEMORANDUM FOR

Mr. Whitehead
Dr. Moore
Dr. Drew

SUBJECT: Schedule for Domestic Satellite Working Group

October 13 - Committees complete draft reports.

October 16 - Committee reports to be sent to members of Working Group.

October 17 - Meeting of Working Group to discuss:

a. Interactions between Technical and Economic Committee reports.

b. Structure and content of Working Group report.

c. Replies to Mr. Whitehead's letter of August 19.

October 21 - Draft Working Group report to be sent to Working Group members.

October 23 - Meeting of Working Group to discuss final report.

W. E. Kriegsman

Finishing pool

OFFICE OF THE SPECIAL REPRESENTATIVE
FOR TRADE NEGOTIATIONS

WASHINGTON

→ Use by govt agencies.

→ x Non-cc: reg intercom
can FCC do this?

x Fractioning svcs & abil to
continue after more
profitable opns excluded
(Telex; TV sports network)

x Criteria on interference compensation
big guys & pols on everybody
obligation to serve

Legal compulsory accommodations?
can FCC reg intercom?

OFFICE OF THE SPECIAL REPRESENTATIVE
FOR TRADE NEGOTIATIONS
WASHINGTON

Are any of the committee other than Drew + Moore to be at the ATT meeting tomorrow?

Have you talked to them (ATT) about locations, who's coming, etc?

I was unaware that mtg was set up. EVA must have done. No one else $ is aware of these meetings. Do you want Gable, Hinchman or others invited.

PARTICIPANTS AT 10/9/69 MEETING

OF

THE DOMESTIC SATELLITE WORKING GROUP

Don Baker	Justice
Tom Moore	~~Gee~~ CEA
Richard Beam	DOT
Winfred Berg	Nat'l Aeronautics and Space Council
Tom Olsson	OTM
Walter Radius	NASA
Asher Ende	FCC
William Watkins	FCC
James Armstrong	POD
Donald Hayne	POD
Robert Scherr	POD
Russell Drew	OST
C. T. Whitehead	White House
William Kriegsman	"
Walter Hinchman	"
Richard Gabel	"

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W. E. Kriegsman
Executive Secretary

Domsat
10/9
10:30 am

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Donald Hayne	POD
Robert Scherr	POD
Russell Drew	OST
C. T. Whitehead	White House
William Kriegsman	"
Walter Hinchman	"
Richard Gabel	"

December 23, 1969

~~CONFIDENTIAL~~

Memorandum

To: Messrs. Peter M. Flanigan and Clay T. Whitehead

From: Charlie McWhorter

Re: Reorganization of the Office of the Director of Telecommunications Management

This memorandum is submitted by me in order to express to you my personal thoughts and concern with regard to the proposed changes for reorganization of the ODTM within the Executive Office of the President. The views expressed herein are my own and are not presented on behalf of A.T.& T. since their comments have been expressed separately. My comments deal with only two aspects of this matter. First, in my opinion, there is a failure to provide adequately for the two problems which almost everybody admits exist in this area, namely:

1. To coordinate the effective use of the frequency spectrum.

2. To develop the necessary policies for the government in connection with its acquisition of communications facilities for its own needs.

If the Administration could take the initiative in providing leadership and developing the necessary policy and internal structure to deal with these two problems, there would be widespread approval within the communications industry. This in turn should provide some political benefits to the extent that "good government is good politics."

The other point, however, which troubles me most deeply is the suggestion that a policy making group for telecommunications matters be set up within the Executive Office which would "initially" have up to 30 people. This proposal does not make sense to me either on the merits or politically. The implicit suggestion that there is no present policy making group within the Federal Government for communications is simply not true. The Congress itself in the Communications Act of 1934 delegated to the Federal Communications Commission a broad policy role in communications matters. This policy role of the FCC has been sustained by the courts and expanded to cover new situations in many instances. It could reasonably be expected that Congress would strongly resent any effort by the Administration to preempt this policy making role that Congress has delegated to the FCC.

To the extent that the White House feels it is necessary or politically advantageous to take on the responsibility for resolving policy disputes, this could be handled on an ad hoc basis as was done in the matter of domestic satellites. I question, however, whether it is politically wise

for any Administration to attempt to resolve most such "policy questions" since many are really a contest between various economic interests. Politically, it would be much better to let the FCC carry out its responsibilities in this area, particularly where we have a strong chairman to represent any views of the Administration.

If the Executive Office has to maintain an initial staff of some 30 policy making people for telecommunications matters, it would inevitably result in the employment of a group of theoretical and academic types who would attempt to use their status as White House policy makers to restructure and meddle with the industry in competition with the FCC. This would inevitably drag the White House into the middle of unnecessary disputes. Politically, there is no way you can win with this approach. Rather, it is my opinion that the White House staff should attempt to discourage their involvement in economic controversies which are a healthy and vital part of our private enterprise system.

In my view the Nixon Administration staff procedures which call for the use of special task forces as needed to deal with a specific problem and then go out of existence seems to be the best approach. If you have 30 policy makers showing up for work every morning trying to justify their existence and providing a basis for larger appropriations and staff the following year, the Administration would be stuck with a trouble-making aparatus that would inevitably create unnecessary political problems. Rather, I would strongly recommend that this suggestion for such a policy making group be rejected and that the Nixon Administration rely on either Dean Burch as Chairman of the FCC or the special task force approach where that seems to be the best alternative.

cc: Hon. John D. Ehrlichman

December 23, 1969

~~CONFIDENTIAL~~

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cc: Hon. John D. Ehrlichman

Domsat

November 18, 1969

Dear Ed:

Thank you for your letter of November 10 and the copies of the FCC and AT&T releases.

I did indeed find Commissioner Johnson's dissent particularly interesting. Maybe we should consider appointing a cartoonist to the Commission.

I understand you have recently talked to Paul McCracken and will soon be talking to Lee DuBridge. The domestic satellite committee reviewing economic and technical considerations found your visit very enjoyable and worthwhile. I am now turning my attention to the broader policy questions and am hopeful that we can have our position developed in the very near future.

I look forward to seeing you again soon.

Sincerely,

Clay T. Whitehead
Staff Assistant

Mr. Ed Crosland
Vice President, Federal Relations
American Telephone and Telegraph Company
New York, New York

cc: Mr. Flanigan
Mr. Whitehead
Mr. Kriegsman
Central Files

CTWhitehead:jm

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

195 BROADWAY, NEW YORK, N.Y. 10007

212 393-1000

EDWARD B. CROSLAND
VICE PRESIDENT

Washington Office
2000 L Street, N. W.
Washington, D. C. 20036
202 466-5571

November 10, 1969

The Honorable Clay T. Whitehead
Staff Assistant
The White House
Washington, D. C. 20500

Dear Tom:

I thought you might be interested in the attached Public Notice issued by the F.C.C. in connection with the recent reduction of interstate toll rates to which we agreed. As you know, this Notice was released on November 5, and the rate reductions are to become effective on January 1, 1970. You may be particularly interested in the dissent of Commissioner Johnson.

I am also attaching a copy of the Company's press release which was released on the same day.

I hope to see you soon.

Warmest personal regards.

Sincerely,

Ed

Attachment

Information Department
American Telephone and Telegraph Company
195 Broadway, New York, N.Y. 10007

For further information, please call:
James M. Freeman 212 393-3323

FOR RELEASE: WEDNESDAY, November 5, 1969

New York - Stating that it was "greatly encouraged" by the FCC's recognition of its need for higher earnings, American Telephone and Telegraph Company said today that it would comply with the Commission's request to reduce its interstate rates by $150 million a year and that it would shortly announce details of the rate changes it will propose.

The Commission has requested that the Company submit its new rate plans to be effective January 1.

Speaking for the Company, AT&T Vice Chairman John D. deButts said:

"We are greatly encouraged that the Commission has taken into account the substantial changes in economic and operating conditions which have occurred since its last review of our interstate earnings. While the rate reduction the Commission has requested is somewhat larger than we believe appropriate at this time, it will not by itself reduce our interstate rate of return below 8% and we concur in the Commission's view that this reduction should not preclude our achieving interstate earnings next year approaching 8.5 percent.

"Although the current economic outlook is too uncertain for us to predict that earnings at this level will be realized, we shall, of course, be working hard to achieve this end. The recognition by the FCC of our need for a

higher interstate rate of return, should enhance our ability to finance on reasonable terms the large construction programs required to meet the communication needs of the future."

In its order issued in 1967, the FCC said that earnings levels found appropriate under then existing conditions did not constitute "an absolute floor or ceiling" and that it would consider changes in such conditions in any subsequent review.

In its presentation before the FCC, AT&T said economic, financial and operating conditions had changed substantially since 1967 and that it required earnings in the range of 8.5 to 9 percent. The Company cited as evidence of these changes the increased cost of borrowing, rising inflation, and its need to raise substantial amounts of new capital under current market conditions.

The Commission indicated that it had taken into account these changed circumstances and said it anticipated that the proposed reductions in rates would stimulate to some extent interstate revenue and earnings. Noting that 1969 earnings are expected to exceed 8%, the Commission added: "We fully expect that the growth trends in traffic, revenues and earnings will continue."

The proposed reduction would be the eighth interstate cut in ten years, AT&T said. Taken together with shifts of revenue requirements from intrastate to interstate services, these reductions represent annual savings to customers of $1 billion at today's calling volumes.

PUBLIC NOTICE

Federal Communications Commission ▪ 1919 M Street, NW. ▪ Washington, D.C. 20554

FCC 69-1210
38859

November 5, 1969 - G

RATES FOR INTERSTATE LONG DISTANCE CALLS TO BE REDUCED

Reductions in rates for interstate long distance telephone calls will be submitted shortly by the Bell System telephone companies to the Federal Communications Commission. It is expected that the reduced rates will save users of telephone service about $150 million per year. In addition, AT&T has previously agreed to file reductions of about $87 million representing an offset to increases in revenues resulting from higher rates recently filed for program transmission, Telpak and teletypewriter exchange (TWX) services when the latter increases become effective. The Commission anticipates that the new rates will permit the companies to achieve earnings in a range needed to attract capital under today's conditions.

The proposed reductions are being submitted by AT&T in connection with the comprehensive review recently completed by the FCC of the Bell System's interstate operations and earnings requirements. The review was conducted as part of the Commission's continuing surveillance of the Bell System's interstate operations, and was participated in by representatives of the Commission's staff, Bell System officials, and several outside consultants who are expert in economics and finance.

The proposed rate reductions take account of the material increases in AT&T's cost of capital. At the same time, they recognize that the growth in interstate traffic is continuing unabated; that the average revenue per message has shown steady increase since the reductions required by our 1967 decision took place; and that the interstate earnings of the Company have consistently grown despite the increases in its costs due to the inflationary spiral. In 1969, interstate earnings are expected to exceed 8%. We fully expect that the growth trends in traffic, revenues, and earnings will continue. This expectation is substantiated by AT&T's own forecast of interstate operating results for 1970, which ranges, under present rates, to levels above 8.5%, depending on economic conditions. Consistent with experience following prior rate reductions, we also anticipate that the interstate revenues and earnings will be stimulated to some extent by the reductions in rates the Company is now proposing. Thus, it is anticipated that the rate adjustments announced today will not, in themselves, prevent the Company from achieving earnings in the aforementioned range. The Commission will maintain a continuing surveillance and take such action as is appropriate in the light of future conditions.

(over)

The Commission initiated the current review in light of the sustained growth in the interstate earnings of the Bell System to levels well in excess of the level determined by the Commission to be adequate and reasonable in its 1967 decisions. In conducting the current review, the Commission examined the Company's present and anticipated capital needs and the levels of, and trends in, its revenues, expenses and earnings. The Commission focused on AT&T's cost, under current economic conditions, of attracting the large amounts of new capital, estimated at more than $200 million a month, required by AT&T for its ever-increasing construction program to meet new and expanding needs of the public for communication services.

The examination was made by the Commission within the framework of the principles and standards it formulated in its decisions issued in July and September 1967, following a comprehensive formal investigation and hearing into the Bell System's interstate rates (Docket 16258). In those decisions, the Commission concluded, among other things, that a return in the range of 7.0% to 7.5% was fair and reasonable at that time for purposes of effecting adjustments in AT&T's interstate rates. It also stated that it did not regard this range as establishing an absolute floor or ceiling for future earnings. Instead, it said it would, when there were departures from this range, consider the matter in light of conditions obtaining at that time.

In keeping with those principles, the Commission is of the view, in the light of current conditions, and with due regard to the proposed reductions, that interstate rates producing an earnings level which exceeds the upper limit of the 1967 range (7.5%), are not unreasonable. The Commission based this view on the changes which have taken place since 1967 in the economic, financial, and other conditions that affect AT&T's revenue requirements and its ability to attract new capital. The Commission noted particularly the sharp increase in the interest rates on borrowed capital, the resulting increase in the Company's cost of embedded debt, the much higher rate of inflation today, and the need to raise substantial amounts of new capital under current market conditions. These factors constitute substantial changes from the conditions which prevailed at the time of the 1967 decisions and must be reflected in a current assessment of the Company's cost of capital and revenue requirements.

There are also a number of uncertainties in the current situation and in the national economic outlook. These include the persistent inflationary trend, with its effects on the cost of capital; the effectiveness of the Government's efforts and policies to curb this trend and stabilize prices; the possible effects of such efforts on the continued growth of the economy; and the duration of any period of adjustment. Another uncertainty results from the present status of the Federal corporate income tax and surcharge, as well as the potential changes resulting from the "reform provisions" of the pending tax legislation.

In view of these uncertainties, the Commission wishes to make clear that the views expressed herein relate to the current situation and cannot be binding under any future changed economic conditions.

The Commission notes that technical changes in separations methods which it recently accepted at the request of the NARUC result in a $35 million transfer of revenue requirements, to the benefit of users of local services subject to state regulatory jurisdiction.

The details of the rate changes are being worked out by the Company. The new rates will be submitted to the FCC in revised tariffs which will become effective on statutory notice.

Action by the Commission November 5, 1969. Commissioners Burch (Chairman), Bartley, Robert E. Lee, Cox and H. Rex Lee, with Commissioner Johnson dissenting and issuing a statement (attached).

- FCC -

Continuous Surveillance

Separate Statement of Commissioner Nicholas Johnson

I. Introduction

The Commission today offers for public view the results of its recent informal negotiations with the Bell System on the appropriate level of interstate rates. The effectiveness of the Commission in this area and the suitability of continuous surveillance as a regulatory technique can now be evaluated. My analysis indicates that the technique is rather ineffective and the Commission's adherence to announced principles is sharply limited when it comes into conflict with ATT. The Commission here issues a press release designed to show that significant decreases have "voluntarily" been agreed to by Bell. The implication is that some wonderful victory has been achieved for the consumer through the activities of the Commission and the benevolence of ATT. Unanswered is the question of whether enough has been achieved or whether the Commission's representation is a true reflection of the facts.

II. Continuous Surveillance as a Regulatory Technique

"Continuous surveillance" is a regular informal review of particular regulatory issues--in this case ATT's interstate rate of return. Informal closed door negotiations were held with Bell to examine going levels of earnings with a view to possible appropriate

action by the Commission or Bell. The theory is that in the context of these negotiations the Commission will be able to make an informed judgment as to what action would serve the interests of the public as consumers and that Bell would agree to take that action even though it is harmful to the interests of its stockholders. Initially there seems no reason that a regulated company would agree to actions inimicable to the interests of its stockholders. However, a company may in fact be willing to meet certain levels of public responsibility which are not too harmful in terms of stockholder reaction.

The Commission has certain penalties it can impose if a company is unresponsive. A company does not wish to receive the unfavorable publicity generated by public Commission criticism of a failure to respond to the interests of the consumer. (Thus, not only has the Commission negotiated with Bell on the rate reduction; the content of the FCC majority's press release was negotiated with Bell officials who are clearly concerned as much with publicity as with profits.) The Commission could issue a show cause order to require a recalcitrant company to prove why its rates should not be lowered. Finally, there is the threat of a full-scale investigation with its attendant uncertainty and unfavorable publicity. The Commission is not without weapons to compel action by the regulated company--even though the continuous surveillance proceeding is not a formal hearing from which orders may be issued.

