February 19, 1970

Dear Mr. Granitsas:

Thank you for your letter expressing interest in the President's proposal for a telecommunications reorganization and in the domestic satellite policy. I am enclosing copies of the White House releases with respect to those proposals.

We will hold your letter until the new Office of Telecommunications Policy is established.

Sincerely,

Clay T. Whitehead
Staff Assistant

Enclosures

Mr. Spyridon Granitsas
Department of Communication
Arts and Sciences
Queens College of the
City University of New York
Flushing, New York 11367

cc: Mr. Whitehead
Central Files

EDaughtrey

Yale University *New Haven, Connecticut 06520*

DEPARTMENT OF ECONOMICS
Box 1905-A Yale Station
Sheffield–Sterling–Strathcona Hall

February 10, 1970

Mr. Clay T. Whitehead
Presidential Assistant
The White House
Washington, D.C.

Dear Mr. Whitehead:

If it is possible, I would appreciate your sending me a copy of your recent report on proposed satellite communications policy.

Sincerely,

G. A. Hay
Assistant Professor of Economics

GAH/nl

Sent 2/16/70

Domestic Satellites

Wednesday 3/25/70

9:05 Dr. Lyons called. He wanted to make sure you knew all the papers are carrying the FCC announcement on domestic satellites. It was in the Star last night and in the Post and New York Times this morning.

Domsat

Friday 3/20/70

11:55 Sue Meyer would like to have a copy of the Economic and Technical Reports on Domestic Satellites when they are available.

Sue Meyer
2512 Yale Station
New Haven, Connecticut 06520

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

FCC 70-307
46002

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

NOTICE OF PROPOSED RULE MAKING

Adopted: March 20, 1970 ; Released: March 24, 1970

By the Commission: Commissioners Robert E. Lee and Johnson concurring in the result; Commissioner Cox concurring in part and dissenting in part and issuing a statement which is attached to Report and Order (FCC70-306)issued simultaneously herewith.

1. Notice is hereby given of proposed rule making in the above-entitled matter.

2. On March 2, 1966, the Commission instituted an inquiry in Docket No. 16495 to explore various questions associated with the possible authorization of domestic communications satellite facilities to non-governmental entities. Notice of Inquiry, 31 Fed. Reg. 3507; Supplemental Notice of Inquiry, October 20, 1966, 31 Fed. Reg. 13763. In its Report and Order in Docket No. 16495 adopted on March 20 , 1970 (FCC 70-306), the Commission decided to entertain applications for the authorization of domestic systems. In order to facilitate expeditious action on the applications and prompt attainment of the potential benefits of the satellite technology in the domestic field, the Commission further decided to keep open the proceedings in Docket No. 16495 and to incorporate a notice of proposed rule making. The rule making concerns the policies to be followed in the event of technical or economic conflicts between applications (Report and Order, paragraphs 23-24), the appropriate initial role of AT&T in the domestic satellite field (paragraphs 25-26), procurement policies (paragraph 28), and access to earth stations (paragraph 27).

3. We discussed in general terms some of the possible areas of conflict, stating (paragraph 23 of the Report and Order):

> Technical conflicts may arise in such areas as proposed orbital locations and frequency usage. Moreover, in the course of coordinating earth stations with terrestrial systems it may prove impossible in some instances to accommodate earth stations at desired sites without some adjustment in the frequencies and routes of terrestrial systems or other measures to avoid interference. Also, arguments of economic incompatibility may be raised, posing questions as to the proper effectuation of the Commission's responsibility under Section 1 of the Communications Act to exercise its regulatory functions in such a manner as to make communications services "available, so far as possible, to all people of the United States * * *."

It is not practicable to specify now, in advance of the submission of applications, the precise aspects that may require policy determinations by rule. Some potential conflicts may be evident to applicants in the course of preparing applications. Others may not become apparent until all of the initial applications have been filed. The purpose of this Notice is to set forth the subject matter and issue to which parties are to focus--namely, the technical or economic conflicts, if any, which exist or may arise between applicants in this area, and what policies are called for in light of any claimed conflicts. In this way, the Commission will be in a position to adopt rules, reflecting its policy determinations, to resolve any such conflicts, if it appears that this procedure would be the one best conducing "to the proper dispatch of business and to the ends of justice" (Section 4 (j) of the Communications Act).

4. Comments are also requested on what initial role of AT&T in the domestic satellite field would be appropriate in order to achieve a market environment conducive to innovation and the vigorous exploration and development of the special communications service potentials of the satellite technology. The discussion of this matter at paragraphs 25-26 of the Report and Order may be summarized briefly as follows: A question has been raised by the Executive Branch as to whether AT&T might discourage or foreclose

entry by others into its special service markets through a policy of inter-service subsidy. The memorandum of the Executive Branch recommended that facilities to be used by AT&T for specialized communications services "should be authorized only after a determination by the Commission on each application, based on public evidentiary hearings, that no cross-subsidization between monopoly public message and specialized services would take place in the development, manufacture, installation, or operation of such facilities." There are also the factors of whether innovative planning by AT&T would be inhibited by its existing terrestrial facilities and services, and whether the expansion of the dominant terrestrial carrier into the satellite field at this time would pose a substantial constraining factor for other potential common carrier entrants in deciding whether to develop system proposals, the kinds of systems that will be proposed, and the types of services and markets that can be developed. Applicants and other interested persons are requested to comment on the question of whether the public interest would be better served by authorizing domestic satellite facilities to AT&T without restriction as to the type of service, authorizing facilities limited to public message service, following the procedure recommended by the Executive Branch, or confining AT&T's participation, for an initial period, to leasing satellite channels in systems established by others.

5. Comments should also address the proposed policies relating to interconnection and access to earth stations (paragraph 27 of the Report and Order), and the question of procurement in the domestic communications satellite field (paragraph 28).

6. Applicants for domestic communications satellite systems are requested to submit comments on the foregoing matters in conjunction with their applications. As stated in the Report and Order (paragraph 30), the Commission will give public notice of a cut-off time for the filing of applications to be considered initially. When such cut-off date is established, the Commission will by further order specify a time for the filing of reply comments by applicants and comments by other interested persons. After consideration of such comments and reply comments, the Commission may request additional comments directed to particular issues.

7. Authority for the proposed rule making instituted herein is contained in Sections 1, 2, 3, 4 (i) and (j), 214, 301, 303, 307-309, and 403 of the Communications Act of 1934 and Section 102 (d) of the Communications Satellite Act of 1962.

8. In reaching its decision in this matter, the Commission may take into account any other relevant information before it, in addition to the comments invited by this Notice. In accordance with the provisions of Section 1.419 of the Commission's Rules and Regulations, an original and 14 copies of all comments, replies, pleadings, briefs, or other documents filed in this proceeding shall be furnished to the Commission.