There are severe limits to the Commission's ability to function in this type of a proceeding. Virtually all of the information was selected, packaged and presented by Bell--there was no direct case from our staff or outside representatives. There was no leavening from outside consumer representatives--even though the New York City Consumers Affairs Department requested (and was denied) the opportunity to appear. The negotiating process depends on the skill and dedication of the negotiators--and a company with a single position faces a multi-member Commission with a variety of positions. There are no limits on the lobbying efforts by the company--to staff or Commissioners--since ex parte rules do not apply. Whatever decisions are made--whether adjustments are needed, how much, what the company agrees to and how much the Commission compromises--are not normally explained publicly in the way formal decisions are. Public statements are made long after the decisions in fact have been made. Appeal from decisions is difficult--there is no opportunity to seek reconsideration of a formal Commission decision or appeal it to the courts. There are no parties to appeal. Apparently all that can be done is to petition for rejection of whatever revised tariffs Bell decides to file as a result of the negotiations.

III. Consumer Advocates

In response to some of the inherent problems with the continuous surveillance proceeding the Commission in this instance decided to

denominate two staff members to ask questions of the ATT witnesses from the consumer's point of view. Operating in a capacity separated from that of the Commission's Common Carrier Bureau staff, these staff members conducted their own cross-examination of Bell's witnesses and offered some additional materials relating to their examination. The quality and completeness of the information before the Commission was improved by their performance. Bell's discomfiture was obvious. On balance, the continuous surveillanve process was clearly improved by this limited use of denominated consumer representatives.

The innovation did, however, heighten the tension as to the role of the Commission's staff in rate proceedings. The Commission has traditionally viewed its staff in ratemaking proceedings as combined protector-of-the-consumer and neutral adviser-to-the-Commission. I have elsewhere argued that the combined functions necessarily affects the quality of the consumer advocacy and this was confirmed by the experiment in this proceeding. A. T. & T., 9 F. C. C. 2d 30, 122 at 141 (1967). I believe the Commission ought to use staff consumer advocates in all important ratemaking matters. The Commission ought to do all it can to have forceful advocacy for alternatives presented to it--a necessary ingredient for competent choice in any decision-making process.

IV. Results Reached and Achieved

Bell argued it should be allowed to earn 8.5 to 9.0% on its total allowed rate base--and thus that the Commission should modify de facto its 1967 decision that the appropriate Bell rate of return was 7.0 to 7.5%. This 2% range from 7.0 to 9.0%, for interstate operations alone, could cost consumers as much as $500 million more per year depending on the level fixed by the Commission. (A change of 0.1% in Bell's rate of return has a $24 million effect on the amount of gross revenues the consumer must pay.) The majority concluded that Bell's current going rate of return is 8.25%, that 7.4% was appropriate for purposes of negotiation and a $200 million rate decrease (after adjusting for stimulation effects) was warranted. (8.25 minus 7.4 equals .85; .85 times $24 million equals $204 million). To this sum was added the $90 million in MTT rates Bell had agreed to file as a result of price increases made in non-MTT (Telpak, TWX, Program Transmission) services. The majority was seeking $290 million through negotiations conducted by the staff and the Telephone Committee.

Bell now says they have agreed to reduce rates by $240 million The majority's compromise in negotiations will cost the consumer $50 million per year. The majority first sought $200 million in

reduction plus the $85-90 million MTT reductions as offsets to the other rate increases Bell has filed. Bell as a counter offered $120 million plus the offsets. Bell also wanted a statement from the Commission that a return of 8% was justified. The majority commendably refused, although offering to say that a rate above 7.5% is justified, and that earnings "in the range" of 8.0 to 8.5% will result from its decision. It is, in any event, indisputably clear that the Commission today sanctions a rate of return in excess of 7 1/2%--the maximum permitted under its own prior order! Now Bell has offered to reduce MTT rates by $240 million and the majority has accepted. The majority's compromise appears to cost the consumer $50 million per year. In fact the majority's additional compromise from what it should have sought from Bell may cost the consumer $250 million per year!

The majority's decision to seek only $290 million in reductions in the face of Bell's present level of earnings severely harms the consumer and is a strong critique of the continuous surveillance process. Let us assume for the moment that the majority's 7.4% floor for Bell's rate of return is correct. Would $300 million in reductions have reached this level? We can be almost certain that it would not. One need only examine the history of continuous surveillance as well as the results of the 1967 rate proceeding. Bell's interstate rate of return has never fallen below 7.5% since 1961. (1961--7.72%; 1962--7.55%; 1963--7.51%; 1964--7.99%; 1965--7.95%; 1966--8.29%; 1967--8.25%; 1968--7.60%.) Although rate reductions were occasionally achieved during this period, it is not at all clear that they were enough. Bell appears to have been successful in earning extra profits through the ineffectiveness of the continuous surveillance process. These profits may have led to a significant over-valuation of Bell's stock during this period and the subsequent readjustment.

The rate of return for 1968 is particularly significant. After a formal rate proceeding the Commission ordered Bell to file tariffs to reach an allowed rate of return of 7.0 to 7.5%. The effect of $20 million in a $120 million rate reduction order was deferred for a substantial period in 1968 out of the professed fear that earnings

might fall below the 7.0% level. [A. T. & T., 12 F. C. C. 2d 167, 168 (1968)] The Commission's fears for Bell's financial health were misplaced. Not only did Bell not go below the lower end of the range, it exceeded the higher limit, earning 7.6%. As if this were not enough, only the Vietnam War and its attendant surtax saved the Commission from further embarrassment. Without the surtax Bell would have earned in the range of 8.2%--a full 0.7 to 1.2% above the range supposedly established by the Commission's 1967 decision. The record suggests that Commission decisions systematically err in Bell's favor on rate of return matters.

An examination of today's decision suggests some of the reasons for the FCC's errors. No estimate is made for growth in Bell's 1970 earnings, although Bell has enjoyed steady growth. No estimate is made for possible lower unit costs, although Bell proudly reports its cost-reducing achievements. No account is taken of the effects of relaxation of the income tax surcharge. If the surcharge rate is reduced to 5% on January 1, 1970, then $70 million less gross revenues will be needed to reach 7.4%. By June 30, 1970, when the remaining 5% is scheduled to be lifted, another $70 million less in gross revenues will be needed by Bell. Since the surveillance process generally takes at least a year from the time excess earnings occur, to Commission recognition, to Commission action, to tariff filing,

the majority's failure to take account of the probable effects of the surcharge changes may cost the consumer $100 million in 1970. (The majority could have directed Bell to have tariff reductions in hand ready for filing when the surtax changes come. For this discussion it is recognized that Bell has effectively passed the entire surtax on to its consumers.)

The majority's willingness to settle for $240 million in reductions can also be attacked for its de facto modification without hearing of the Commission's 1967 order. The Commission rejected the participation of outside parties representing consumer interests but did allow attendance by representatives from NARUC (the association of state regulatory commissioners). The majority has made a decision in fact, but there is no announcement of it, no rationale offered for it, and no consideration of the rights of parties who may feel aggrieved. A leading case is often cited for the proposition that no legal redress is avilable for decisions reached under continuous surveillance. [The Public Utilities Commission of the State of California v. United States, 356 F. 2d 236 (9th Cir. 1966)]. However, the fact that the Commission recently made an on-the-record determination, and now changes it without hearing, may present a different legal situation.

Bell argued that circumstances had changed from the 1967 environment, and that these changes warranted a change in their

allowed rate of return. Its evidence focused on one basic point--the change in the interest rate for long-term debt capital. The majority agreed with Bell to the tune of $100 million per year. (The difference between a range of 7.0 to 7.5% and 7.4 to 7.9% is between $24 million and $196 million.) In 1967 the Commission reached two basic conclusions--the overall rate of return should be 7.0 to 7.5% and Bell had been severely negligent in not using more debt financing in the past, a policy that has been and continues to be costly to both consumer and shareholder.

The issues concerning proper capital financing of a public utility need not be as confusing as they appear. A company can raise capital by equity or by debt. Equity includes retained earnings and money gained from stock sales. Debt is capital borrowed from money-lenders at a fixed rate of interest. Other things being equal debt financing is generally less costly to the consumer while being beneficial to the stockholder. Debt costs less since the interest rate is normally lower than the required return for equity. Interest costs are a cost of doing business and as such are deducted before the payment of corporate income taxes. And for any given level of overall return the use of debt financing can often increase the pool of earnings available to equity holders.

Since the 1967 decision Bell has gone to all-debt financing and even at the present high interest rates, debt financing continues to exert a favorable leveraging effect on Bell's earnings. In fact as the staff consumer representatives pointed out in a chart submitted during cross-examination, Bell has been able to offset the effects of high interest through increased leverage.

1966 [Test Year] Allowed Rate of Return 7-7 1/2%

	Low	High
31.5% Debt at 4% Interest =	1.26	1.26
68.5%, Equity at 8.4-9.1% Return	5.74	6.24
Total Allowed Rate of Return	7.00	7.50

1969 Calculation Incorporating:

1. Higher interest rates being paid;
2. Changed capital structure;
3. The same return on equity range as allowed in the 1967 decision.

	Low	High
40% Debt at 5% Interest =	2.00	2.00
60% Equity at 8.4-9.1% Return =	5.04	5.46
Total Allowed Rate of Return	7.04	7.46

Note: The increased interest cost for debt is counteracted by the increase in debt ratio so that if the return on equity remains the same, the allowed rate of return would remain the same.

Transcript pg. 943-A

The majority's calculation is perhaps simpler. In 1967 the Commission said the Bell System could be earning at least 9% on equity if it had achieved a debt ratio of 40% at 4% embedded interest cost, although Bell had debt ratio of about 35% at the time. (A debt ratio is the ratio of the amount of debt to the total capital of a company--a company with $100,000 total capital of which $35,000 is debt has a 35% debt ratio. "Embedded interest cost" is the average interest rate being paid on debt capital of the company.)

If Bell had a 40% debt ratio and was paying on the average of 4% in interest, a 7% overall return on capital would result in a 9% return to equity.

40% debt times 4% interest =	1.6%
60% equity times 9% return =	5.4%
	7.0% Total return

At 7.5% return Bell would be earning 9.83% on equity.

40% debt times 4% interest =	1.6%
60% equity times 9.83% return =	5.9%
	7.5% Total return

Today Bell has a 40% debt ratio but borrowing at higher interest rates has made its average interest cost for all debt capital 5%. In order to achieve a 9% return on equity, the overall rate of return must be set at 7.4%, the majority's figure.

40% debt times 5% interest =	2.0%
60% equity times 9% return =	5.4%
	7.4%

The crucial question is whether the 1967 decision "guaranteed" Bell a 9% return on equity. There is a strong suggestion it did not. As noted, a 7.0 to 7.5% rate of return suggested a return on equity based on 1966 test year data of 8.4% to 9.1%. The leveraging effect of all-debt financing has retained that range of equity return even if there is no change in the allowed range of 7.0 to 7.5% on total capital. And there was no demonstration by ATT that the fundamental factors affecting the required return on equity have caused the cost of equity capital to ATT to increase.

The majority could easily have taken account both of the surtax and reduced the going rate of return to 7.0%. It could have made some estimate of the impact on rate of return in 1970 from growth and lower cost technology. It did not. Cost to the consumer: at least $200 million a year.

V. Conclusion

There are a number of concluding comments which seem relevant. Consumers and Bell's shareholders continue to suffer from Bell's past errors in financing. Bell abhorred debt financing in periods of low interest rates and thus finds it necessary (and cheaper) to use debt exclusively at a time of very high interest rates. But it is even more disquieting that Bell now speaks of returning to equity via convertible

bonds despite the fact that debt financing continues to be less costly to the consumer and more beneficial to the stockholder than equity financing. Moreover Bell's debt ratio, although increasing, is still not within shouting distance of that employed by most other major telephone electric and gas utilities. Today consumers still must pay Bell a higher rate of return on total capital than they pay electric utilities while stockholders till get a lower return on equity from Bell than they obtain from the electrics. Moreover, these relationships are likely to prevail for some time in the future as Bell attempts to extricate itself from its past inefficient financing policies. It is of some concern that the Commission majority says nothing on this issue--as it remained silent when Bell followed costly equity financing in the past--even after it has concluded that Bell is not more risky than the electrics. If Bell elects to improve its capital structure at its leisure, must the consumer pay for today's inefficient financing as well as yesterday's?

Bell continues to refuse to use liberalized depreciation with either normalization or flow-through. The majority refuses to take action despite the fact that liberalized depreciation could in the past and would now provide substantial benefits to both consumers and stockholders. [See the discussion in Trebing (ed), Rate of Return Under Regulation, pp. 129-175 (1969)]. Bell and FCC errors

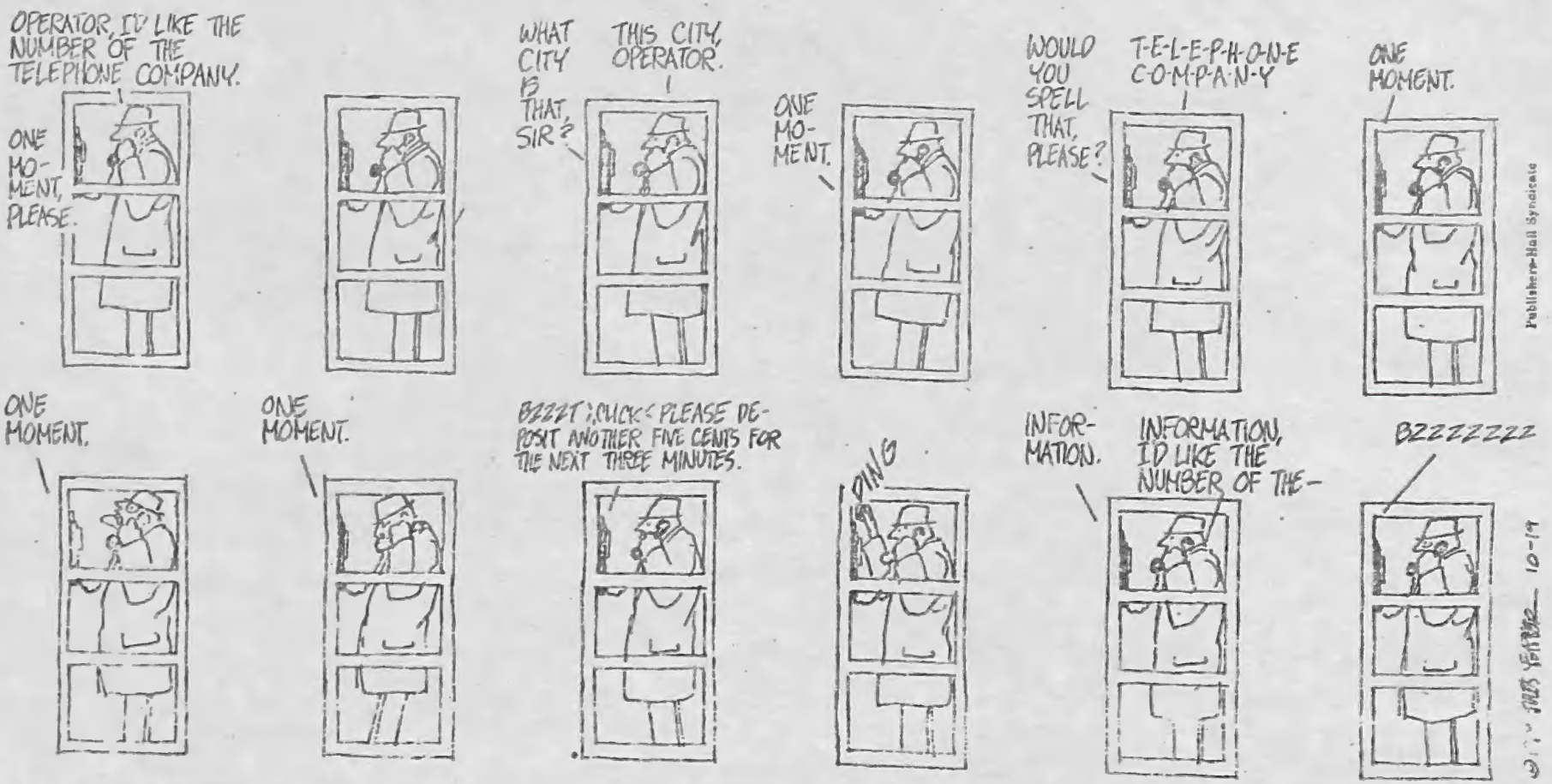
on the use of liberalized depreciation are very likely of the same order of magnitude as the errors in capital financing--with the attendant adverse impact on the consumer and stockholder. The Commission implicitly allows Bell to pass the full amount of the Vietnam surtax on to consumers for the purpose of rate level calculations. A strong case can be made that Bell should bear at least some of the costs of this special war-inflation tax and the Commission said in a letter to the then Consumer Affairs Assistant, Betty Furness in 1968 that it would at least consider that possibility.