FEDERAL COMMUNICATIONS COMMISSION

Ben F. Waple
Secretary

From the desk of

WILLIAM J. CASEY

3/23/70

Dear Tom:

We are making this proposal to the general counsel for the Commission. If it seems to you that it could be important to save six months in making this system available to the public, it would help if the Chairman were to express an interest in giving our petition the most expeditious treatment which is properly available to it.

Bill Casey

LAW OFFICES

HALL, CASEY, DICKLER & HOWLEY

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PETER B. CLARK
MORTON A. SMITH
JOSEPH STEIN
EDMUND S. WARTELS

March 23, 1970

The Honorable Richard M. Nixon
The President
The White House
Washington, D. C.

Dear Mr. President:

For some time I've been working on what we call a quasi-laser link system which can carry 80 TV channels via satellite and 40 TV channels via intracity distribution. This new communications capability can have immense values in dealing with urban congestion, teaching limitations, rural development and a whole host of social problems. I'm enclosing a paper on the relationship of this development to our social patterns.

We understand that the Chief Engineer of the Federal Communications Commission has just approved the technical validity of this system.

Now, we'd like to get the Commission to act on the Laser Link petition (Docket No. 18452) by order in the Hughes-Teleprompter docket rather than by opening up a new docket. The Commission may deem it proper to move in this way in view of the fact that the two matters deal with comparable technologies performing similar functions and everyone involved in the Hughes-Teleprompter docket has commented on our petition. If the Commission were to move in this way, it could save six months in making our laser link system available to the public.

Yours very truly,

William J Casey

"THE POTENTIAL IMPACT OF THE QUASI-LASER LINK SYSTEM ON OUR SOCIAL PATTERNS"

by Ira Kamen,
Senior Member IEEE and President of Laser Link Corp.

and Dr. Joseph Vogelman,
Fellow of the IEEE and VP of Electronics Research, Chromalloy American Corp.

The wide spectrum communications (80 TV channels via satellite, 40 TV channels via intra-city distribution) created by the quasi-laser link system is designed to create new life styles in human settlement. In a society where 80% of the people reside in less than 10% of the land area the only answer is to provide communications means which will encourage man to move to less dense areas where he will have the same cultural, educational and recreational benefits as well as conducting business in an effective environment.

Table I is an analysis and forecast of the "Total Involvement Services" planned by those engaged in this development which includes some of the leading national and international corporations in the world.

Within a city the interlinking of the buildings (see Figure 1) will allow the socialogical rebuilding of every urban community which is vital to our society. TV channels for urban air polution control, traffic surveillance and municipal services will become an absolute necessity. Intra-city channels are necessary to build community pride, economic and meaningful participation in local elections, and to advance education and cultural activities including recreational pursuits.

As the system moves to its inter-city applications (see Figure 2) we will be allowing many persons to work near or in their suburban or rural homes which

will alleviate some of the anticipated intercity transportation problems.

The satellite system to be described will provide numerous communications services to the home, business, and communication and educational centers on a local, regional or national basis.

This new type of system will sponsor new services for self education (Figure 3) in a society where knowledge will be developing faster than it can be acquired. Shopping, banking and the utilization of information services will be done in the confines of the home. 50 Billion dollars of computers by 1975 may be tied together on high speed information exchanges capable of transmitting graphic pictures at high speed rates. A system was tested and demonstrated at the N.Y. Times whereby 80,000 visual images could be transmitted within one hour from a centralized bank of information, if this rate of transmission would ever become necessary. This system will lead us to a checkless society and to paperless stock transfer systems. The law and order goals of most growth communities will require greater video surveillance of critical areas as well as rapid identification of criminals and the fast dissemination of crime combatting information to field police forces.

We must accelerate the acceptance of these new services which in the USA have been approved by the FCC (Docket #18452) and will soon be adopted by the world. The Electronic Mailbox, worldwide information utilities, cradle to grave education programs, medical diagnosis by remote control are all possible now. We must keep pace with change and not fall victim to it.

The Laser Link system has been offered to the Nixon administration as a plan which could be implemented in the United Nations for worldwide Global Communications Corps through a system of satellites and new communication detection systems.

By reason of the total and immediate interchange of ideas, education, culture,

etc., between any nations in the world, crises resulting in war, declared or undeclared, would be anticipated and avoided.

The program would involve setting up a system of low level satellites in orbit, as well as fixed satellites. Special, inexpensive transmitting and receiving devices would be set up at all of the desired stations throughout the world. The interchange would include weather information, news, navigation aids, emergency warnings, education, culture and surveillance. The interchange could reach or emanate from any remote part of the world where a transmitting or receiving station has been installed.

All of these services would be transmitted with multilingual audio transmissions accompanying the visual broadcasts through a system of multiplex subcarrier techniques.

To supplement this program it is recommended that we set up a worldwide communications corps with training available in any country via a new United Nations commission.

A uniform and correlated system of training under United Nations auspices could bring young people of the world together in this common effort and be instrumental in breaking down the tensions which presently exist. It would provide exciting and useful careers for our young people who are dedicated to a new diplomacy.

This system is based upon proven technology which has remained unharnessed through the recent dynamic years of an exploding science.

In addition to reducing present costs of communication and much of the expenditures for aid programs, the actual cost of the new system would be a small percentage of what our current budgets are for far less services.

This plan would in turn release substantial funds which are sorely needed in our current crises in the cities.

Description of low level satellite broadcasting and communications system as shown by Figures 5 through 8:

A group of satellites would be planned for launching by both the United States and other governments which would place the low level satellites in orbit in the vicinity of 5,000 to 6,000 miles from earth to assure reliable broadcasting to and from earth transmitting and receiving stations. At this level the satellites would make frequent periodic traverses of the earth and would lend themselves to programming of new communication information at frequent intervals and the continuous broadcasting and rebroadcasting of many services and program materials. Any member of this Global Communications System could receive this information by financing a low-cost receiving site which would be offered in complete design by those who plan the Global Communications System. Those receiving signals could easily integrate the program material into its existing established network or station service.

The planned services:

In establishing Global Communications via United Nations oriented agencies, the following services could be offered which would add to the immediate upgrading of those nations on the lowest strata of society. Philosophically, it has been agreed that all revolutions have been created by the have-nots, and this would be an economical technique for allowing the have-nots to have access to all of the latest information, worldwide thinking, cultural exchanges and services which will be described in the following paragraphs.

Here are some of the services which the Global Communications System could offer:

Weather: This system would be so designed as to provide all the weather information any nation could use about its locale, as well as worldwide weather sequences as they would affect its own environment. A north-south orbiting satellite would cross every nation in the world as the earth turns on its axis. During the interval within which the satellite crosses any given nation it would be in a position to obtain from the satellite that portion of the current weather situation that applies to it and the prediction for future weather derivable from the worldwide weather sequences acquired by the international weather network.