Bell and the FCC use electric utilities for comparison purposes. Several comments are relevant. Implicit is the assumption that the regulation of the electrics has achieved a proper rate of return and thus the performance of the electrics is a proper benchmark. Some might disagree. Senator Lee Metcalf in his book, Overcharge, urges that in fact electric utilities--the FCC's comparative standard--are earning too much. [Metcalf and Reimer, Overcharge (1967)]. But even so the electrics, because of a higher debt ratio, require less in overall rate of return (6.7% in 1968 for the electrics to Bell's 7.6%) while returning more to equity holders (11.9% in 1968 for the electrics to Bell's 9.3%). The electrics also make substantial use of liberalized depreciation.

Bell's contempt for the consumer is clear, not only for refusing to lower exorbitant rates but also for its shocking acquiescence in the decline in the quality of telephone service its slipshod performance has permitted, as Jules Feiffer has so concisely portrayed:

It is difficult to evaluate the process of continuous surveillance as a regulatory tool. It offers some real procedural benefits. But it requires somewhat more than the Commission was able to bring to it this time.

Feiffer



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UNITED STATES GOVERNMENT

Memorandum

TO : The Economic Committee on Domestic Satellites

DATE: 1 December 1969

FROM : Thomas G. Moore, CEA T. G. M.

SUBJECT: Revised Preface to the Report

The attached Preface should be substituted for the one in your copy of the Report dated November 1969.

Also, as you were advised by telephone, please be sure that your copy is marked FOR OFFICIAL USE ONLY.

Attachment

TM:eam

5010-108

PREFACE

On September 18, 1969, the White House appointed two committees to investigate the policy options available to the Administration in connection with use and establishment of domestic satellites. This is the report of the Economic Committee, chaired by Thomas G. Moore (CEA). On the Committee were William Morrill (BOB), Donald Baker (Justice), Walter Radius (NASA), James Armstrong (Post Office), Richard Gabel (Transportation), and Walter Hinchman (Commerce). Lawrence Gatterer (Commerce) was an observer. Bernard Strassburg from the FCC served in an advisory capacity with Asher Ende and Boyd Nelson.

There is another committee chaired by Dr. Russell Drew (OST) which investigated the technical aspects of domestic satellite policy. No recommendations are included in either report because the studies were limited to technical and economic considerations only.

REPORT

OF THE

ECONOMIC COMMITTEE

ON

DOMESTIC SATELLITES

November 1969

FOR OFFICIAL USE ONLY

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INTRODUCTION

The United States has one of the most comprehensive, economical, and flexible system of telecommunications in the world. This highly developed and valuable resource provides a wide diversity of telephone, telegraph, TELEX, television, radio, facsimile and data exchange services for the Nation's private, public and government users. These services are provided through an intricate complex of private and government-owned facilities and systems including: (a) radio and television broadcast stations and receiving sets; (b) an integrated public switched telephone network including common carrier transmission systems (wire, cable and radio); (c) fixed radio network; and (d) mobile radio network (vehicular, aeronautical and maritime). This enormous infrastructure of systems network and institutions is worth an aggregate of over 50 billion dollars and includes more than 110,000,000 telephones, 6700 broadcast stations, several million mobile radio transmitters, and 200 million miles of voice equivalent circuits interconnecting virtually every town and city in the United States.

The feasibility of long-distance communications via communications satellites in geostationary orbit has been

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demonstrated and, in fact, such capability is now utilized on an operational basis through the facilities of the International Telecommunications Satellite Consortium (INTELSAT).

The potential for providing domestic telecommunications services by the means of satellite communications technology has been under active consideration by many private and government organizations for several years. However, this Administration decided to review for itself the options open to the Government for satellite communications in domestic applications. Consequently the White House appointed two committees--one dealing with economic factors and the other with technical factors--to investigate the issues and present the options.

The Economic Committee is charged with examining those factors having economic relevance in the introduction of satellite communications into the domestic telecommunications environment. The Committee limited its consideration to the near-term frame using current state-of-the-art and allocated frequency bands (4 and 6 GHz) available for commercial communications satellites. In this examination, the Committee addressed, in part, the following important policy questions:

- What services might satellites perform economically?
- What are the advantages and disadvantages of encouraging competition in this area or providing for monopoly control?
- What difficulties might arise under a competitive approach?
- What policies might be followed to minimize these difficulties?

I. The Role of Satellites in Domestic Communications

The two basic telecommunications functions are interconnection and mass communications. The objective of interconnection is to permit individuals or machines to communicate with each other by telephone, telegraph, teletype, facsimile, dataphone or other similar equipment. This function is performed by both common carriers and private systems, and typically involves switching facilities and trunk routes. Interconnection is not necessarily restricted to bi-directional communications; it also includes the function of transmission of information to one or more receive-only terminals.

Mass communications or the one-way transmission of information intended for direct reception by the public is performed by the broadcasting stations and CATV systems which may also use interconnection facilities to convey their program material from points of origin to transmitting stations.

While satellites may some day broadcast television directly to modified or unmodified home receivers, it is unlikely that this function will be performed under an initial domestic satellite program. Such satellites are beyond the proven state-of-the-art and no frequencies have been allocated for such services. Consequently, domestic communications satellites will be used initially in an interconnection role.

Initially satellites for domestic services generally will not directly interconnect user terminals but will interconnect gateway earth stations which in turn will serve one or more user terminals in the adjoining area through land-line or microwave connections. In some instances, notably local broadcasting stations, CATV systems, educational institutions, or large industrial complexes, direct user access may be provided. Although this same interconnecting function can be performed by terrestrial communications facilities through a combination of transmission and switching facilities, the satellite can directly connect any two gateway earth stations, or can relay a signal from any transmitting earth station to

all receiving earth stations simultaneously. The exploitation of these capabilities can provide, for some services, greater economy and flexibility of operations.

Any user having a requirement for interconnection is a potential user of domestic satellites so long as he can deliver his signal to the earth station. If he has sufficient traffic to warrant the cost of the satellites, the earth stations and terrestrial links at each of the points with which he wishes to communicate, he could have a system dedicated to his sole use. On the other hand, it would also be possible for him to combine with other users having similar requirements to jointly finance such a system. A third alternative would be for one entity to provide the required services to all users as a common carrier. Under this last alternative, the common carrier could either be the same as that providing common carrier services between the users' terminals and the earth station (as AT&T, for example), or one limited to transmission of the signal between earth terminals (as COMSAT, for example) in which case the user would be responsible for providing or obtaining the link to the earth station. The communications functions that could be performed would be identical in each of these cases.

Potential Applications

Some of the potential applications of domestic satellite communications are:

Nationwide and/or Regional Distribution of Television and Radio: The distribution of television and radio programs from one (or a few) originating points to many local stations is basically a wide-area and, for TV, a wide-bandwidth function. This function is currently performed by long chains of microwave and coaxial cable links, in which the program travels from A to B, where it is both used and forwarded to C, and so on through the country. At each junction, there are both terminating facilities (to pick off the desired signal); retransmission equipment (to forward the signal along); local distribution lines to each individual broadcast station being served; and, of course, additional terminating equipment at the local station. Additionally, there is a complex network of control circuits and associated switching/routing facilities to provide the sub-network interconnections, or alternate routing in case of a break in the transmission chain, and intermediate testing, monitoring and maintenance equipment with the personnel needed to maintain adequate signal quality through this maze

of switching and transmission facilities (which can introduce different distortions to the signal, depending on weather conditions, differing routes, etc.).

To accomplish this same task via satellite requires a single transmission from the originating point through an earth station to the satellite, and a single broadcast transmission from the satellite to an earth station and then to the local stations. To the extent that different local stations desire different program material, it is necessary that the satellite transmit multiple programs, the local station then selecting the particular one it wished to use--as in the case of the home broadcast receiver. Broadcast distribution appears to be the most attractive domestic application of communication satellite technology at the present time.

Despite the occasional requirement of present-day commercial TV networks for simultaneous nation-wide distribution of programs, the normal operation of these networks is that of a series of regional sub-networks, each using delayed broadcast of programs taped earlier and each inserting a variety of both local and regional advertising, news programs, etc., at varying times. Currently a vast amount of switching and capacity must be reserved for subdividing networks and introducing

regional advertising. A similar service by satellite would require many additional channels and a switching network. This type of operation, being somewhat closer to interconnection than pure distribution, would therefore provide less opportunity to explit the satellite distributional advantage.

Several comparisons have been made between satellite and terrestrial systems for TV program distribution and interconnection. These differ appreciably in their assumptions, in the factors compared (some compare satellite system costs with terrestrial system rates, some compare only transmission costs, some include the cost of local loops while others do not, etc.). Obviously their findings also differ. However, without exception, they all found savings from the use of satellites for this purpose.

National/Regional Data Exchange and Video Conferencing Networks: For the foreseeable future, the market for wide-band data exchange, telemail, and video-conferencing (including Picturephone) appears to be thinly dispersed and limited primarily to certain highly specialized uses, since the terminal equipment is costly and the benefits undetermined. In addition to demand being thin and widely dispersed, these markets also may require very specialized communication interconnections,

such as wide-bandwidths (possibly variable) and limited phase shift and distortion. Such services can not easily utilize the existing long-lines transmission and switching network since it is built around the requirements of analog narrow-bandwidth voice signals. To take care of some of these services new facilities will have to be built or existing equipment extensively modified.

By its very nature, a thinly loaded dispersed communications market is prone to much wider fluctuations in traffic loading than a dense market in which customer use is statistically smoothed out. Using fixed capacity, fixed route terrestrial transmission and switching facilities, a high degree of excess system capacity would be often required to handle such a market. On the other hand, satellite systems employing demand-assigned circuit capacity are much more adaptable to meet fluctuating demand. In effect, a satellite system can reallocate capacity among many routes throughout the country--which terrestrial facilities cannot do--and thereby minimize excess circuit capacity. Therefore, it would seem that satellites might be most economical for providing any long-haul, thinly loaded dispersed communications service

which requires significantly different bandwidths, distortion, error rate, etc., than the basic telephone plant can provide.

Point-to-Point Trunking: Point-to-point trunking now appears to represent the least economic utilization of satellites in the domestic environment, in relation to terrestrial alternatives. There are several reasons for this. First, this mode of operation derives no benefit from the routing capability of satellites; hence, they must compete on a straight-transmission basis. Furthermore, terrestrial facilities are themselves most economical in point-to-point trunking, with a sharp downward cost trend with increasing route density. Systems using satellites show much less difference in costs between thin and dense routes, yet dense rather than thin routes are presently most in demand for long-haul point-to-point trunking in the domestic switched network.

Satellites may consequently be useful for point-to-point trunking, but potential cost savings appear slight and may be of fleeting duration unless future developments in satellite technology bring about very significant cost reductions--which is certainly possible.

In addition to the relay functions described above, there are specialized services which satellites can perform which

are uniquely suited to their characteristics. Some of the specialized services could be provided within existing state-of-the-art technology, although they might raise problems of frequency allocation and compatibility with existing ITU regulation and CCIR recommendations. Among such services would be communications with mobile terminals such as aircraft and ships for navigation and air traffic control functions, collection and relay of data from remote terminals and clock coordination for many ground or mobile applications. Whether these services could be incorporated in satellites configured primarily to provide the interconnection function discussed earlier, or would require separate systems, would involve an analysis of the requirements for such services and their technical and operational compatibility with other services that might be provided by the satellite.

Government as User of Satellite Communications Services: The United States Government is dependent upon a very wide range of modern telecommunications services in conducting its functions. Within the contiguous 48 states the Government has followed the policy of obtaining commercial services from common carriers to meet its traffic needs wherever possible and only establishing Government-owned facilities to meet

special requirements. Hence, the Government is today by far the largest single customer of common carrier telecommunications services both domestic and international. Government uses include networks for national defense, radio navigation, air traffic control, intelligence, weather reporting, law enforcement, agriculture, medical, research and development, recreation, education and many others. In 1968 the Government spent $144 million for non-military leased telecommunications services and $225 million for military leased services.

The most probable candicates for leased satellite telecommunications services include: (a) wideband collection and distribution (video, high-speed data and computer to computer real time); (b) alternate routing of point to point telephone, dataphone and telegraph; (c) possible new applications for the Post Office Department, the Department of Transportation, the Department of Defense, and the Department of Health, Education and Welfare.

The Post Office in particular has indicated potential interest in the use of satellites for an electronic postal system. It is quite possible that at some future date the postal service might want to establish its own system or to

contract with a domestic satellite licensee. If the Post Office established its own system, it would presumably use that proportion of the spectrum allocated to Government use and, consequently, would not accupy any spectrum or orbital space that domestic satellite operators would use. Alternatively, if the Post Office contracts with a potential private satellite operator for a pilot project, an additional satellite operation could be established. This might be desirable if the number of entrants were very few (see Section III for more on this point). Another organization that has indicated an interest in the use of satellites is the National Library of Medicine of the National Institutes of Health. They have indicated a need for a biomedical communications network for professional specialized information interchange.

Costs

Without specifying system requirements and absent a detailed study, no firm conclusions can be drawn about costs. To adapt any Intelsat satellite for domestic use would require some additional R&D. Moreover, Intelsat would undoubtedly require some compensation for the R&D already invested in

existing satellites. Thus a satellite of the size of Intelsat IV can be expected to cost more than the $6.5 million Intelsat would have to pay for an additional one.

A satellite system would require the purchase of more than one satellite. At a minimum, a spare would be desired--probably in orbit. An additional spare on the ground might also be necessary. Thus a company entering the satellite business would have to expect to pay for a minimum of two satellites and launches and probably more. In addition, launch failures as well as satellite failures are quite possible and must be considered in estimating costs. The fewer satellites in a system, the greater the impact of a single failure.

On the ground, send and receive and receive-only stations must be constructed. The more earth stations the higher the total cost. One advantage of a satellite system is the ability to switch capacity among different routes. But to receive this benefit, at least several send and receive stations must be built.

In general, then, satellite systems are expensive. It is hard to conceive of the simplest system costing initially less than $35 million for the space segment alone while a large complex system might run in the hundreds of millions of dollars for the whole investment.

Economies of Scale

Provided there is a demand for the circuits, high capacity transmission facilities are the most economical per unit of traffic. When applied to satellites, the larger the capacity of the satellite, the lower the cost per circuit. But helping offset the lower circuit cost of higher capacity satellites is the trade-off between launch cost and satellite weight, which in turn is a rough measure of its capacity. Other important variables that could further affect the relative costs of large and small satellites are the manner by which launch and satellite failure risks are accounted for, the lifetime of the satellites and whether in-orbit or on-ground spares are included. Additionally, a major impediment to further scale economies beyond the INTELSAT IV is the limitation imposed by existing frequency bandwidths allocation.

If communication satellites should continue to grow in size beyond the capability of the Atlas-Centaur, launch costs would make the large incremental step to the Titan-Centaur vehicles and hence introduce problems of risk and redundancy that might well outweigh the advantages of added communications capability.

It should be emphasized that the discussion of economies of scale is predicated on existing technology and the 4 and 6GH_z bands. In the future larger satellites and higher frequency bands will become available and will change the minimum size satellite that is economical to launch. But in the near future it is quite clear that more than one satellite will be desired and that additional satellites will have additional earth stations. As was pointed out above, costs will also depend on the need for spares, the need for tracking, telemetry, and control stations, management expenses, and any economies in purchasing multiple satellites. Consequently, it is impossible to determine the smallest size system which would also minimize costs for a given use.

II. The Basic Alternatives

While there are an infinite number of institutional arrangements for a future domestic satellite communications industry, the committee focused on two polar categories. Clearly some position between these extremes could be selected but the arguments are best clarified by discussing these categories.

The first category, called competitive entry, is defined to mean that no economic criteria other than minimum financial capability would be used to screen potential entrants, but that antitrust considerations could be used to restrict the manner in which some firms would be allowed to participate. Subject to that caveat and the availability of spectrum and orbital space, the Commission would routinely make the necessary public interest finding to grant a license. In other words, the FCC would issue a license to any applicant to use the frequency allocations appropriate to his service provided that the proposed satellite system would not create undue interference problems with other systems or would not monopolize the spectrum. The location of each transmitting earth station would, of course, have to be considered and licensed. The

criteria for licensing would be whether such an earth station might cause interference with either terrestrial users or other satellite systems. If interference were expected to result from the use of such an earth station or developed after installation, the applicant could be required to pay the cost of relocating the terrestrial equipment, to provide equipment to eliminate interference, or to relocate his earth station.

The competitive entry category represents a straightforward extension of the policies now followed with respect to the use of terrestrial radio facilities, where the prospective user of telecommunications services has the option of either installing his own private system, joining a cooperative consumer-user system, or obtaining services from a communications carrier. However, the major thrust of this option is to permit competition among communications carriers. Thus, no protection against competitive inroads would be offered either to existing terrestrial carriers or to new satellite operators. While current law does not require that existing carriers be protected, the FCC must insure that necessary public services are maintained. This point is elaborated below in Section IV.

Even under the competitive entry approach, existing law would compel the Commission to make a finding that competition--the basic feature of the competitive entry policy--would produce some economic benefit to the public. We believe that the Commission would be able to make such a finding in this industry, where rate and technical competition is possible. In other words, while the FCC has certain statutory responsibilities, we would expect the FCC to minimize its activity in this field to give competitive forces the maximum free play consistent with the law.

Underlying the competitive entry option is the assumption that spectrum and orbital capacity exceeds, for the near-term, the needs of potential operators. In fact, the technical committee has estimated that with existing technology and with 30-foot antennas, the orbital space would accommodate at least 16 satellites, each capable of covering all of the contiguous 48 states. However, not all of these "slots" are available to the United States. Canada is planning two satellites; Intelsat may desire space for North America-South America service. Nevertheless, it appears that in the near future all proposed systems could be installed. If, however, proposed systems

require more than the available orbital capacity, the FCC would have to allocate space among entrants or choose between entrants.* Since this appears to be unlikely at this point in time, that problem will not be considered further.

While no test of profitability of entrants would be involved in competitive entry, certain classes of companies, e.g., terrestrial common carriers, might be restricted for antitrust or regulatory reasons. This point is elaborated below in Section III, Policy on Potential Entrants.

Competitive entry does involve an implicit contradiction in U. S. policy. In the past the United States has strongly supported the monopoly of Intelsat by opposing regional systems. Allowing domestic competition would appear to be inconsistent with that position.

The other category, called a chosen instrument, would involve management of all satellites by one entity. Such a single management could either involve the system being a common carrier, or alternatively, could in fact be a combination of users organized under one agent, thus a common user system with common carrier obligations. Any chosen instrument would

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* Several solutions to that problem exist: first-come, first-served (with the option of selling a system), or having the FCC allocate the space to those with the most desirable attributes.

clearly provide common carrier services and might in addition have some specialized satellites or earth stations. It is, of course, quite possible that under a competitive entry policy a single system might result. It could be that only a single firm would apply for a license to run a satellite system or it could be that after an initial trial of several rivals, economies of scale might be so pronounced as to result in the combination of all the systems.

Evaluation

The goal of Government policy should be to establish a program in which this new technology can make the maximum contribution to the total telecommunications resources available to the American people in both quality and economy. This Committee has translated this general goal into five specific criteria which if satisfied will make this contribution. Each of these categories has been evaluated according to these desirable criteria. Much of the evaluation must perforce depend on theoretical considerations which may not be borne out in all situations. Some of the evaluation is based on evidence from other industries or studies of a wide variety of industries. Nevertheless, we cannot be dogmatic about our conclusions.

They are the probable results as forecasted by theory and evidence but they might not result for future satellite services.

Service Flexibility: The first criterion for evaluating the alternative policy options is which policy offers the greatest flexibility in providing the public with a wide variety of services. A chosen instrument can, of course, offer any service, but would it? A monopoly may prefer to offer a few broad categories of services rather than many specialized ones tailored to customer needs. A single entity may not conceive of some potentially profitable service or may be unwilling to take the risk of offering such a service. On the other hand, if several firms are offering satellite communications and other entities can enter, there will be more incentive to search out alternative services. The first firm to offer a service may secure a lucrative market. Moreover, with a number of firms in the business, there will be more groups generating ideas and so more likelihood that new ideas will be tried.

On the other hand, if only one or two specialized carriers enter, some potentially profitable services might be neglected--at least temporarily. Some service that would be

potentially profitable as an adjunct to other offerings but which could not support its own system might not be offered by specialized carriers which did not want to be classified as common carriers, or which were primarily concerned with their specialized customer needs. If many such services were neglected, however, it would be possible and profitable for a common carrier to enter and service them. Moreover, except for possibly a system dedicated to television distribution, any entrant would very likely be sufficiently hungry for business that it would search out potentially profitable service offerings. Thus, unless the only entrant is one dedicated to television, we would expect the competitive entry alternative to offer the greatest flexibility in meeting customer demands. The options open if the only entrant is a dedicated television distribution system are discussed below in Section III under the heading, The Problem of Few Entrants.

Efficient Satellite Use: A second criterion is to insure that satellites and satellite communications are used efficiently both economically and technically. Technological efficiency is compatible with multiple entry provided that the regulatory control recommended in the Technical Committee report is followed.

Economic efficiency is related to the question of economies of scale. As was concluded above, any multiple purpose system would involve multiple satellites which could be owned by separate entities. We have been unable to determine the extent of any economies of scale. However, if economies of scale were substantial, there would be significant gains from combining systems and it is likely that potential satellite operations would recognize these gains and would establish a single unified system.

It may be argued that a chosen instrument would be better able to avoid overcapacity and redundancy. Any excess capacity that might develop under competitive entry, however, would probably be of short duration. Demand will probably grow to meet the capacity. Moreover, satellites have a limited life and excess capacity would not be replaced. Thus, in the long run, competitive entry could be expected to be about as economically efficient as the other alternative.

Low Rates: A third criterion is which alternative will keep the rates lower and closer to costs. If many firms enter--a long-run possibility--competition can be expected to keep rates close to costs.

On the other hand, if economies of scale were substantial for a specific service, and if economies of specialization negligible, a chosen instrument would be lower cost and might offer lower rates.

Even under a competitive entry we would not expect a large number of systems. Thus, any competition in satellite service offering would at best tend to be among a few oligopolists (as well as with the terrestrial common carriers). Such competition is unlikely to lead to vigorous rate competition. It is quite possible that initially only a television distribution system and a common carrier system might enter. Even in this situation some price competition might develop. A TV distribution system would likely have excess capacity on weekdays during working hours and late at night after broadcast hours. Consequently, a profitable alternative for such a system might be to offer weekday private line wideband data service in competition with the common carrier. In addition, the common carrier might attempt to secure CATV and independent station business in competition with the TV system.

There are almost unlimited ways that satellite services can be "packaged" and sold. Different rates probably would

develop for interruptible service, continuous service, on demand service, when space is available service, peak service, and so forth. Such differentials will promote active competition in offering the various services at various rates. Thus, even under oligopoly conditions considerable competition can be expected among the various entrants.

It should also be noted that for almost all uses of satellites, terrestrial carriers compete. Thus, a maximum rate is imposed by terrestrial service. Nevertheless, there may be a few uses for satellites which are unique. In these areas rates could conceivably be high relative to costs. Yet, since these services are now unavailable, the public would still gain even if rates were high. It is possible that maximum rate regulation could be imposed in these areas, but such a step could deter entry by many firms.

Conceivably, regulation of a chosen instrument could keep prices closely related to costs. Regulation, however, suffers from the difficulty of measuring costs accurately, of a necessarily long process involved in achieving rate reductions, and of limited resources. In a number of regulated areas, competition has been found decidedly helpful in keeping rates down and in improving services.

Competition in international telecommunications has had the result of deferring rate increases in times of low earning, expediting rate decreases for certain services, particularly leased voice grade channels, and encouraging innovations in service. Thus, after World War II when the international telegraph carriers were faced with increased costs and major decreases in traffic volumes, they were unable because of the existence of competition to effectuate rate increases to compensate for their traffic losses for a considerable period of time. After the Commission's Authorized User decision, the international carriers engaged in a series of competitive activities seeking the business of leased circuit users. As a result of this competition, rates across both the Atlantic and Pacific for leased circuits were successively reduced so that now they are some 25 to 35 percent below levels of a few years ago. After the Commission indicated that it would authorize competing direct radio traffic circuits, RCA Communications which previously had enjoyed a virtual monopoly in this field was forced to seek other means of maintaining and increasing its revenues. It then pioneered the international TELEX service which today accounts for a substantial percentage of the total revenues of the international telegraph carriers.

Experience in the commercial aviation industry also indicates that an oligopoly leads to some beneficial competition. In routes with 3 or 4 carriers, competition is considerably more vigorous and prices considerably lower than in markets with fewer carriers. The natural gas pipeline industry is another example where even under regulation, competition among 2 or 3 lines has benefited consumers.

Promoting Innovations: A fourth major criterion is which option would most promote innovation in communications. Marketing innovations were discussed above in the section on flexibility of service. Technical innovations would appear to come more readily from the manufacturer rather than the satellite operating entities. Yet the choice between the policy alternatives may have an impact on technological innovations. A single chosen instrument could result in only one or two suppliers since suppliers would either feast or starve. Competitive entry, on the other hand, that resulted in more than one domestic satellite company would probably also result in several suppliers.

There is good evidence that within limits the existence of several manufacturers is likely to result in more innovations than if output is controlled by a very few suppliers.

Several economic studies have examined the relationship between the degrees of monopoly in an industry and its innovativeness. In general, comparing similar industries, they have found that the very monopolistic industries are less innovative than less concentrated ones.

A major case study concluded that the introduction of two new firms in the aluminum industry after World War II led to more inventions in the postwar period than would have occurred if Alcoa had maintained its monopoly. Thus, competition in the provision of satellite communication services should stimulate innovations.

Increased Learning: The final objective of a domestic satellite system is to increase the learning about possible uses, costs and services. Again it is clear that the more competitive and the more open the market, the greater the possibilities are of learning about new uses, about the true costs, and about potential service. Thus, competitive entry would provide the greatest possibility of learning. While it is possible that a chosen instrument could have imposed on it some requirements for experimentation, it is unlikely that these requirements could or would cover all the possibilities

and might overlook some important uses. Moreover, it would not be possible under a single system to derive very good estimates of costs of particular services.

III. Policy on Potential Entrants

While COMSAT would prefer to be the chosen instrument, it is a likely entrant regardless of conditions of entry or service terms. COMSAT with large cash reserves needs investment outlets. Moreover, its business and its expertise lie in satellites and consequently it would be very unlikely to pass up an opportunity to enter the market even if it expected to face competition.

Among the terrestrial carriers, the magnitude of the project would restrict the possibilities to three firms: General Telephone & Electronics, Western Union, and AT&T. General Telephone has expressed little interest in establishing a satellite system and can probably be discarded at the outset, as an independent entrant, as can be Western Union, whose small size and all-consuming interest in developing its data processing and switching capacity probably precludes consideration of such a massive new undertaking. Both companies, of course, might consider participation in any joint venture along the lines of COMSAT. Basically, though, the only likely independent entrant in this class is AT&T whose expertise in communications systems management and sophisticated technology is well known.

It has ample resources available to finance such a project, and as a large potential user, sufficient motivation. Furthermore, traditionally the company has shown strong interest in new communcations techniques, and prior to the establishment of COMSAT was the prime contender in the international sector. Even though AT&T has indicated that it does not now consider satellites economical for domestic services, it would clearly reconsider in the event that satellite operations by others become successful.

ABC has already requested authorization from the FCC to operate a dedicated broadcast system. The president of CBS very recently advocated a joint network dedicated system. As broadcast distribution presently offers the greatest cost-savings through satellite services, all three networks might be viewed as potential independent entrants, but their participation in a dedicated satellite joint venture seems even more likely.

General Electric has proposed a satellite system to provide high speed record and video interconnection services. There presently exists a large potential domestic demand for a high speed record service, principally in business, that existing terrestrial carriers cannot satisfy without a major

investment in new communications facilities or modification of existing facilities. GE's longstanding position as a leading innovator, and its ample resources, make it a definite potential entrant. Yet in its filing, GE refrained from requesting operating rights for reasons which are not clear. It is possible that GE was reluctant to enter a high risk industry in which their rate of return might be limited by regulation.

In addition there might possibly arise new carriers such as a new computer or general data carrier or an existing CATV carrier such as Western Microwave.

Conditions of Entry for AT&T

In principle, a policy of competitive entry provided it results in a number of entrants appears the most effective in promoting innovation, low rates, and learning in the use of domestic satellites. However, one entity, AT&T, so dominates the domestic communications industry that without appropriate guidelines "competitive entry" might well mean the entry of only AT&T.

The gross assets of AT&T and the associated operating companies of the Bell System are worth about $43 billion,

making it the largest corporation in the world; by comparison, the largest potential other entrant (the parent companies of three TV broadcast networks) have combined assets of only $3.6 billion. Furthermore, AT&T provides through its terrestrial long-lines network over 90% of all long-distance communication services (public and private); through the local operating companies, it also controls over 95% of the local distribution facilities, the use of which are essential to many long-distance services. Finally, this position of AT&T is largely the result of a longstanding public policy at both the state and national level that the public message telephone service represents a "natural monopoly" subject to public regulation rather than private competition. Given this monopoly control of the public message exchange service, AT&T's ability to control the private line service as well is virtually assured.

Unrestricted entry by AT&T into satellite operations could discourage entry of other firms and thus reduce the possibility of either effective competition or independent communications operations. Most satellite systems will have to use AT&T terrestrial facilities to reach the ultimate users.

If AT&T also offers satellite services, other satellite entities would face the very real possibility that Bell, through cross-subsidization from the public message exchange service, might reduce its rates on specialized service offerings to a point that competitors could not afford to match.

To ensure that AT&T -- or for that matter any other entity -- does not enjoy an unfair advantage as a result of prior policies or entrenched position several alternative conditions on entry might be imposed.

Bar AT&T from Entry: AT&T would not be permitted to own or operate domestic satellite systems, on the grounds its entry would automatically discourage other potentially innovative entrants and thereby further extend its monopoly control of both public and private communication systems. AT&T would, however, be authorized to lease satellite transmission services from other entrants; and those entrants providing for-hire services in competition with AT&T (but not dedicated user systems) would be required to lease to AT&T.

A major drawback in excluding AT&T is that the Bell System would not be likely to patronize satellite systems extensively. Thus it might be cheaper for AT&T to lease some trunk capacity through a satellite but since such leased lines would not go into the rate base, terrestrial lines would be unduly favored.

Limit AT&T's satellite to serving only the switched public message network: AT&T would be permitted to establish and operate a satellite system dedicated to the switched public message network including associated services such as data phone. No private line, video or data transmission, not sent through the switched public telephone network, could be sent through Bell's satellite. However, Bell would be permitted to lease capacity from other satellite entities for its other offerings.

This would clearly prevent Bell from using its public message telephone to subsidize its other services using satellite. It would permit AT&T to participate in satellite operations and thus give them motivation to innovate.

The primary drawback to this alternative is that it would restrict a technically advanced company from exploring

many potential uses with its own satellites and it would reduce the incentive to innovate in areas outside of public message telephone transmission.

Some of the Committee believed that this restriction on AT&T might lead to the greatest number of entrants and would in the long run most promote competition. Even under this restriction, the Committee believed that AT&T might still apply for authorization to operate a satellite, although this would clearly reduce the profits to Bell from satellite operations.