International news services: It would be possible to integrate into all local networks and local stations all over the world news originating from any nation in the world which is participating in the Global Communications System. It should be noted that while not every country will be able to originate news, every country will have access to all of the news originated by others. By having each national news originating service provide a short time slot of news, a single pass of a satellite at any point of the globe would provide a complete series of these nationally originated broadcasts at any location. The complete series would be receivable, though not necessarily in the same sequence, insofar as the starting and terminating points are concerned.

The technology permits multiplexing of a large number of languages which can be selected according to the receiving nation's requirements. In the case of television broadcasts, the video information would, of course, be identical and the language of national choice would be available from the satellite. Even in those areas with esoteric languages a translator would translate the information from a multiple choice of widely used languages.

Worldwide navigation system: This system of worldwide navigation would make the most remote points in the jungle just as identifiable as the most urban

community in the world, and this would be accomplished with low cost receiver instrumentation, as the major costs of system engineering are incorporated into the satellite system. In addition, with the advent of supersonic jet travel, a worldwide navigation system would provide bearing information by means of stationary satellites in a manner similar to that currently provided by Loran Systems. This will permit automated flying throughout the world and relieve the planes of human errors which are intolerable at supersonic speeds.

Worldwide emergency system: This would allow immediate visible inspection and recording and reporting to those in an area of a catastrophe, as well as advising those who could anticipate residual effects such as a tidal wave created by an earthquake situation.

Worldwide cultural exchange: As a matter of creating understanding any nation could make its problems understood to all other nations as well as benefiting from each others' art forms as may be economically transmitted through this system.

Worldwide educational system: This system would have the capability of bringing the educational material from anywhere in the world to everywhere in the world for its use in upgrading every society within its own language requirements or to provide multilingual capability for all those who wish to realize this accomplishment. The results will be mutually beneficial to all participants regardless of their state of advancement in the culture.

As of this writing, even the smallest African nation has a television station operating or planned. The instant escalation and subsequent total breakdown of the machinery of international propoganda could be prevented through the use of the Quasi-Laser system. Nations have proven themselves to be like individual men - scared of one another because they simply don't understand. Countries and the hostilities they have toward one another are similar to the American

racial crisis where whites and blacks have come to hate and fear each other more out of a sense of ignorance than anything else.

Since this system will make possible the easy broadcasting and receiving of news from every country, each nation's propaganda mills will grind away at full speed as soon as the laser hook-up is complete. Soon after, the common exposure of all the different distortions of reality will make the truth the only credible medium. Imagine catching the 10 pm TV news from Washington followed by the 8 am news from Peking. It wouldn't take long for the two special interest viewpoints to disappear and a more objective reporting of things like the Vietnam War would be the logical outcome.

The instituting of an equality of surveillance system monitored by the United Nations with full access to the intelligence it gathers for every nation in the world would make sneak attacks impossible. So would the constant fear of them which drives entire countries into fever pitch of wasteful expenditures.

In the United States the most important fact about this development is that it links every building in the urban area via air and costs far less than trying to cable people for even partial TV service. It does take some business away from the telephone companies, will fragmentize some of the broadcaster's audience, but the FCC has the responsibility to the people of the United States to make the maximum use of the airwaves and frequencies will be used that are so high that no one believed that it could be done.

It is anticipated that the synergistics of the Quasi-Laser System will open new entertainment, education and communications vistas for urban dwellers and businessmen who have the wit and the means to benefit from these new wide spectrum services.

This Quasi-Laser Link Community Antenna Television System (CATV) opens a wide spectrum of services for urban multiple dwelling residents who may be airlinked by a grid of dispersed beams. The new air link systems will offer CATV, commercial and business subscribers all available TV and FM entertainment channels

along with additional services associated with education, shop by television, business and computor data, continuous news and weather and for a host of other entertainment, industrial and educational purposes. The application of this principle to satellites will offer the quasi-service to all areas of the world on a very economical basis.

Laser Link Corporation and Chromalloy American Corporation recognized the need for an urban local distribution air link communication system, capable of providing a multi-channel high capacity service for use as intra-city CATV systems. Early considerations of the various modulation techniques available pointed out their shortcomings for use in such a high capacity system. Among the modulation techniques considered were, AM, pulse code modulation (PCM), pulse position modulation (PPM), pulse width modulation (PWM), frequency modulation (FM) and phase modulation (PM). For example: AM was rejected because of the extreme linearity required and the lack of noise and interference immunity it possesses. Conventional PCM, PPM, FM and PM were rejected because the complexities of creating the modulation made these techniques uneconomical for CATV applications. The following section discusses the various factors which effect the performance of radio systems at microwave frequencies and above.

Our continued search for a viable solution led us to our proprietary method of Filtered Pulse Width Modulation, (FPWM) which is capable of providing multi-channel relay and transmission of television channels, independent of frequency, anywhere in the frequency spectrum between 8 GHz and 10,000 GHz. The initial

development conducted in our laboratories culminated in a demonstration before the FCC on October 24, 1968 of a FPWM system operating on a carrier frequency of 8 GHz with symmetrical side band, full carrier power. A full 32 channel capability was demonstrated with satisfactory performance being maintained down to signal to noise ratios as low as 3:1*.

Continued experimentation has been conducted under authorization issued to Chromalloy American on June 26, 1969 and July 4, 1968, reference file number 4536-ER-68 CALL KB2XGW and reference file number 4482-ER-PL68 CALL KB2XFL respectively.

* - Data furnished to the Commission at the presentation is attached.

These authorizations assigned the operating frequencies of 18.5, 30.0, 39.3 and 42.0 GHz. Experiments conducted at all these frequencies have verified that satisfactory performance is achievable using the FPWM technique even under adverse conditions such as major rainfalls.

We are currently applying for a renewal of our license to enable the continued study and improvement of the system, with particular attention towards optimizing the band width requirements.

In evaluating any communication system the essential consideration is the optimum utilization of that valuable natural resource which is the frequency spectrum. There are a significant number of parameters which contribute to the utilization of frequency in an optimized manner. Frequently the narrowest band modulation technique is the most costly usage of this natural resource because its susceptibility to interference requires widely spaced usage and steals a significant amount of frequency band width thus precluding its use by others. From a natural resource point of view the optimum utilization is one in which the most densely packed

combination of frequency and geography can be achieved. The more important factors which must be evaluated are: A. Intersystem interference, B. Propagation and Propagation Anomalies, C. Modulation Methods, D. Power Considerations.

A. Interference in Radio Systems

The three most important system parameters affecting interference are antenna discrimination, the modulation method used and the frequency assignment plan.

a) Antenna Discrimination

Increased antenna discrimination reduces interference between systems operating in the same geographic area but a limit is set on antenna size and performance (beamwidth) by such practical factors as cost and mechanical stability of the supporting structure. The short wavelengths resulting from the use of super high radio frequencies reduce the overall size of an antenna having a given gain (beamwidth). The truth of this fact is not altered in any way by the type of information transmitted or the modulation method used.