Require AT&T to Establish Separate Domestic Satellite Operations: AT&T would be permitted to own and operate a domestic satellite system, but must keep the operations separate from its terrestrial network. This separation could be accomplished by establishing a separate satellite affiliate, charged with competitive procurement practices, and whose operations were not included in the revenue requirements of the terrestrial system. Or it could be accomplished by careful segregation of costs and separate accounting.

Nevertheless the problem of terrestrial cross-subsidization will remain. Without a major restructuring of the industry,

the only way cross-subsidization can be minimized is by depending on the diligency of the FCC in regulating AT&T.

Some of the Committee believe that a separate affiliate having publicly identified rates would aid regulators in preventing cross-subsidization. Other members believe that the FCC can be equally effective in policing AT&T through separate bookkeeping. All members of the Committee recognize that neither solution is a panacea nor could completely prevent cross-subsidization.

Therefore, we concluded that Bell should not be authorized to establish a domestic satellite system without conditions. Some Committee members believe that permitting AT&T to enter with a subsidiary would be the best alternative; others, as was mentioned above, believe that any Bell satellite should be restricted to the switched message telephone service.

Conditions of Entry for the Networks

Another problem involves the potential entry of one or more of the major networks which would lead to vertical integration.

The principal reason for limiting vertical integration is that it may involve foreclosure of independent entities

not enjoying the same advantages. Since both television networking and satellite communications are businesses involving high costs to enter (quite apart from any regulatory barriers), major network control of satellites might lead to the exclusion of additional commercial networks, or competing sources of information and entertainment (including educational television and CATV networks.)

On the other hand, excluding networks would exclude one of a few possible entrants. Moreover, broadcasting unlike common carrier communications, is not a "cost-plus" proposition, and hence broadcasters may have the maximum incentive to encourage innovation with resulting cost reduction.

Given these circumstances, the networks should be permitted entry either individually or in a joint venture consistent with antitrust considerations. Any foreclosure problem that arose out of a joint venture should be dealt with by requiring that access be granted to all in the trade --including other networks, broadcast stations, CATV systems, etc., --on equal and non-discriminatory terms. If capacity of the systems were inadequate to accommodate a new entrant, the joint venture would have the choice of launching an additional satellite or restricting their own use.

This requirement would not necessarily make the joint venture into a common carrier. Such a requirement was imposed in an antitrust action on the Associated Press.

Conditions of Entry for COMSAT

If COMSAT established a domestic satellite operation, it will compete with AT&T for some long haul traffic. Established antitrust principles prohibit a firm from owning stock in a competitor. With the entry of COMSAT in the domestic field AT&T would own stock of a major competitor. Therefore it would be desirable if AT&T were to divest itself of its equity in COMSAT. This requirement could and should be imposed before AT&T be allowed to operate satellites and this divestiture would be desirable, if possible, even if only COMSAT enters the domestic satellite field.

The Problem of Few Entrants

It appears that entry requires a capital expenditure of at least $50 million for small specialized systems and much more for any large scale operation. Such a figure would necessarily limit the number of individual potential entrants.

It seems likely, however, that if competitive entry were permitted, there might be two potential entrants for large scale systems: these would include some broadcaster joint venture and a common carrier system owned by either AT&T, COMSAT, or both. While the market would appear to exist now for two systems, it is unclear whether it will support three or more.

We would stress, however, that entry confined to one or two entities as a result of marketplace forces would be quite different in effect from the same result achieved by regulatory action. Such a marketplace result would suggest that those with capital, resources, and experience see relatively modest opportunities in satellite communications for domestic purposes at this time; but the door would remain open to them (assuming available spectrum space) if and when market conditions or technology justified it. Thus, such a competitive entry policy -- even combined with very limited actual entry -- would continue to act as a spur to innovation of low-cost technology. Limited entry achieved by regulation would, on the other hand, probably tend to inhibit technical innovation by those not having some financial

stake in the system chosen and reduce the need for innovation by those operating the system. While there might be an opportunity for later entry (especially if the original program were regarded as some sort of pilot project), the non-included interests might well conclude that they would not have a substantially better chance the next time around; and this would in turn lead them to devote their capital and technical resources to other areas of innovation and growth.

Assuming that only one or two applicants came forward under a competitive entry policy, the economic results would depend to a considerable extent on who those entrants were. If the only entrants were television networks, this would probably be sufficient to produce distribution cost lower than now provided by the terrestrial network. On the other hand, it would probably do little to develop new uses of satellites.

If the only entry were by AT&T, satellite development might have a realtively modest impact on long-haul communications and on rates (except possibly for television distribution rates). AT&T would have the least incentive to

push the satellite technology far and fast or to encourage new satellite uses, given its very large and continuing investment in terrestrial radio, cable, and switching facilities.

A serious problem might arise if the only entrant were to be a specialized carrier such as a network joint venture. In this case some services that might be offered profitably by a common-carrier satellite system might be neglected because the networks preferred not to be common carriers or because they were uninterested in handling non-television communications.

There are several solutions to this problem. First, the networks could be required to offer such services. This has two drawbacks. It substitutes an FCC estimate of what is a profitable service for that of the private company that must pay the cost. Moreover it might even discourage the entry of such a joint effort.

A second solution would be to pay the specialized carrier to offer additional services. This has the disadvantage of initiating a subsidy program that may be difficult to abandon later.

A third alternative is to encourage an additional entrant to become a common carrier by guaranteeing the entrant for a fixed period substantial Government business. The additional entrant would be given the Government business on condition that it became a common carrier. With sufficient Government business to cover its cost but not enough to make large profits, the additional entrant would be strongly motivated to seek out profitable services. This alternative has the advantage of promoting more competition and, in addition, providing the Government with satellite services.

IV. Policy on Operation of Systems

Regulation of Satellites

Some minimum amount of regulation is required by law; other regulation is permissible and may be desirable. Initial specification of regulatory actions required by statute does not settle the question of how much and what kind of regulation is desirable, only what is necessary without statutory change. Examination of the Communications Act of 1934 and the Communication Satellite Act of 1962 indicates four basic requirements:

(1) an FCC license for use of the spectrum would be required for the space segment, for any earth station, and for any interconnecting radio facilities.

(2) if land lines are used to connect earth terminals with common carrier facilities or connect other points by common carrier facilities, the common carriers would require a certificate of public convenience and necessity from the FCC.

(3) if the satellite system were to provide common carrier services, the FCC would need to insure that rates are just and reasonable and avoid undue discrimination among users.

While the FCC must concern itself with rates of the common carriers, the statutes do not require a particular means of regulation.

(4) if the Communication Satellite Act were deemed to apply and the system provided common carrier services, the FCC would also be required to insure effective competition in procurement, equitable and non-discriminatory access, and technical compatibility and interconnection of the system. There is, however, a question concerning the applicability of these provisions to the domestic system.

Given these requirements, what should public policy be on ownership, rates, spectrum use and access for each of the major alternative systems under consideration?

Ownership: By definition, ownership of satellites would be determined by the satellite operators under competitive entry. Alternatively, under the chosen instrument approach the ownership question would be of major importance. This report does not attempt to identify whether the chosen instrument should be a combination of users, a combination of terrestrial common carriers, or a single entity. If a decision were made to select a chosen

instrument for the operation of a domestic satellite system, a careful study should be made on the ownership of the system.

Rates: In a competitive entry approach, there does not appear to be a strong theoretical case for either maximum or minimum rate regulation since the market would over the longer run force an efficient provision of service. There are, however, two practical problems. First, the FCC is required to provide some oversight over the tariffs of all common carrier services. This responsibility, however, could be met without utilizing rate of return regulation. For example, regulatory intervention might be limited to insuring separation of costs and revenues for the initial operating period and non-discriminatory pricing. In particular, no matter how low the rates, they should be considered reasonable. Maximum rates are set by terrestrial competition. Second, permitting rate competition by a satellite entity could cause problems for terrestrial common carriers which normally practice average pricing in the terrestrial network. Equity and efficiency therefore require that terrestrial common carriers be permitted to compete on a non-discriminatory basis with common carrier

satellite systems (non-predatory pricing and true marginal costs for the specific service).

In the chosen instrument approach, more comprehensive rate regulation would be required, though it would not necessarily need to follow the same form as terrestrial common carrier regulation so long as tariffs bear some reasonable relationship to costs and provided comparable alternative terrestrial services were available. Maximum rate regulation would appear to be in order, and possibly minimum as well depending on the stance taken with respect to competitive pricing in terrestrial common carrier systems.

Spectrum use: From the previous discussion, it is clear that FCC will be required to issue a license for use of the spectrum. The Technical Committee has indicated that several domestic satellites can be accommodated. Since a number of systems are technically possible within the ground rules, the license for spectrum use appears relatively straightforward except for the problem of interference with terrestrial microwave systems. In this problem area, there are some technical uncertainties which may make guarantees of non-interference difficult. A means of handling this problem is discussed in the next section.

Access and interconnection: Except for a private system dedicated to a single user, a general rule would require non-discriminatory access or use of the satellite system by the class of users for which the system was designed. With respect to multi-purpose or common-carrier type systems, it is assumed that the Authorized User ruling would not apply to the domestic system.

In the competitive entry concept, few rules beyond these two basic ones appear justified. Users would essentially have satisfactory options in that they could either obtain services if available or undertake individually or collectively to provide services through their own systems whether such services were otherwise available or not.

In the chosen instrument concept, the rules concerning access become more complicated as governmental intervention substitutes for the marketplace. While the basic rules of access to encourage economical uses may not be radically different, the Government may need to become much more involved in evaluating the technical design of the system to insure that the technical characteristics of the system do not defeat the objective of open access and exploitation of new or different technology.

The subject of interconnection is a highly complex problem full of convictions of ancient and often unexamined variety. Much time was devoted to this subject by the Rostow task force. For the sake of brevity here, only a basic guiding principle is asserted. In both of the concepts under consideration, common carriers should be required to provide interconnection on a non-discriminatory basis without unnecessarily expensive buffer systems.

Moreover, it is essential that local communications utilities be required to provide private line and common carrier interconnection (if desired) with earth stations. Such interconnection must of course be provided at reasonable and non-discriminatory rates. Absent this requirement AT&T could strangle any satellite company.

Earth Station Ownership

It is necessary to coordinate the design and operation of space and earth stations employed in a specific system, but users might participate in ownership of earth terminals. Under competitive entry, ownership of earth stations could be left up to the satellite operators without any obvious difficulty, but under the chosen instrument option, provision

for user ownership or partial ownership of ground facilities should be required. No strong reasons exist for specification of ownership for receive-only terminals or for small mobile two-way terminals.

Trial Period

If the competitive entry option is chosen and provided spectrum and orbital space is available, applications should be automatically approved (subject to the conditions spelled out in this report) for a given period. We believe that a fair trial of the competitive entry option would require a minimum of three years and perhaps longer. At the end of the trial entry period, the policy of approving all applicants should be reviewed. Perhaps it will be found to be successful and continued as is or it might be modified. Perhaps no more applications in the 4 and 6 GHz bands would be accepted but new systems might be proposed to operate with higher frequencies. Perhaps competition may not have developed as desired and new policies might be instituted to encourage more entry. Or perhaps, it might be apparent that consolidation of existing entities should be encouraged.

In any case, assurances should be given that those who invest in satellites during the trial period will be allowed

to try and recoup their investment over a reasonable period after the end of the trial and that any consolidation of entities that might occur at that time would involve payment of a fair price for their remaining investment.

Orbital Space

The technical committee has estimated that only five satellites could be located in the orbital arc to provide simultaneous coverage of Alaska, Hawaii and the 48 contiguous states. For those entities which plan communications services only with the 48 contiguous states, other orbital locations are preferable.

Under the competitive entry option, we would expect the FCC to announce that they were accepting applications for satellite systems for some period, e.g., three months. At the end of that time the FCC would attempt to work out with the applicants an equitable allocation of orbital locations consistent with international obligations. No one entity would be permitted to preempt all desirable locations. Carriers proposing to service only the 48 contiguous states would probably not be allocated a position that would cover Alaska and Hawaii unless such an allocation would not foreclose others and there was good reason for doing so.

Moreover, during the first application period, it would seem undesirable to assign any one entity a major proportion of the desirable orbital space. However, if a company showed a compelling reason for additional space and the extra space would not limit the entry of other firms, the FCC could authorize the addition. The reason for the orbital space limitation is to prevent any one carrier from dominating the system initially.

V. Effects of Alternatives on the Terrestrial Common Carriers

Most economic discussion of a domestic satellite system tends to focus on setting a "break-even point" -- the distance above which satellite service would supposedly be cheaper than equivalent terrestrial links. The rule of thumb has been that long distances favor the use of satellites, whereas short distances favor cable and microwave relay. However, the break-even point is also a function of the total traffic load and the number of routes served.

Generally, the space segment cost of a satellite system is independent of whether total traffic is used to connect two points along a high traffic-density route or many points with relatively lower traffic-density. For instance, a 2000-circuit satellite can equally well provide 2000 circuits between 2 points or 200 circuits over each of ten different routes representing all possible interconnections among five points. In the latter system, with many low-traffic-density stations, the break-even distance can be lower than is the case for the high density point-to-point systems, although there is a point beyond

which a further increase in the number of terminals because of this high cost reverses the diminishing-costs curve. The important concept, though, appears to be that the special advantage of a satellite system lies typically in providing many routes between many points through a single space relay.

Cream Skimming

Satellite operations are bound to compete with terrestrial common carriers. If domestic satellites are to be successful, they will have to divert business from the terrestrial system. This diversion is likely to lead to charges of cream skimming.

The FCC is required by law to insure that "necessary" public services are maintained. It is possible that satellites will divert profitable services to satellites leaving some remaining services offered by terrestrial common carriers uneconomic. These might be uneconomic because they were being cross subsidized by the diverted services or because there were economies in offering the services jointly.

If there were economies in offering services jointly, it is likely that such economies would remain when satellites are substituted for microwave relays or coaxial cable. In

that case the satellite operators would probably offer the joint services.

However, it is possible that a satellite operator might only offer some services, neglecting others either because the others would be unprofitable or because the domestic satellite firm wishes to avoid becoming a common carrier. In other words, the gain from offering some services would be less than the cost to the satellite operator (where the cost might be becoming a common carrier).

It should be recognized that many charges of cream skimming are unsubstantiated in fact. All services may be profitable but the new entrant is planning to compete for the most profitable. It is, of course, often difficult in this area to separate fact from fiction.

If, in fact, a "necessary" public service is uneconomic, there are several alternative policies that might be followed. First, the new entrant could be required to offer the "necessary" public service. It should be recognized that this means that rate payers of other services would be taxed to pay for the subsidized services.

Strong economic arguments can be made against this practice both on the grounds of economic efficiency and on grounds of economic equity. Moreover, this requirement might actually discourage the entry of the proposed satellite operator.

An alternative method of handling this problem would be to provide a public subsidy either to the satellite operator or to the terrestrial carrier to continue the service. This has the obvious drawback of creating a new subsidy program that may be difficult to remove when it is no longer needed. Depending on how it is administered, the subsidy program may reduce the incentive of the subsidized firm to reduce costs. Moreover it substitutes the "wisdom" of the Government for the "wisdom" of the marketplace.

A third policy alternative would be to permit the workings of the market. If the terrestrial carrier gives up the service and it is really necessary to some of the public, it is quite possible that some other entity will offer a service which while not identical may satisfy the public need. Whether this option is either politically or legally

possible, this Committee cannot say. It does involve some risk that a "necessary" service may disappear at least for a while.

Finally, it is at least arguable that because satellite costs are substantially independent of terrestrial distances, the likelihood of serving small users will increase. It is quite possible that the eventual decision on entry may involve an implicit choice between an existing terrestrial service and one or more new services by satellites.

Regulation and Rates

Satellites to compete will have to offer lower costs or better services. Where lower rates are offered, terrestrial common carriers will either have to meet the lower prices or give up the service.

The competitive entry approach only makes sense if satellite operators are free to compete on the basis of price. Satellite operators will clearly be unwilling to set rates below their marginal cost. Such a practice would guarantee them a loss without any prospect of eliminating terrestrial competition.

Conversely, the hands of terrestrial common carriers should not be tied. They should not be required to stand by and watch their service offerings competed away without responding. However, terrestrial carriers, especially AT&T, are in a position to reduce their rates on specialized services almost to nothing without seriously affecting their financial position. Thus the terrestrial carriers should be permitted, under competitive entry, to reduce their rates but not below the marginal cost of the service.

If some services were diverted from terrestrial carriers to satellites, it is possible that a part of the terrestrial facilities might become economically obsolete. Permitting such facilities to be depreciated over a short period of time might be used to justify higher rates on remaining terrestrial services. This raises both questions of economic efficiency and of equity. For economic efficiency rates should be related to the costs of that service and not inflated by unrelated factors. Consequently, if there is no joint cost problem, efficiency considerations would imply no change in charges for other services.

On the grounds of equity the problem is more difficult. Persumably had the terrestrial carriers been able to correctly forecast the satellite competition, they would have attempted to depreciate their terrestrial investment over a shorter period or perhaps not make the investment. In a non-regulated market, the failure to properly forecast the future is borne by stockholders. In a regulated market, however, carriers may not be permitted to use short depreciation periods or to earn rates high enough to compensate for such risks. Thus whether the burden should fall on the stockholders or whether the Government should compensate the company is a difficult problem. It seems elementary, however, that justice is not served by requiring users of other services to accept the burden of unforeseen advances in technology and proposed changes in governmental policy.

A more difficult situation arises in the joint cost situation. If facilities are commonly used for two or more services and some of them diverted to satellites, it is possible that cost of providing the remaining services will rise. Efficiency considerations imply that rates

should also rise. Clearly, rate payers of this service will suffer especially if they do not or cannot benefit from the lower cost satellite services. Alternatively if regulation effectively prohibits the satellite operators from diverting some services, the users of those services will not gain the benefits they would have otherwise. Consequently, there is no simple solution to the quity problem — one or the other user group will be adversely affected.

Interference and Compensation

Interference with, and from, existing terrestrial microwave installations represents a significant potential problem area for any prospective domestic satellite operator. In addition, future satellite systems might cause interference with and between other satellite systems. Existing licensees will expect protection from harmful interference and will look to the FCC for assurance of that protection.

From a technical point of view, the problem of interference can be handled in one of several ways. Newcomers can be required to accommodate to the existing system; proposed facilities can be relocated or modified to eliminate the problem. Alternatively, existing facilities could be

moved. One, or both of the parties involved might shift operating frequencies or reduce output power, or affect some other change in system operations. A change is not always technically feasible and in any case usually works to the economic disadvantage of one, or both, of the parties involved. Another means of handling the interference problem is for one, or both, of the parties to operate with inferior, lower-grade signal channels, since operating on a totally interference-free basis does not represent the most efficient use of the radio spectrum.

Because there is a cost associated with avoiding, or eliminating, harmful interference, the question of financial compensation to the disadvantaged party arises. No single guideline or overriding precedent exists for determining when compensation is warranted or how much compensation is called for, although there is little doubt that in terrestrial telecommunications the burden of compensation normally falls to the newcomer. When, because of a change in operations, an interference problem arises between two established carriers, resolution is usually effected through negotiation. If this procedure fails, recourse is available through an appeal either to the FCC or, in some instances, to a consortium of interested parties.

Minimum Government involvement in these matters is possible simply by adopting existing terrestrial procedures and treating the satellite system operator in the manner of a new microwave competitor. By so doing, any compensation for changes in either system to reduce interference becomes a matter for two-party resolution between the existing terrestrial carrier and proposed satellite carrier. Such a policy would be consistent with establishing the position of satellite systems as competitors on an equal, non-favored basis with terrestrial systems. No new problems arise as a result of this policy, but likewise several old problems (e.g., compensation guidelines) are lift unsolved.

We would recommend the adoption of the existing terrestrial procedures that the burden of adjustment lies with the new equity and that the parties involved settle the problem through negotiations. However, if negotiations fail and the newcomer believes it has made an offer that would fully compensate the existing system appeal to the FCC or to the Courts should be provided for, by statute if necessary.

FOR OFFICIAL USE ONLY

Don*

November 20, 1969

To: Don Baker

From: Tom Whitehead

Attached is the letter AT&T asked us to send you a copy of; copy had previously been sent to you in the package of letters sent by memorandum of October 9th.

Official Use Only.

SUMMARY ~~OUTLINE~~ OF ECONOMIC AND TECHNICAL COMMITTEE REPORTS DOMESTIC SATELLITE WORKING GROUP

The Working Group has limited its deliberations to technical and economic issues bearing on domestic communications satellite policy. Before formulating such policy, other matters must also be considered. Among these other considerations are:

-- the impact on Intelsat;

-- the importance to the national interest of early establishment of a domestic satellite system;

-- other international considerations with regard to orbital and spectrum usage;

-- the desirability of introducing competitive forces into the domestic communication industry and the effect of such forces on rate making practices now pursued in landline services.

-- the effect on services now being furnished by terrestrial means, but which may not be economically viable under conditions of competitive alternatives since they are currently subsidized by more profitable services.

The report is considered to be a sound basis for policy decisions insofar as technical and economic matters are concerned.

However, since no examination of the problems beyond these areas ~~were~~ was undertaken, no recommendations with respect to policy are offered.

The Technical Framework

The establishment of U. S. domestic communications satellite facilities is technically feasible within the present state of the art, and there are spectrum and orbital resources available to accommodate several satellite systems within the presently allocated 4 and 6 GHz bands. ~~Several~~ At least one transmit/receive earth stations can be located in or near most urban areas, although the most suitable locations may be a number of miles from dense communications centers. A larger number of receive-only stations can be located in proximity to urban areas, particularly if some degradation of signal quality ~~can be accepted.~~ is not important. The exact number and location of earth stations is a subject for detailed engineering on a case-by-case basis.

Radio relay networks and satellite earth stations can share the 4 and 6 GHz frequency bands without harmful interference, provided reasonable precautions are taken in the design, location, and operation of the systems. To permit a large number of satellites, it is desirable that earth station antenna be as large as economically feasible. ~~It~~ therefore, it may be necessary to set minimum antenna standards based on geographic location in conjunction with satellite orbital location.

Technical considerations place no serious constraints on the formulation of policies for the ownership or mode of operation (single- or multi-purpose) of domestic communication facilities. Though of great importance in the engineering, operations, and economics of specific systems, these considerations can be dealt with effectively under any foreseeable ownership structure.

The Economic Framework

The most immediately apparent potential for domestic communication satellites is to provide transmission and routing functions for long-haul television distribution. A second possibility is to provide highly specialized broad band services for thinly dispensed and highly specialized broad band users.

Several institutional arrangements for satellite service were considered. The two primary alternatives were: 1) a single system established by a chosen instrument, for which relatively detailed system characteristics and operating rules would be specified by the FCC and to which conventional regulatory constraints would be applied; and 2) a more flexible industry structure permitting relatively open entry and where government involvement in technical design, operations, and management would be minimized.

These two basic options were evaluated from the standpoint of maximum contribution to the public interest in reliable, low-cost telecommunications services. Five criteria were used for this

purpose: reasonableness of rates; service flexibility; technical and service innovation; efficient use of satellite facilities and radio resources; and new opportunities for learning.

1) The U. S. experience is that with multiple suppliers, competitive market forces tend to keep rates at reasonable levels. The lack of evidence for economies of scale in satellite service and the availability of large capacity, low-cost terrestrial networks suggests that excessive rates would be unlikely. On the other hand, a chosen instrument would receive close scrutiny by the regulatory authorities, and it could be expected that rates allowed would restrict earnings to a reasonable level.

2) A large organization has greater resources and capability for service flexibility than a small organization. Yet several smaller organizations may be more responsive to customer needs than a single large organization; This is especially true in areas of rapid technological and economic change.

3) Technical innovation is more likely to occur where there are several competing manufacturers, and this is more likely to occur with multiple operating entities than with a single chosen instrument. A chosen instrument may well be very innovative in offering new services, yet there is somewhat more opportunity for new services to be offered when entry is not sharply restricted.

4) Efficient satellite use requires both economic efficiency and efficient use of orbital and spectrum resources. Since there does not appear to be evidence of strong economies of scale or of specialization, either of the two options appear comparable in terms of economic efficiency. The type of regulatory control associated with a chosen instrument might avoid wasteful use of orbital capacity; and the current state of the art is such that reasonable standards for earth station and satellite design could be specified by the FCC to assure that the same result is achieved under conditions of open entry. ~~Furthermore,~~ the development of an open entry structure would be well suited to the transfer of systems and spectrum resources to more productive uses in the future without detailed Federal intervention in corporate operations that would be required with a single chosen entity.

5) A final objective of a domestic satellite policy is to increase learning about possible uses, costs, and services. A chosen instrument could be assigned certain public interest responsibilities to explore and offer potentially uneconomic services and to carry on technical research. However, the primary uncertainties relate to cost and to market and service innovations. The incentives provided by competition among a number of entities are expected to result in a more vigorous examination of these uncertainties than would be expected from a chosen instrument.

MEMORANDUM

THE WHITE HOUSE

WASHINGTON

Insert A

It is also true that the mere opportunity for competitive entry will provide incentives for initial entrants to explore new services that they otherwise might ignore. Unless the only entrant is a dedicated television distribution system, therefore, the competitive entry option can be expected to offer the greatest flexibility in meeting customer demands.

Under either of the two basis considered here, option, the FCC will exercise its licensing authority over spectrum usage. Interference with existing terrestrial microwave installations represents a potential problem area for any prospective domestic satellite operator, and future satellite systems may cause interference with one another. ~~Under an open entry policy, it may be desirable to consider new approaches for~~ Procedures for resolving differences over interference questions between satellite services and terrestrial carriers should receive careful attention. Satellite operating entities should have equal status with respect to access to radio spectrum as the terrestrial users.

A potential exists for cross-subsidization of services and for limiting entry through interconnection and access restrictions. ~~under~~ Under either policy option. Such practices could result in inequitable rate structures or anti-competitive practices and should ~~not be allowed~~ minimized.

Although there are substantial uncertainties as to the economics and technical operation of domestic communication satellite services, these are not so great as to justify any delay in proceeding with licensing of such services. ~~Whatever policy option is chosen, it should be adopted only on an interim basis.~~ For this reason, it may be desirable to ~~approve~~ adopt a policy on an interim basis that is, ~~At the conclusion of this interim period,~~ such as three years, the situation should be reviewed to determine ~~what modifications of requirements are necessary.~~ with subsequent review in the light of actual experience.

SUMMARY OUTLINE OF ECONOMIC AND
TECHNICAL COMMITTEE REPORT
DOMESTIC SATELLITE WORKING GROUP

Insert from p. 5

The Technical Framework

Technical considerations ~~provide no meaningful guidance~~ place no serious constraints on the formulation of policies ~~on~~ for the ownership or mode of operation (single- or multi-purpose) of domestic communication facilities. Though of great importance in the ~~detailed~~ engineering, operations, and economies of specific systems, these considerations can be dealt with effectively under any foreseeable ownership structure.

insert on p. 2

The establishment of U. S. domestic communications satellite facilities is technically feasible within the present state of the art, and there are spectrum and orbital resources available to accommodate several satellite systems within the presently allocated 4 and 6 GHz bands. Several transmit/receive earth stations can be located in or near most urban areas. A large number of receive-only stations can be located in proximity to urban areas, particularly if ~~users are willing to accept~~ some degradation of ~~service~~ signal quality can be accepted. The exact number and location of earth stations is a subject for detailed engineering on a case-by-case basis.

Radio relay networks and satellite earth stations can share the 4 and 6 GHz frequency bands without harmful interference,

provided reasonable precautions are taken in the design, location, and operation of the systems. To permit a large number of satellites, it is desirable that earth station antenna be as large as economically feasible. It, therefore, may be necessary to set minimum antenna standards based on geographic location in conjunction with satellite orbital location.

insert from p. 1

The Economic Framework

The most immediately apparent potential for domestic communication satellites is to provide transmission and routing functions for long-haul television distribution. A second possibility is to provide highly specialized broad band services for thinly dispensed and highly specialized broad band users.

Several institutional arrangements for satellite service were considered. The two primary alternatives were: 1) a single system established by a chosen instrument, for which relatively detailed system characteristics + operating rules would be specified by the FCC, and to which conventional regulatory constraints would be applied; and 2) a more flexible industry structure permitting relatively open entry and where government ~~intervention~~ involvement in technical design, operations, and management would be minimized.

These two basic options were evaluated from the standpoint of maximum contribution to the public interest in reliable, low-cost telecommunications services. Five criteria were used for this purpose: reasonableness of rates, service flexibility, technical and service innovation, efficient use of satellite facilities and radio resources;

and opportunities for new learning.

1) The U. S. experience is that with multiple suppliers, competitive market forces tend to ~~maintain~~ keep rates at reasonable levels. ~~charges.~~ The lack of evidence for economies of scale in satellite service and the ~~existence~~ availability of a large capacity, low-cost terrestrial network suggests that excessive rates would be unlikely. On the other hand, a chosen instrument would ~~require~~ receive close scrutiny by the regulatory authorities. ~~Rate regulation has succeeded in restricting utility earnings to a reasonable level,~~ and it could be expected that rates ~~arrived at by a chosen instrument~~ allowed would ~~also be reasonable.~~ restrict earnings to a reasonable level.

2) A large organization has greater resources and capability / for service flexibility than a small organization. Yet several smaller organizations may be more responsive to customer needs than a single large organization. This is especially true in areas of rapid technological and economic change.

3) Technical innovation is more likely to occur where there are several competing manufacturers, and This is more likely to occur with multiple operating entities than with a single chosen instrument. A chosen instrument may well be very innovative in offering new services, yet there is somewhat more opportunity for new services to be offered when entry is not sharply restricted.

4) Efficient satellite use requires both economic efficiency and efficient use of orbital and spectrum resources. Since there does not appear to be evidence of strong economies of scale or of specialization, either of the two options appear comparable in terms of economic efficiency. The type of regulatory control associated with a chosen instrument might avoid wasteful use of orbital capacity; The current state of the art is such that reasonable standards for earth station and satellite design could be specified by the FCC to assure that the same result is achieved under ~~more~~ conditions of open entry. Furthermore, the development of an open entry structure would be well suited to the transfer of systems and spectrum resources to more productive uses ~~should that be necessary~~ in the future without detailed Federal intervention in corporate operations that would be required with

5) A final objective of a domestic satellite policy is to increase learning about possible uses, costs, and services. A chosen instrument could be assigned certain public interest responsibilities to explore and offer potentially uneconomic services and to carry on technical research. However, the primary uncertainties relate to cost and to market and service innovations. The incentives provided by ~~more open entry~~ competition among a number of entities are expected to result in a more vigorous examination of these uncertainties than would be expected from ~~with~~ a chosen instrument.

Under either option, the FCC will exercise its licensing authority over spectrum usage. Interference with existing terrestrial

microwave installations represents a potential problem area for any prospective domestic satellite operator. Future satellite systems may cause interference with one another. Under an open entry policy, it may be desirable to consider new approaches for resolving differences over interference questions between satellite services and terrestrial carriers. Satellite operating entities should have equal status with respect to access to radio spectrum as the terrestrial users.

A potential exists for cross-subsidization of services and for limiting entry through interconnection and access restrictions under either policy option. Such practices should not be ~~forbidden~~ allowed.

Although there are substantial ~~real~~ uncertainties as to the economics and operation of domestic communication satellite services, these are not so great as to justify any delay in proceeding with licensing of such services. Whatever ~~Whichever~~ policy option is chosen, it should be adopted only on an interim basis. At the conclusion of this interim period, such as ~~say~~ three years, the situation ~~service~~ should be reviewed to determine what modifications of requirements are ~~is~~ necessary.

insert p.1

The ~~Your~~ Working Group has limited its deliberations to technical and economic issues bearing on domestic communications satellite policy. Before formulating such policy, ~~you will wish to give consideration to~~ must also be considered other matters. Among these other considerations are:

-- the impact on Intelsat;

-- the effect on services now being furnished by terrestrial means, ~~on a cross-subsidized basis,~~ but which may not be economically viable under conditions of competitive alternatives since they are currently subsidized by more profitable services.