It is highly desirable to design antennas with small side and back lobe radiation. This requires considerable sophistication in antenna design requiring precise construction techniques. Fortunately, this is one problem that becomes easier as frequency increases since size diminishes, making it relatively simple and inexpensive to design and fabricate the required structures. The increase in efficiency with which the spectrum and geography are used are well worth the extra care required.

In the past, antenna gain has been a dominant design parameter. For short range systems operating in an environment of potentially severe signal interference this is no longer valid. The angular response is of much greater importance. For maximum use of the spectrum in a given area, systems should be designed to be interference limited under normal conditions. Thermal noise is only a significant

factor during conditions of deep fades - usually caused by heavy rainfall, or anomalous propagation.

The environment in which an antenna is placed is also of great importance. Reflections from natural and man made structures can distort the antenna pattern and severely reduce the discrimination produced by the antenna beam pattern. Systems such as AM which rely solely on antenna discrimination for immunity to interference can suffer considerably if forced to operate in an undesirable environment.

b) Modulation

Perhaps the most important factor in determining the maximum use of a frequency assignment in a given area is the modulation method employed. Signals transmitted by a radio system are degraded by a variety of sources of noise and interference produced within a given system or induced by other nearby systems. If the total national usage of the spectrum is to be truly efficient, the system used must be resistant to these types of interference so that systems can be densely packed.

Interference resistance can be obtained by using large index frequency or phase modulation, pulse code modulation, pulse position modulation or pulse width modulation. Increased resistance to interference will allow more channels to be used in a given area but will also require more bandwidth so that an optimum will eventually be reached. Beyond this point total capacity will begin to decrease.

c) Frequency Plan

Most microwave radio systems use a so-called "two frequency" plan. This is because they must transmit information in two directions and the coupling between transmitting and receiving antennas must be less than the repeater gain. In LDS (FCC designated Local Distributor Service) or CARS (FCC designated Community Antenna Relay Service), where there is usually no need for bidirectional transmission and the prospects for isolating the transmitting and receiving antennas are very good,

a single frequency plan appears to be quite feasible. This is important because it implies full utilization of all the assigned spectrum.

d) Signal-to-Interference Ratios

The power received at a receiving antenna is given by:

$$(1)\quad P_r = P_t \left(\frac{\lambda}{4\pi R}\right)^2 G_r(\theta_r)\, G_t(\theta_t)$$

Where:

P_r = power received

P_t = power transmitted

λ = wavelength

R = distance traversed

G_r = receiving antenna gain

G_t = transmitting antenna gain

θ_r = angle measured between axes of the receiving antenna beam and the transmitted beam

θ_t = angle measured between the axes of the transmitter beam and the receiver beam

From: (1) the signal received at the i th receiver is:

$$(2)\quad S_i = P_t \left(\frac{\lambda}{2\pi R}\right)^2 G^2$$

the interference at the same receiver is:

$$(3)\quad I_i = P_t \left(\frac{\lambda}{2\pi}\right)^2 \sum \frac{G(\theta_{ij})\, G(\theta_{ji})}{R_{ij}}$$

the signal-to-interference ratio is therefore:

$$(4)\quad \frac{S_i}{I_i} \sum_j \frac{G^2}{G(\theta_{ij})G(\theta_{ji})} \left(\frac{R_{ij}}{R}\right)^2$$

The signal to interference is a function of antenna beam pattern and the relative spacing of the antennas.

e) Interference Resistance and Bandwidth

Resistance to interference can be increased by increasing the RF bandwidth. This is a well known fact and even the most casual observer is aware of this when com-

paring the performance of AM and FM broadcast receivers. This can be expressed mathematically by the relationship:

$$(5) \quad \frac{S_o}{I_o} \simeq 2\beta^3 \frac{S}{I} \qquad \text{when } \beta \geq 2.5$$

Where: $\frac{S_o}{I_o}$ is the signal/interference at the baseband output

β is the modulation index

$\frac{S}{I}$ is the signal interference at the receiver input

This expression is equally valid for filtered pulse width modulation. The point of all this being that extra bandwidth provided for wideband systems is in no sense wasted. In addition to permitting a higher quality of transmission it may also permit a greater "packing" density of usable channels and may permit a really efficient use of available spectrum.

B. Propagation Above 10GHz

At 10GHz and above the presence of liquid precipitation in the path of the beams of point-to-point radio systems greatly attenuates electromagnetic waves. The severity of the problem can be seen by looking at Fig. 4.1. The repeater spacings were determined by assuming a fade margin of 40db and a uniform rainfall rate of 4 inches per hour over the entire path. This is a "worst case" situation to be sure, but not at all impossible, particularly for very short range systems such as would be involved in LDS service.

Below 6 GHz rainfall attenuation plays no role in determining repeater spacing. Here it is determined by antenna heights and geographic features. Typical repeater spacings are between 20 and 30 miles.

Above 10 GHz the situation is entirely different. The spacing of repeaters is almost entirely determined by rainfall attenuation. Even a very short haul

system may require a number of repeaters. If a system is to be economically feasable the system concepts must lend themselves to low cost implementation. The modulation system chosen must be of such a nature that processing in the repeaters will not seriously distort the signal or add significant amounts of undesired modulation products. Amplitude modulation, although apparently the least demanding on channel bandwidth, is the most fragile in this regard. It is certainly the most vulnerable to the amplitude non-linearities which are likely to occur. This would preclude multi-hop links using AM. It is also the most vulnerable to interference from other systems.

Our current knowledge of attenuation of radio signals by rainfall has been summarized in a paper of D.C. Hogg[1]. Fig. 4.2 shows for several locations in the United States and one in England, the number of minutes a year that a given level of attenuation at 30 GHz is exceeded. Large differences exist between various locations - due to the maximum rainfall rate prevalent in a given area. This means that repeater spacings for systems operating above 10 GHz will vary for different locations. The final adoption of standards for systems operating in this region will have to include considerations of this effect. Systems designed to operate under only the most favorable conditions will prove to be very unreliable or totally useless in areas where heavy rainfall is a common occurrence. Fig. 4.3 shows the minimum and maximum attenuation that has been measured across the microwave spectrum at a rainfall rate of 100 mm/hour.

Fig. 4.4 shows the correlation between path attenuation due to rainfall over a typical 6.4 km path in the heavily populated northeastern United States. The rainfall and attenuation curves are almost mirror images of each other.

Combining the typical rainfall data and the propagation equation it is possible to determine the transmitter power required to achieve reliable operation over a desired path length as a function of frequency. Fig. 4.5 shows the transmitter

1. Hogg, D.C. "Millimeter-Wave Communications Through the Atmosphere" Science 159 No. 3810 Jan. 5, 1968 PP 39-46

power required as a function of path length for a K factor of 135 db, where K is defined by:

$$(6) \quad K = G_t + G_r - S_r$$

Where: G_t and G_r were defined before and S_r = min. usable input signal at the receiver in dbm

The reliability factors are calculated assuming that the rainfall is constant throughout the path and is equal to the maximum value. Actual performance will be considerably better since high intensity storms are highly localized.