-- the importance to the national interest of early establishment of a domestic satellite system;

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~~The deliberations of the Working~~ Group were ~~limited to technical and economic matters.~~ The report is considered to be ~~The views presented are~~ a sound basis for policy ~~making.~~ However, since no examination of the problems beyond these areas were undertaken, no recommendations with respect to policy are offered.

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SUMMARY OF ECONOMIC AND TECHNICAL COMMITTEE REPORTS DOMESTIC SATELLITE WORKING GROUP

The Working Group has limited its deliberations to technical and economic issues bearing on domestic communications satellite policy. Before formulating such policy, other matters must also be considered. Among these other considerations are:

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-- the importance to the national interest of early establishment of a domestic satellite system;

-- the desirability of introducing competitive forces into the domestic communication industry and the effect of such forces on rate making practices now pursued in landline services.

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The report is considered to be a sound basis for policy decisions insofar as technical and economic matters are concerned.

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Technical considerations place no serious constraints on the formulation of policies for the ownership or mode of operation (single- or multi-purpose) of domestic communication facilities. Though of great importance in the engineering, operations, and economics of specific systems, these considerations can be dealt with effectively under any foreseeable ownership structure.

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These two basic options were evaluated from the standpoint of maximum contribution to the public interest in reliable, low-cost telecommunications services. Five criteria were used for this

purpose: reasonableness of rates; service flexibility; technical and service innovation; efficient use of satellite facilities and radio resources; and new opportunities for learning.

1) The U. S. experience is that with multiple suppliers, competitive market forces tend to keep rates at reasonable levels. Even in regulated industries, competition has been a useful complement to regulation. The lack of evidence for economies of scale in satellite service and the competitive availability of large capacity, low-cost terrestrial networks suggests that excessive rates would be both unlikely and untenable under conditions of open entry. On the other hand, a chosen instrument would receive close scrutiny by the regulatory authorities, and it could be expected that rates allowed would restrict earnings to a reasonable level.

2) A large organization has greater resources and capability for service flexibility than a small organization. Yet several smaller organizations may be more responsive to customer needs than a single large organization; this is especially true in areas of rapid technological and economic change. It is also true that the mere opportunity for competitive entry will provide incentives for initial entrants to explore new services that they otherwise might ignore. Unless the only entrant is a dedicated television distribution system, therefore, the competitive entry option can be expected to offer the greatest flexibility in meeting customer demands.

3) Technical innovation is more likely to occur where there are several competing manufacturers, and this is in turn more likely to occur with multiple operating entities than with a single chosen instrument. A chosen instrument may well be very innovative in offering new services, yet there is somewhat more opportunity for new services to be offered when entry is not sharply restricted.

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5) A final objective of a domestic satellite policy is to increase learning about possible uses, costs, and services. A chosen instrument could be assigned certain public interest responsibilities to explore and offer potentially uneconomic services and to carry on technical research. However, the primary uncertainties relate to cost and to market and service innovations. The incentives provided by competition among a number of entities are expected to result in a more vigorous examination of these uncertainties than would be expected from a chosen instrument.

Under either of the two basic options considered here, the FCC will exercise its licensing authority over spectrum usage. Interference with existing terrestrial microwave installations represents a potential problem area for any prospective domestic satellite operator, and future satellite systems may cause interference with one another. Procedures for resolving differences over interference questions between satellite services and terrestrial carriers should receive careful attention. Satellite operating entities should have equal status with respect to access to radio spectrum as the terrestrial users.

Under either policy option, a potential exists for cross-subsidization of services and for limiting entry through interconnection and access restrictions. Such practices could result in inequitable rate structures or anti-competitive practices and should be minimized.

Although there are substantial uncertainities as to the economics and technical operation of domestic communication satellite services, these are not so great as to justify any delay in proceeding with licensing of such services. For this reason, it may be desirable to adopt a policy on an interim basis with subsequent review in the light of actual experience.

THE EVENING STAR
Washington, D. C., Tuesday, January 13, 1970

Domsat

White House Readies Stand On Satellites

Open-Competition Position On U.S. Systems Reported

By STEPHEN M. AUG
Star Business Writer

The White House is reportedly ready to recommend that the Federal Communications Commission permit virtually wide open competition for construction and operation of one or more domestic communication satellite systems, it was learned today.

Barring last-minute changes, the recommendation is to be sent to the FCC in a week or two in the form of a memo.

Although it is not binding on the commission, such a recommendation from the White House expressing the administration's view obviously will have great weight when the FCC authorizes some form of domestic satellite system.

Although details were lacking, the White House is reported to have accepted some recommendations from two staff reports completed early last month, but kept private.

The staff recommended that any organization should be permitted to set up its own domestic satellite system provided it has the financial support to do so, could arrange for a launch from National Aeronautics and Space Administration, there is room for such a satellite system without endangering other uses for outer space, and there is frequency space available.

Hearings Probable

Presumably, the FCC would hold public hearings on competing proposals for the same type of satellite system. The commission would decide which of several applicants is the best-suited from economic and technical standpoints. It would also seek to maintain the most efficient use of limited frequencies available.

White House officials see no problems in obtaining launches from NASA for any organization the FCC approves. NASA has only 10 launches scheduled in all of 1970, and probably would be happy to have more work paid for through private sources.

If the competition policy eventually is recommended, it would represent a major change from recommendations made about a year ago by a White House communications task force appointed by President Johnson. It sugggested —after a year-long study—that the FCC authorize establishment of a pilot domestic satellite program in which Communications Satellite Corp. would have primary responsibility.

Comsat, however, would be far from frozen out under a competitive system. The firm has had lengthy conversation with broadcasters, educational television officials, the news media and cable television firms offering to set up a domestic satellite system for their needs. The talks were held against a background of increased rates for such transmission services put into effect by American Telephone & Telegraph Co.

Common Carrier Field

The FCC itself has in recent months opened up for competition the field of so-called common carrier communications. Last August it authorized Microwave Communications Inc. to set up a private microwave radio system between Chicago and St. Louis which would compete with AT&T in renting out communications facilities to businesses — primarily of the plant-to-plant type.

The problem of a domestic communications satellite system has been under study by the FCC for about five years. The commission several times has been ready to recommend setting up such a system, but at least twice has held up action pending completion of a White House study.

Bill Timmons (Lee McReynolds) wants a dopy of the Domsat paper when it comes out. 2711

Tom wants a copy to go to Frank Norwood when it comes out.

Belieu and Cowen want copies -- Elaine

Draft

Tuesday 1/13/70

11:45 Mr. Button's secretary called to say they are having a Board of Directors' meeting this Friday and Mr. Button thought that if there was any information that Gen. McCormack should pass to the Directors this was the time to do it. 554-6086

Domestic Satellite

1/12/70

To: Mr. Ken Robinson

From: Tom Whitehead

For your comments as discussed.

Proposed Policy on Domestic
Satellite Communications

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF EMERGENCY PREPAREDNESS
WASHINGTON, D.C. 20504

OFFICE OF THE DIRECTOR

JAN 9 1970

MEMORANDUM FOR DR. CLAY T. WHITEHEAD
STAFF ASSISTANT

SUBJECT: Proposed Policy on Domestic Satellite Communications

I found your memoranda on this matter very thought-provoking. While I heartily concur in most of the objectives set forth in your proposed memorandum to the FCC and agree that there is a need for a re-examination of existing policies in this area, I am not convinced that the Administration's position should be based on the proposition that competition should take precedence over all other objectives.

I am in doubt about some of the economic and technical aspects underlying your proposal. There may in fact be economies of scale and other economic factors in this area that inhibit effective competition. Technical considerations may also place serious constraints on policies governing ownership or mode of operation of domestic satellite communications facilities.

I also foresee serious domestic and international difficulties if your proposal is adopted as it now stands. For example, I believe that the Communications Act of 1934 and the Communications Satellite Act of 1962 represent legislative mandates to ensure that national security and efficiency considerations have higher priorities than the principle of competition in establishing public policy in the field of communications. The Supreme Court upheld the intent of Congress on this point in its decision on FCC versus RCAC, 346 U.S. 86. I also fear that the problems of international cooperation in the satellite communications field would be seriously complicated by opening domestic satellite communications to largely unregulated competitive enterprise.

Finally, I am particularly concerned by the absence of any reference to the requirements of national security or the needs of Federal agencies during periods of emergency. I am confident that the President would wish to take into account the command and control requirements of the Executive Branch in any new charge to the FCC or requests for new legislation.

I recognize that a great deal of technical work and staff effort have gone into these memoranda. However, the issues referred to above, particularly the omission of consideration of requirements stemming from the dictates of national security, suggest that the subject requires further analysis and consideration within the Executive Branch before the President is asked to approve new policies in this field.

Since I have not had time to study the proposal in detail, I am attaching the comments of those in my staff who are most conversant with this problem. In order to give you all the assistance we can on this complicated matter I asked my staff to draft an alternative memorandum to the FCC, based on their detailed comments. That draft is also enclosed with the thought that parts of it may be helpful. Please feel free to consult directly with Bill Plummer, Bob Kupperman or members of their staffs, on any of the points raised.

G. A. Lincoln

G. A. Lincoln
Director

Attachments

DETAILED COMMENTS ON PROPOSED POLICY MEMORANDUM REGARDING DOMESTIC SATELLITE COMMUNICATIONS

I. Introduction

The basic questions facing the nation in the domestic satellite communications matter are the following:

1. What should be the role of satellite communications in the domestic scene?

2. What should be the nature and priority of specific goals to be achieved in the development of domestic satellite telecommunication services within the framework of the Administration's national policy objectives (social, economic and security)?

3. What essential regulatory controls are needed to protect the national (public) interest?

Since the combined communication services and manufacturing industries contributed about 5.0% ($42.2 billion) to the Gross National Product during 1968, these questions assume significant dimensions. The basic goal must be to assure continued health and growth of the vital domestic telecommunication services segment of the industry in order to meet the essential needs of both private and Government customers. In view of the absence of a compelling case to treat satellite communications in a "special" manner, the Administration's broad policy objectives should be based on experience in this field.

There is general agreement that private enterprise rather than Government should develop commercial communication satellite services. However, the institutional approach outlined in the recommendations of the Draft Memorandum could place the Administration in the position of proposing a radical and fundamental departure from existing regulatory practices which have given the people of the United States the best telecommunication services in the world at the lowest real costs. Such an Administration recommendation, without a concomitant legislative mandate and in the face of the acknowledged uncertainty with respect to technical and economic factors, could invite a hostile reaction from both Congress and a large segment of the industry.

The consequences of the proposed approach are manifold and involve important domestic and international ramifications. A proposal to implement such a theoretical and untested market approach could create intense conflict within the Government, among contenders within the telecommunications industry, and possibly in the international scene among partners of the International Telecommunications Satellite Consortium (INTELSAT) and among members of the International Telecommunication Union. If the Commission were to attempt to adopt the proposed concept, further lengthy delays could be encountered in the application of this new technology to domestic use because of the necessity for FCC hearings involving a plethora of conflicting claimants.

II. Economic Reservations

The fundamental premise of the Draft Memorandum is that more competition and less regulation will accelerate technological innovation and thus achieve a better quality of telecommunication services for our people at lower costs. The validity of this premise remains unproven; in fact, there is substantial evidence to the contrary.

A. The facts show that switched public telecommunications (telephone, telegraph, television and data) services are provided by a large integrated industry composed not only of the Bell System and Western Union but also of about 2,000 independent telephone companies. The growth, particularly in the independent sector of the industry, has been spectacular and the switched system has provided the technical and economic base on which other modern telecommunication services have been built. Further, this is the largest integrated communications system in the world and it generates about 2% of the Gross National Product of the United States.

B. Contrary to the position of the Draft Memorandum, there is considerable knowledge about the economies of scale in satellite communications. While it might necessitate a major study to identify all of these economies, reasonable cost estimates for most foreseeable applications and alternative systems can already be put on a comparative basis. The Nation's experience with the INTELSAT Consortium and with military satellite operations shows a continuing trend toward economies of scale with advanced satellites and no substantial evidence of clear economies of specialization.

C. In a field requiring large capital investments, adequate reserves against possible major systems failure, and extensive technological skill, it is quite possible that an absolute minimum of regulation (as inferred in the Draft Memorandum) could promote the rapid establishment of a monopoly. This possibility is even more likely in the current tight money market.

III. Technological Reservations

While the conclusions of the technical committee clearly point out the problems associated with orbital space and frequency spectrum usage for a number of separate domestic satellite systems, further study is required on several issues:

A. The interference problems created by a large number of satellite ground stations raise several unanswered questions: Are we to have separate earth facilities for domestic as well as international satellite systems? If so, will the awarding of early domestic station sites drive up the costs of later international systems? Are the CATV systems likely candidates for satellite ground terminals?

B. While communication satellites may be operated with as little as 0.5° separation, other systems now envisioned would require spacings of as much as 6.0°. Since orbital spacing is a very complex problem, it requires much more research and understanding before defining standards for orbital spacing and antenna diameter size.

IV. Domestic Ramifications

The Draft Memorandum raises serious legal questions and could create intense conflict within the government and serious objections from the public and the industry.

A. Legal Aspects

1. The Communications Act of 1934 and the Communications Satellite Act of 1962 are legislative mandates to ensure that national security and efficiency considerations have a higher priority than competition in establishing public policy toward the field of communications. Congress

has also imposed specific obligations on the US Government to the Communications Satellite Corporation and its public stockholders and to the Corporation of Public Broadcasting. A major change from these legal obligations would require new legislation.

B. Governmental Problems

1. The recommendation that both financial and technical resources be evaluated in approving private industry's proposals for domestic satellite systems brings into question the ability of the FCC to accomplish this under current budgetary and manpower limitations. The FCC has never had the resources to assess adequately the implications of technological advances on competing proposals and regulatory policies. Like many regulatory groups, they are largely dependent upon those they regulate to supply such assessments. If the FCC is to regulate this area effectively, its base of technological skill in this area must be improved and expanded.

2. The national security and emergency preparedness agencies can be expected to raise questions about the compatability of separate domestic satellite systems with their essential needs.

C. Public Interest Aspects

1. If profitability is the main criterion for providing domestic satellite communication services, many potential public consumers might not be serviced adequately. For example, Alaska is comparable to underdeveloped countries of the world at least with respect to communications and is not likely, therefore, to present enough profit potential for the private sector to undertake a separate satellite system serving its communications needs. The Draft Memorandum could be interpreted by the Alaskans as short-changing their needs and requirements.

2. How does the policy presented in the Draft Memorandum insure that certain applications in the public interest (Alaskan communications, educational systems, government communications) having low or nonexistent profit margins get served by allowing almost unrestricted approval of proposed systems? The first and strongest backed proposals are likely to be for specialized systems which will skim off the profit cream inherent in broadband commercial requirements.

3. The Draft Memorandum overlooks this problem by putting common carrier services on the same basis as special services. Common carriers, however, by their very nature, produce external economies -- public benefits for which they are not able to collect in a market system -- and thus are in part public goods and eligible for public support. The idea that individuals derive some benefit from having a common carrier available, whether or not they actually use it is called "option demand" in the public finance literature. There is no way for the producers of this service to collect except when the service is actually used. In the public interest, therefore, there is clearly a case for giving preference to common carriers, especially if an interference problem causes more profitable special service systems to preclude common carriers in a given geographic area.

D. Industry's Possible Objections

1. Satellite communications cannot be isolated from other domestic communication media. The paper does not consider what public policy should be regarding tolerable situations of private control of both satellite and terrestrial communications industries. Is public policy well served if a firm that dominates one of the terrestrial industries emerges as the dominant market force in satellite communications? Will this paper be interpreted by some as an attempt to allow AT&T the opportunity to bypass COMSAT?

V. International Ramifications

A "domestic satellite system" raises significant questions of an international nature which must be explored further.