C. Considerations of Modulation Methods in Radio Systems Operating Above 10 GHz

It has been known for some time[1] that band spread modulation techniques are not wasteful of radio frequency spectrum if all factors, especially interference, are taken into account. Amplitude modulation (AM), particularly single sideband AM requires the least bandwidth for transmission. One is always tempted to think in that direction when trying to make efficient use of the radio spectrum. Unfortunately as so often happens in nature, you cannot get something for nothing. AM, it turns out is also the most susceptible to noise, interference and system non-linearities. Alternative modulation schemes such as pulse code modulation, pulse position modulation, pulse width modulation, frequency modulation and phase modulation, all require additional bandwidth for transmission. They do however give the transmission a degree of ruggedness not possible with AM alone. After careful study of many schemes and many influencing factors we have ascertained that a proprietary technique which we call Filtered Pulse Width Modulation (FPWM) is the most economical compromise for the transmission of wideband information in local distribution service(LDS) of multiple channel CATV signals. It is a

1. Feldman, D. R. and Bennett, W. R. "Bandwidth and Transmission Bandwidth" BSTJ No. 3 July, 1949, PP 490-595

technique which is flexible enough to be used in the currently assigned band between 12,7000 and 12,950 MHz and will also be useful as higher frequency assignments become available, as they surely must in the future. The introduction of lasers into the frequency band above 10 GHz will provide highly efficient coherent frequency sources. The FPWM technique is ideally suited to modulating such coherent sources. It is a technique which combines a practical degree of immunity to noise, interference and non-linear distortion with equipment simplicity. This latter factor will manifest itself in the cost per channel-mile which ultimately will decide how practical any system is. Unlike AM, FPWM has the flexibility to trade channel bandwidth, channel capacity and interference immunity as required by the spectrum allocation and the public interest. For example, with a fixed bandwidth allocation improved interference immunity can be achieved by reducing the number of TV channels per transmitter or increased where the interference immunity is not critical. This flexibility permits an orderly expansion of facilities in the public interest in a most economical form.

The theoretical performance of a FPWM system in comparision to an AM system is shown in Fig. 4.6. The output signal to noise ratio in the demodulated baseband is plotted against input signal to noise ratio. The noise can be thought to include interfering signals which in many instances can be of greater significance than thermal noise. In the AM system the performance is given by a straight line of unit slope through the origin. In other words, there is no difference between the demodulated signal and the input signal so far as signal to noise or interference is concerned as long as all devices used are linear. On the other hand, a FPWM system with an index of 4 shows a 17 db improvement in signal to noise ratio once a threshhold level is exceeded (this does not include the further improvement resulting from the higher average power compared to AM as noted below).

Even in situations where the index is reduced the FPWM system is capable of better operation than AM systems since it is not subject to the cross modulation noise caused by amplifier non-linearities.

D. Power Output in Modulated Systems

In amplitude modulated systems it is necessary to operate the amplifiers in a linear region to perserve the fidelity of the information bearing envelope and to minimize intermodulation and cross modulation if multiple signals are present. This is particularly bothersome in an output stage which is required to deliver significant amounts of power. Often this means that the output device has to be operated far below its maximum output level, when non-linear (saturation) effects are large. The need to run a device far below its maximum output means that it is not being used efficiently and it must have performance capability far beyond its actual use.

This situation is further aggravated when the system is transmitting television signals where the sync tips represent maximum modulation. Under this condition with normal scene information the average carrier level is probably only 15-25% of the peak value. This further reduces the useful power available from a given device.

In wideband transmission systems such as Filtered Pulse Width Modulation there are no such limitations since no information is carried in the amplitude of the signal. As a result a power device can be driven (and usually is!) into the saturation region to obtain its maximum available power. This implies that the circuit will be both efficient and economical since it is performing at its maximum capability. For the case of video modulation this results in a further improvement in the signal to noise ration of the FPWM system over the signal to noise ratio obtained from an AM system beyond that shown in Fig. 4. 6.

The full capacity and diversified uses made possible by the FPWM technique have

been enumerated so that for the purposes of presenting the experimental performance achieved the system will be shown in a relatively simple configuration. A block diagram of the FPWM system is shown in Figure 5.1. The transmitter portion consists of a wide spectrum compiler, the proprietary modulator, a carrier oscillator and a power amplifier. The receiver portion contains a detector and IF amplifier, the demodulator, and the demultiplexer.

The wide spectrum complier accepts independent inputs off the air and from locally generated sources as determined by the users need. By appropriate filtering, amplifying and combining a composite wide spectrum signal is constructed. In the modulator this composite signal is converted into very narrow pulses of variable width and variable spacing. These variations in width and spacing contain the information from which the signals can be extracted in their original form. The desired output frequency and power level are obtained by use of the proper carrier oscillator and power amplifier respectively.

At the receiver the signal is detected and amplified at the intermediate frequency. The demodulator extracts the original composite wide spectrum signal which is then demultiplexed and distributed according to the users plan.

b) First Experimental System Operation

Extensive tests on the transmission capabilities and subjective performance of the FPWM technique for use as a local distribution system were conducted under experimental authorizations KB2XFL and KB2XGW issued to Chromalloy American. The first series of on the air tests were made at the Carle Place, New York location of Chromalloy American. These tests were primarily designed to determine the performance of the system at different transmission frequencies. Therefore, the major effort was concentrated at the extremes of the frequencies allocated, namely 18.5 GHz and 42 GHz. Sufficient tests were conducted at the other two frequencies allocated, 30.0 GHz and 39.3 GHz to ensure complete evaluation.

The following shows the hours of operation on each of the frequencies assigned.

Assigned Frequency	Total Operating Time	
18.5 GHz	300 HRS.	Operations conducted over the period from January, 1969 - April, 1969
30.0 GHz	20 HRS.	
39.3 GHz	20 HRS.	
42.0 GHz	300 HRS.	

The seven New York TV channels, covering a frequency band of 54 through 216 MHz were transmitted in place with good picture quality being maintained. In order to make a more stringent evaluation, five channels of video programming were combined to form the wide spectrum signal. The VHF-TV channels 2, 4 and 5 were used directly and VHF-TV channels 9 and 11 were translated into the slots for channels 3 and 6 respectively. The detected signal to noise ratio in each channel, when using a transmission index of 0.75 is shown in Table II. The signal measured was that of the carrier only. The noise level was the highest level in the channel, determined by searching the band with a field strength meter. The noise measured is the total of idle noise plus cross modulation and as such results in the poorest ration in each channel.

TV Channel	S/N+ x mod.	
2	45.2 db	
3*	47.0	
4	45.0	*Channel 9 translated **Channel 11 translated
5	47.5	
6**	48.0	

DETECTED S/N RATIO FOR 5 CHANNEL MULTIPLEX TRANSMISSION

Due to the location of the test site relative to the source of local TV transmission the received signals were such that the signal to noise ratio into the receiver was only 51 db. However, the resulting S/N ratios are still well above the minimum acceptable level of 15 db S/N for the FPWM system so that good picture equality was always maintained. Furthermore, the experimental results indicate a significant fade margin available insuring satisfactory operation during adverse weather conditions.

c) Second Experimental System Operation

From these extensive tests under varying atmospheric conditions, it was determined that the FPWM technique is not frequently sensitive giving essentially the same performance at the four assigned frequencies. It was therefore decided to concentrate the experimental effort at 18.5 GHz. A new air link was established over a 1.5 mile line of sight path as shown in figure 3.2. The transmitter was located at the Times printing plant at 64th. Street and West End Avenue and the receiving site was in the Times tower at 43rd. Street and Broadway in New York City. This link was maintained over a period from May, 1969 through November, 1969, logging a total of 750 hours of operation.

In this instance, three channels of video information were transmitted by multiplexing VHF-TV channels 2, 4 and 5 directly. The input signals were adjusted to produce identical output signal to noise ratios and the detected signal to noise ratios in the three channels are shown in Table III. The measurements were made in the same manner as described for the Carle Place link.

TV CHANNEL	S/N + x mod.
2	57 db
4	57 db
5	57 db

TABLE III - DETECTED S/N RATIOS FOR 3 CHANNEL MULTIPLEX TRANSMISSION

The transmitter TWT amplifier had a power output of 1 watt. Both the transmitting and receiving antennas were 3' parabolic dishes. This combination results in a range capability far in excess of the 1.5 mile path length established (See Section II). The effective path length was increased to 15 miles by use of attenuators. Because of the advantage of the Filtered Pulse Width Modulation technique in the presence of noise and fading this link continually performed in a satisfactory manner. Transmissions maintained during major rainfalls resulted in no degradation in the received picture quality, including September 3rd., 1969 when the rainfall during the 24 hr. period exceeded 3.32 inches.

We believe the system presented will confirm the words of Marshall Mc Luhan, the prophet of the media, who wrote only three years ago, "The medium, or process, of our time - electric technology - is reshaping and restructuring patterns of social interdependence and every aspect of our personal life. It is forcing us to reconsider and re-evaluate practically every thought, every action and every institution formerly taken for granted". The hope is that this total involvement technology will create new understanding and attitudes and possibly a new will for peace.

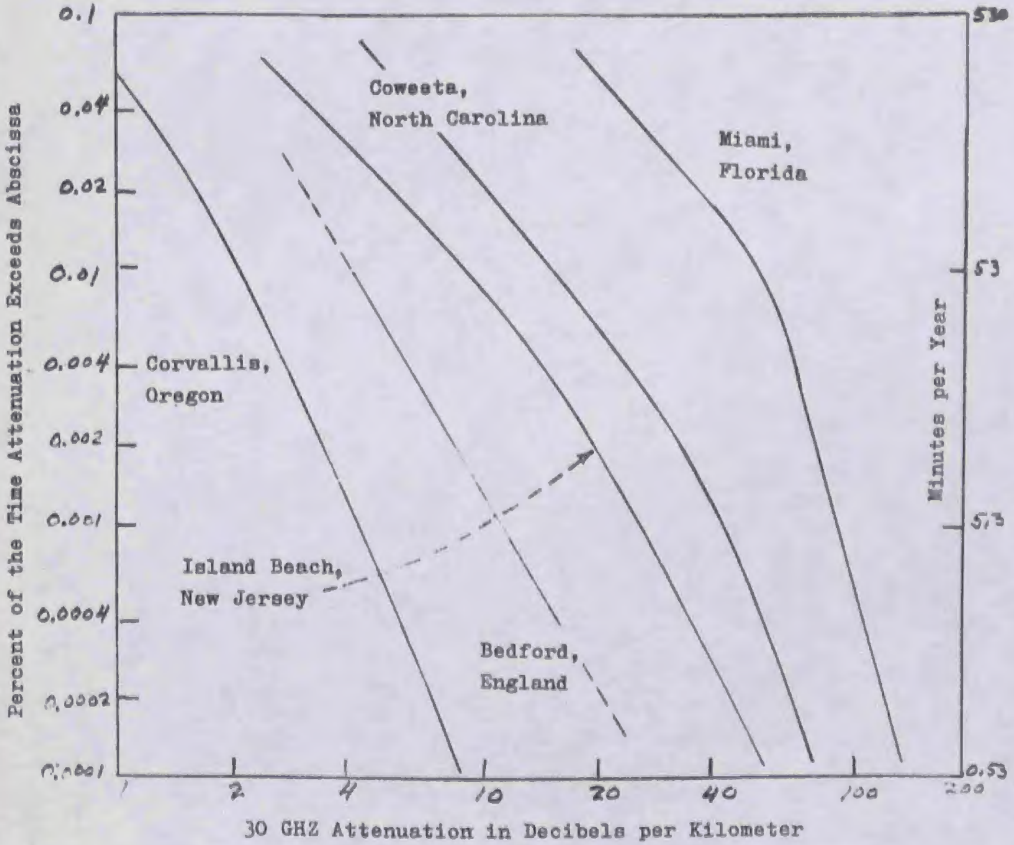


Fig.4.2-The number of minutes per year that a given level of attenuation at the United States and England. (after L.C.Tillotson, BSTJ, vol. 48, p1566.)