A. What would be the impact of a number of separate domestic satellite systems on US commitments and obligations to the INTELSAT Consortium, on the orderly evolution and growth of the Global System, on the US position to be taken at the 1971 Space World Administrative Radio Conference, and on the negotiations of Definitive Arrangements? If the US proceeds with a variety of uncoordinated domestic systems, it is possible a good many other nations will jump to the same posture, producing a situation where international agreements become very difficult to obtain. Certainly, it will be difficult for the US to discourage the proliferation of regional systems which may divert support from the INTELSAT system.

B. There is the problem of interference with existing terrestrial microwave systems in the US and Canada. Coordination and agreement with the Canadians, at least, is paramount to establishing a rational domestic regulation policy. Also, some form of capability between the Canadians and the US may be desirable for the US in linking Alaska to the rest of the US mainland.

VI. Conclusions and Alternatives

For the above reasons, the Draft Memorandum requires substantial revision. The Administration should focus its position on broad policy objectives, leaving implementation details to the regulatory agency. A suggested revision of the memorandum to the FCC is provided in Attachment I. While time has not permitted all interested parties within OEP to review this attachment, it is consistent with the detailed comments above.

ATTACHMENT 1

DRAFT January 9, 1970

MEMORANDUM FOR: Honorable Dean Burch
Chairman
Federal Communications Commission

This memorandum presents the Administration's position on the development of domestic communication-satellite services. The position outlined herein reflects the product of an extensive policy review made by the Executive Branch. Hopefully, the national (public) policy objectives and policy considerations presented by the Administration will aid the Commission in the exercise of its statutory responsibilities.

The early 1970's will provide enhanced opportunities for our nation to utilize practical applications of technological advances flowing from the national space program. During the 1960's the technical feasibility and economic viability of communications satellite technology for international telecommunications was demonstrated with dramatic success by the International Telecommunications Satellite Consortium (INTELSAT). This achievement means the United States, in conjunction with its partners in

INTELSAT, has essentially met the basic goal established by the Congress in the Communications Satellite Act of 1962. The challenge is to develop satellite communications to provide domestic services wherever the result will be improved services at lower cost.

The Commission is fully aware that the importance of telecommunications to our society cannot be overstated. The United States has the most comprehensive, flexible and economic system of telecommunications in the world. This highly developed and valuable resource provides a wide diversity of telephone, telegraph, TELEX, television, radio, facsimile and data exchange services for the Nation's private, public and government users. These services are provided through an intricate complex of facilities and systems including: (a) radio and television broadcasting stations and receiving sets; (b) an integrated public telephone network including common carrier transmission systems (wire, cable, and radio); (c) private fixed radio networks; and (d) mobile radio networks (vehicular, aeronautical and maritime).

As the nerve system of our economy, Government and private business operations, public welfare and national security activities, telecommunication systems are

indispensable to the pursuit of our national objectives. Our nation's well-being depends in very large measure upon the telecommunication technology; and it is in the interest of all of us to assure that this dynamic technology -- which includes many diverse means of communicating -- continues to grow. It is important that the fruits of telecommunication technology be used in the interest of all of our people as rapidly and economically as possible.

NATIONAL (PUBLIC) POLICY OBJECTIVES

The fundamental objective in telecommunications is to assure the continued improvement and growth of the enormous domestic and international telecommunications complex available to American society. Attainment of this goal will enhance the availability, quality, versatility, dependability and economy of telecommunication services; provide increased benefits to users (public, private and Governmental); and contribute to the achievement of the social, economic and security objectives of our nation.

The Government's role in pursuing this important goal is protection and promotion of the national (public) interest through enlightened Executive policy and leadership and by effective Federal regulation and guidance. The keystone of success is a healthy environment for dynamic

action by both private and public sectors to bring the full potential of new technologies into reality.

To achieve the overall policy objective, the Administration has established the following specific policy objectives related to domestic communication-satellite services:

-- To realize the early and orderly introduction of satellite communications technology into the domestic telecommunications environment when and where economically viable and improved services will result;

-- To assure that when domestic communications are established they are compatible with and fully integrated, where appropriate, with the existing domestic and international public telecommunications systems that support improved services, national security and preparedness.

-- To encourage expansion of the range of available telecommunications services offered to all users through the application of technological advances in satellite communications;

-- To attain coordinated and efficient use of the electromagnetic spectrum -- a limited international resource -- and assure technical compatibility of the domestic communications satellite facilities with existing terrestrial facilities both in the United States and abroad, and with other communication satellite systems;

-- To assure that where economic benefits can be attained by satellite communications facilities, they will accrue to users of telecommunication services;

-- To assure compatibility with and support of US objectives and obligations concerning INTELSAT and the Global Commercial Communications Satellite System.

POLICY CONSIDERATIONS

There are several fundamental factors and policy considerations which this Administration believes to be relevant to the introduction of domestic communication-satellite services. Such considerations must be evaluated carefully during the formulation of definitive policy guidelines for the establishment and use of domestic satellite communications. The more important considerations include the following:

-- Program Approach for Domestic Satellite Communications

The potential for early introduction of satellite communications services in the United States includes the simultaneous distribution of television programs to locations throughout the fifty States; the rapid exchange of computer and data information; and the provision of alternate trunk routes in the basic nationwide public leased circuit and switched networks. Longer range potential applications include: The broad distribution of educational and instructional radio and television programs to widely dispersed groups; and a range of other services requiring broad-band facilities. These new, improved and expanded telecommunication services should contribute to the general enhancement of the capability, flexibility and reliability of the total domestic telecommunication environment.

There are uncertainties, however, as to the specific role, the technical compatibility and economic viability of domestic satellite communications which make it prudent to proceed in an orderly manner when implementing such facilities. Accordingly, the Administration believes definitive policy guidelines should provide for:

- Establishing flexible arrangements to ensure maximum learning about the capabilities and limitations of domestic satellite communications and problems associated with the establishment and use of such facilities.
- Promoting incentives to foster the development of competitive sources of satellite communications technology.

- Recognizing the importance to the national interest of the benefit that would accrue to the American people and Government institutions by establishing domestic satellite communications through a multiple-purpose system, as a complementary medium, compatible with and fully integrated, where appropriate, with the existing domestic and international public telecommunication networks.

- Modernizing the regulatory process and setting to emphasize improved performance of telecommunications entities, and the timeliness and efficiency of the regulatory activity.

- Recognizing the dynamic nature of this new technology by establishing guidelines on an interim basis subject to a full review after a few years.

-- Federal Government as User of Telecommunications Services

The United States Government is dependent upon a very wide range of modern telecommunication services in conducting its functions. Every department and agency of the Government have ready access to telecommunication services in carrying out its missions assigned by the Congress and the President. Government policy is to obtain communication services from common carriers to meet its traffic needs whenever possible and to establish Government-owned facilities only as necessary for special requirements. The Federal Government is today by far the largest single customer of leased, commercial telecommunications services. Accordingly, the definitive policy guidelines should include:

- Provision for Federal Government department and agency utilization of new and improved telecommunication services furnished by domestic satellites, when such services are economically viable and/or contribute to overall enhancement of telecommunications available to departments and agencies. Government users should have direct access to communication-satellite facilities, when required for unique services.

- Provision for use of domestic communication-satellite services in support of national security and emergency preparedness efforts, when appropriate. Since the operational existence of nationwide systems of rapid voice, data and record communications is indispensable to national security and emergency preparedness, the Department of Defense and other agencies will utilize commercial domestic satellite services to improve the total telecommunications capability available for these purposes.

-- Institutional Arrangements --

The United States has a unique opportunity ahead in promoting the use of satellite communication technology by broadening participation in the marketplace and encouraging flexible institutional arrangements. The definitive policy guidelines should include provisions for:

- Offering the opportunity for responsible entities to apply to the Federal Communications Commission to establish domestic satellite communication facilities.
- Encouraging customer groups from a broad spectrum of our society to utilize telecommunication services provided by domestic satellite communication facilities.
- Recognizing the public interest in and the obligations of the United States to the Communications Satellite Corporation and its public shareholders, and to the Corporation for Public Broadcasting, both created by Congress.

- Establishing criteria for authorizing domestic satellite communication facilities to perform appropriate role(s) -- taking into account the national (public) interest considerations of the available orbital space and frequency spectrum and other important definitive policy guidelines.

-- Foreign Policy --

The United States Government recognizes the international aspects of satellite communications, particularly the use of orbital space and frequency spectrum. The definitized policy guidelines for the establishment and use of satellite communications domestically should include:

- Respect for the obligations of the United States under the Interim Arrangements of 1964 Establishing the INTELSAT Consortium (and under Definitive Arrangements when promulgated): and avoidance of any action in the establishment of commercial domestic satellite communication facilities which would be incompatible with our support of the Consortium and with our support of the Global System.
- Coordination of program plans and orbital space and frequency spectrum requirements for new domestic satellite communication facilities with the INTELSAT

Consortium and the International Telecommunication Union, as appropriate.

- Recognition of the importance of the pending 1971 Space World Administrative Radio Conference and the impact any domestic satellite communication policies could have on the position to be taken by the United States at the Conference.

-- Conclusion--

The American system has developed satellite communications technology and has promoted the sharing of this new capability with people throughout the world. The genius of our institutions for effective competition and the generation of innovative advances should now be focused on bringing the benefits of this technology to a broad sector of our nation's people. The establishment of domestic satellite communication facilities must be accomplished in an orderly and organized manner subject, of course, to essential regulatory control by the Federal Communications Commission. The opportunity exists to effect innovation in the regulatory process for the introduction of this new technology in our domestic infrastructure.

The Administration is confident that the efforts of private enterprise supported, where required, by the Government can bring about a realization of domestic communication satellite services. The Administration pledges its support in providing satellite launch services for communication satellites which the Commission authorized through the National Aeronautics and Space Administration, and to advise the Commission, when requested.

Signature

Redo Memo for Burch

make it draft and confidential

Send it to all the people who got the orignal package and call their offices and sá/ ask them to please stamp their cover memo confidential inasmuch it relates to INTELSAT negotiations which should be considered confidential until the memo is released publicly. DO NOT WANT ANY LEASK APPARENTLY THERE WERE SOME.

"Your lucky day. You will get a dial tone in the first phone booth you enter."

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Aviation Week & Space Technology, January 5, 1970

AT&T Calls For Indefinite Delay In Domestic Satcom Inception

By Katherine Johnsen

Washington–American Telephone & Telegraph Co. is now calling for indefinite postponement of establishment of a domestic communications satellite system.

Developments in terrestrial systems have made satellites comparatively uneconomical for domestic service, Richard R. Hough, AT&T vice president, told a House space subcommittee headed by Rep. Joseph E. Karth (D.-Minn.)

For the long term, Hough said a few very high capacity satellites may be justified eventually as backup for the terrestrial network and to add some operational flexibility.

Hough's presentation marks a reversal from the past position of the dominant telecommunications carrier. In 1966, AT&T proposed a $500-million domestic program to the Federal Communications Commission (AW&ST Dec. 26, 1966, p. 24). The program would be initiated with Hughes Intelsat 4-type satellites, each with about 9,600 circuits, and grow to a total system capacity of 83,000 voice circuits and 27 television circuits by 1976.

If satellites are integrated with the land-based network at some future date, AT&T wants to own them. "We perceive no barriers, legal or otherwise, which would prevent us from owning and operating a satellite system for domestic communications," Hough said.

This reflects another position change by AT&T. In its 1966 proposal to FCC, AT&T said Communications Satellite Corp. would own and operate the space segment and AT&T would own and operate the ground facilities.

FCC was on the verge of issuing a decision in the four-year-old domestic satellite case last summer, but withheld action at the request of the White House so that the Nixon Administration could make a 60-day policy review. The 60 days expired Oct. 1, 1969, but the review, under the direction of Clay T. Whitehead, a presidential assistant, has not yet been completed.

Hough told the Karth subcommittee: "At one time it appeared that the upcoming new generation of satellites now expected to be operational in 1971 or 1972, that is the Intelsat 4 series, would offer some cost savings over terrestrial systems for traffic of transcontinental distances. However, more recently there have been dramatic advances with respect both to microwave radio and coaxial cable along with a significant increase in satellite system costs which have changed the situation."

He listed two developments that have made a system of 9,600-circuit satellites uneconomical for domestic service. These were:

- A coaxial cable with a capacity of 32,400 circuits is now operating. By 1971-72, a cable with 90,000 circuits will be installed.

"Even on transcontinental routes it now appears that the cost per circuit mile of [these two] cables would be substantially less than that of the Intelsat 4 satellites," Hough said.

- A method to double the capacity of the backbone domestic microwave system to 12,000 circuits has been developed within the past three years.

"The cost of deriving the additional 6,000 circuits on the existing [microwave] network is very low indeed, and is very much less than the circuit-mile cost of satellite systems," Hough said.

AT&T's Bell Telephone Laboratories is now pushing research and systems planning on an advanced satellite with far greater capabilities than the Intelsat 4 which would use super-high frequencies in the 18-30-gc. band.

"If the cost disadvantage can be minimized, there are certain operational advantages which could be gained by introducing satellites into the network on selected routes," Hough said.

One would be a backup.

"A satellite is not subject to being cut by a construction contractor, nor . . . subject to signal fading due to atmospherics and other transmission problems which affect microwave radio," Hough said. "It is important to have adequate capacity available for restoration [of terrestrial systems] should it be needed."

The other satellite use would be for flexibility. For example, Hough said, a satellite could be used partially to meet the daytime New York-San Francisco peak load and then be used nighttime to handle peak New York-Miami traffic.

Hough anticipated that the demand for telecommunications within the U.S. will soar over the next decade.

By the late 1970s, Hough said, AT&T plans transmissions by waveguides with 250,000-circuit capacities. These will be followed by laser tubes with capacities up to 2 million circuits.

"When we do use satellites domestically, it will take whole satellites just to provide a small bit of service," Hough said.

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EDWARD B. CROSLAND
VICE PRESIDENT

Washington Office
2000 L Street, N. W.
Washington, D. C. 20036
202 466-5571

December 24, 1969

The Honorable Clay T. Whitehead
Staff Assistant
The White House
Washington, D. C. 20500

Dear Tom:

In accordance with our discussion, I am forwarding herewith a copy of the transcript of the testimony by Howard Hawkins of RCA Global Communications and Dick Hough, Vice President, AT&T Long Lines Department, before the Karth Subcommittee on December 18. I believe you will find their statements of interest.

It was most kind of you to call me last Saturday, and I greatly enjoyed talking with you. As I mentioned, I still have some grave misgivings regarding your proposal with respect to governmental structure for determining communications policy.

As you suggested, I have procured a copy of Peter Flanigan's memorandum from the Space Subcommittee and I am most anxious to discuss the matter further with you. I would be most appreciative if you would contact me upon your return from your vacation.

I certainly hope that you have a wonderful trip and a delightful holiday. My best wishes and warmest personal regards.

Sincerely,

Ed

Domsat - Karth
12/16, 17, 18

Wednesday 12/3/69

5:45 Charlie McWhorter called.
Wanted you to know that he received word today that Cong. Karth is having hearings on December 16, 17, and 18 . Said they wanted AT&T to have a witness and Comsat and RCA will also have someone; also someone from NASA, he thought.

domestic

Jan. 9, 1970

To: Dr. Tom Moore

From: Tom Whitehead

Could I have your comments
by Monday?

OEP memo re proposed policy
on domestic patellite communications

Domsat

Tuesday 1/6/70

10:50 Katherine Johnson of Aviation Week Magazine was checking to see if we had any idea when the Domsat report would be coming out.

Thursday 1/15/70

3:00 General McCormack will have a small gathering of his Directors tonight at 6 p.m. and expects to tell them what he thinks is about to happen. A couple of the people are Presidential appointees.

He would be glad to tell you what he plans to say to them -- if you have a few moments on the phone. Would be leaving his office by 5:30 this afternoon.

Donna

Monday 1/12/70

1:15 Mr. Steve Aug from the Evening Star called. He said the question he has goes deeper than when the communications report will be out.

LI3-5000
Ext. 604

1/12/70

To: Alan Woods

From: Tom Whitehead

Draft memo
to Burch
on Domad

Domestic satellite

Jan. 9, 1970

To: Dr. Drew

From: Tom Whitehead

Could I have your comments by Monday?

OEP memo re proposed policy on domestic satellite communications