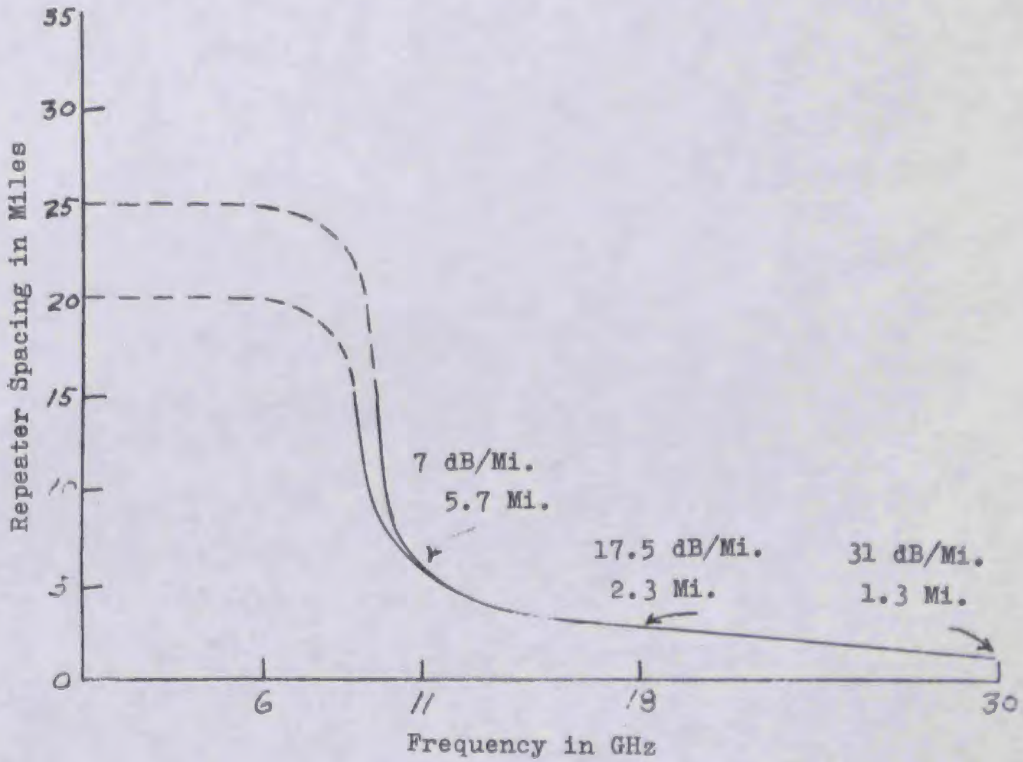


Fig. 4.1-Repeater spacing as determined by a rain rate of 100 mm per hour. This assumes uniform rain over entire path and a 40 dB fade margin. (after L.C.Tillotson, BSTJ, vol. 48, p1565.)

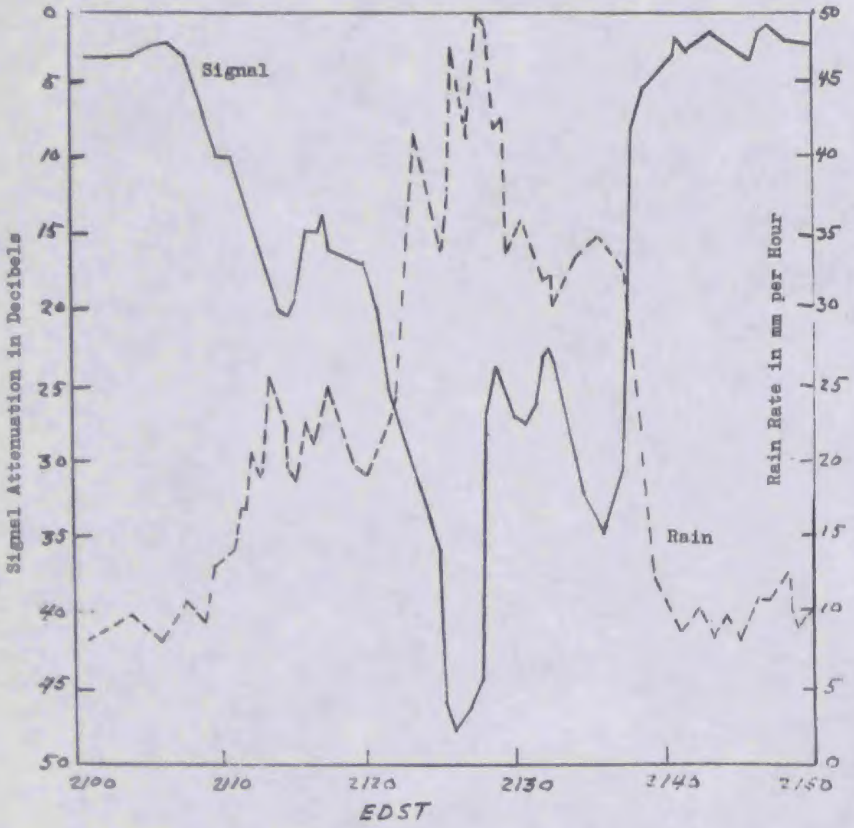


Fig.4.4-18.5 GHz signal attenuation and rainfall versus time. Measured data of October 25, 1967 -for 18.5 GHz 6.4 km path- Cliffwood to Crawford Hill. (after Semplak and Turrin, BSTJ, vol. 48, p1774.)

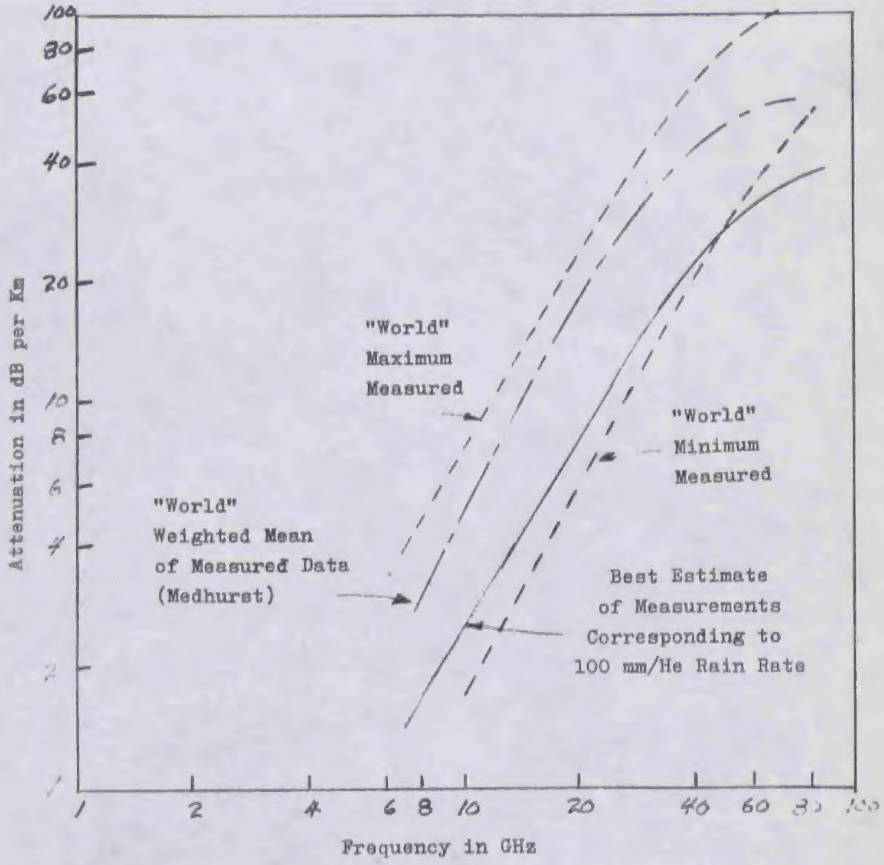


Fig. 4.3 Signal attenuation as a function of frequency at 100 mm/Hr showing minimum and maximum values. (after Semplak and Turrin, BSTJ, vol. 48, p1784.)

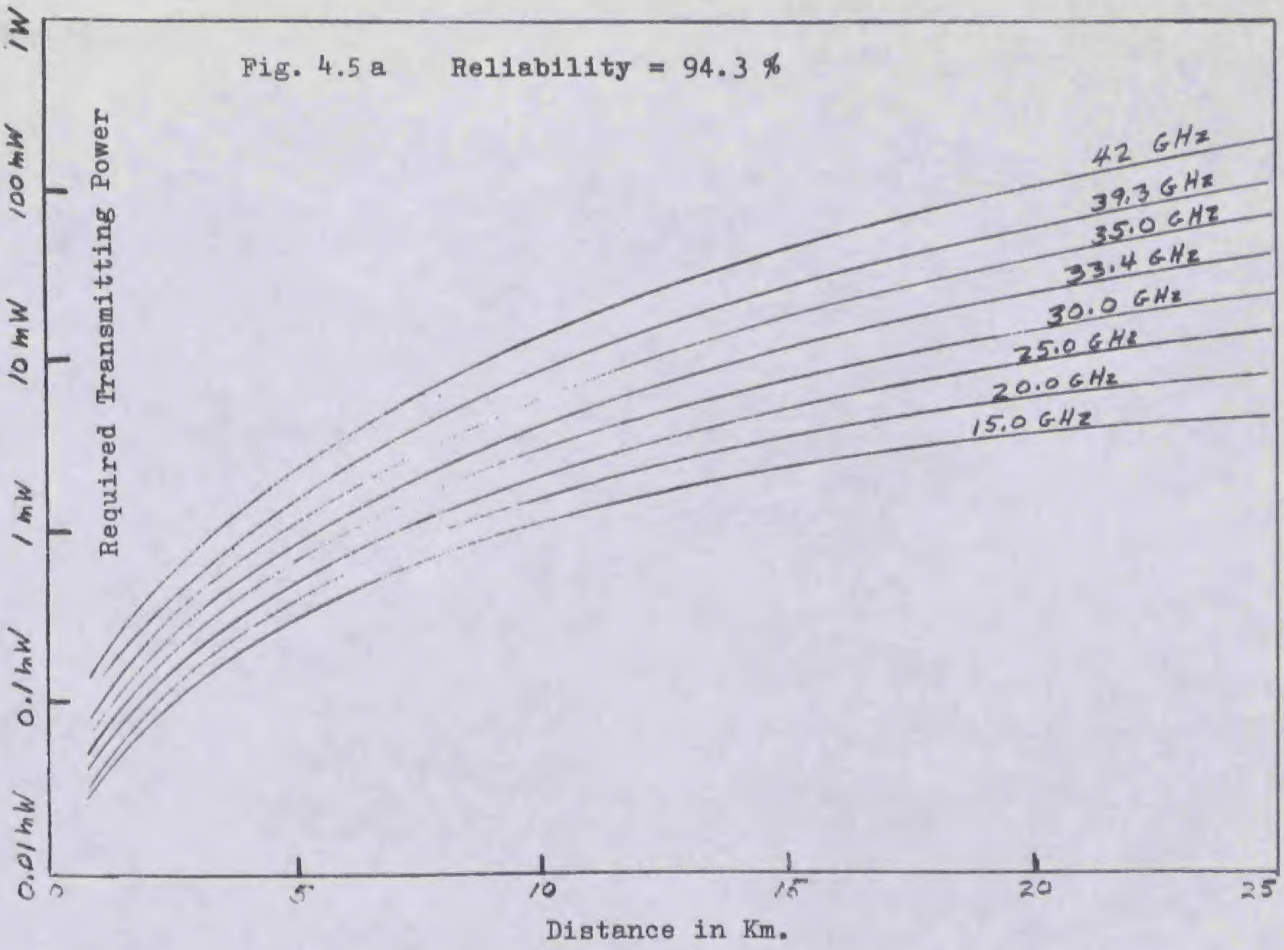
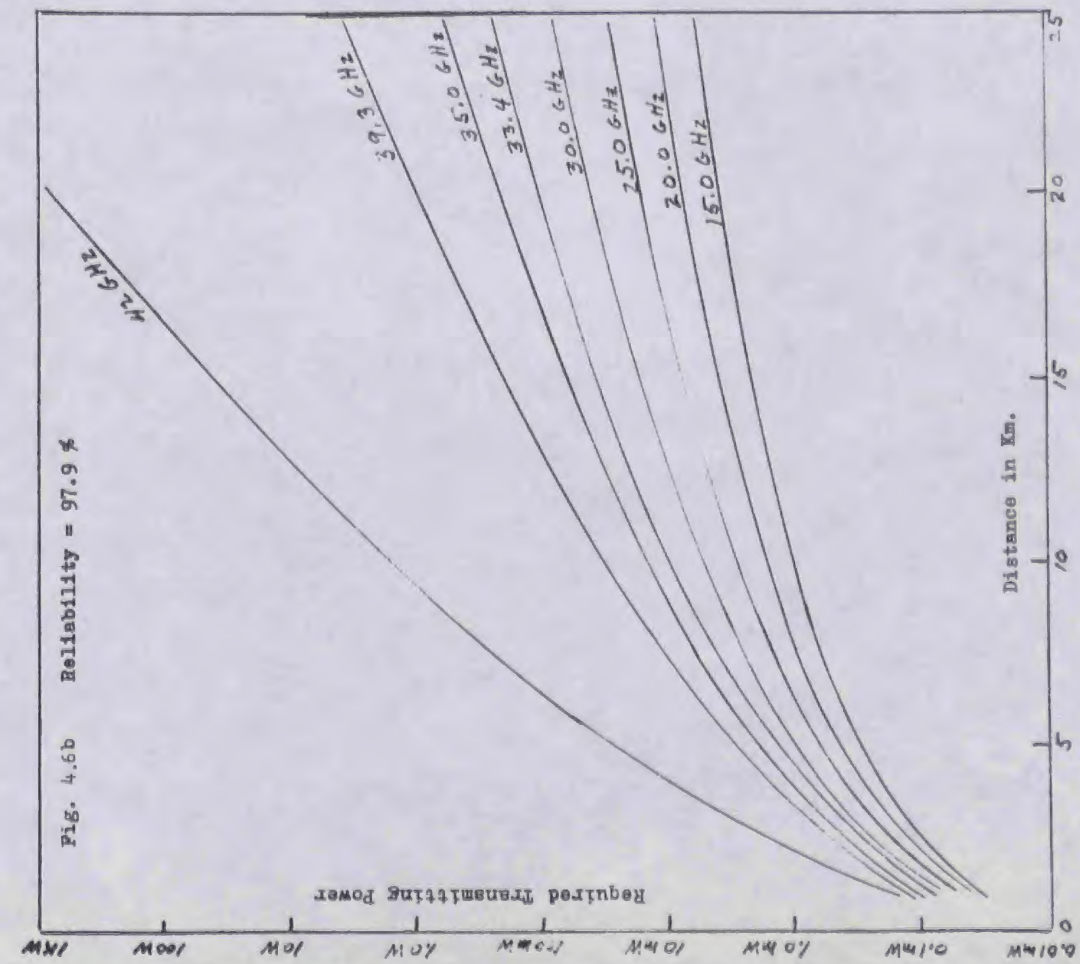


Fig. 4.5 - Transmitter power versus repeater spacing for a K factor of 135 db as a function of different reliability values.



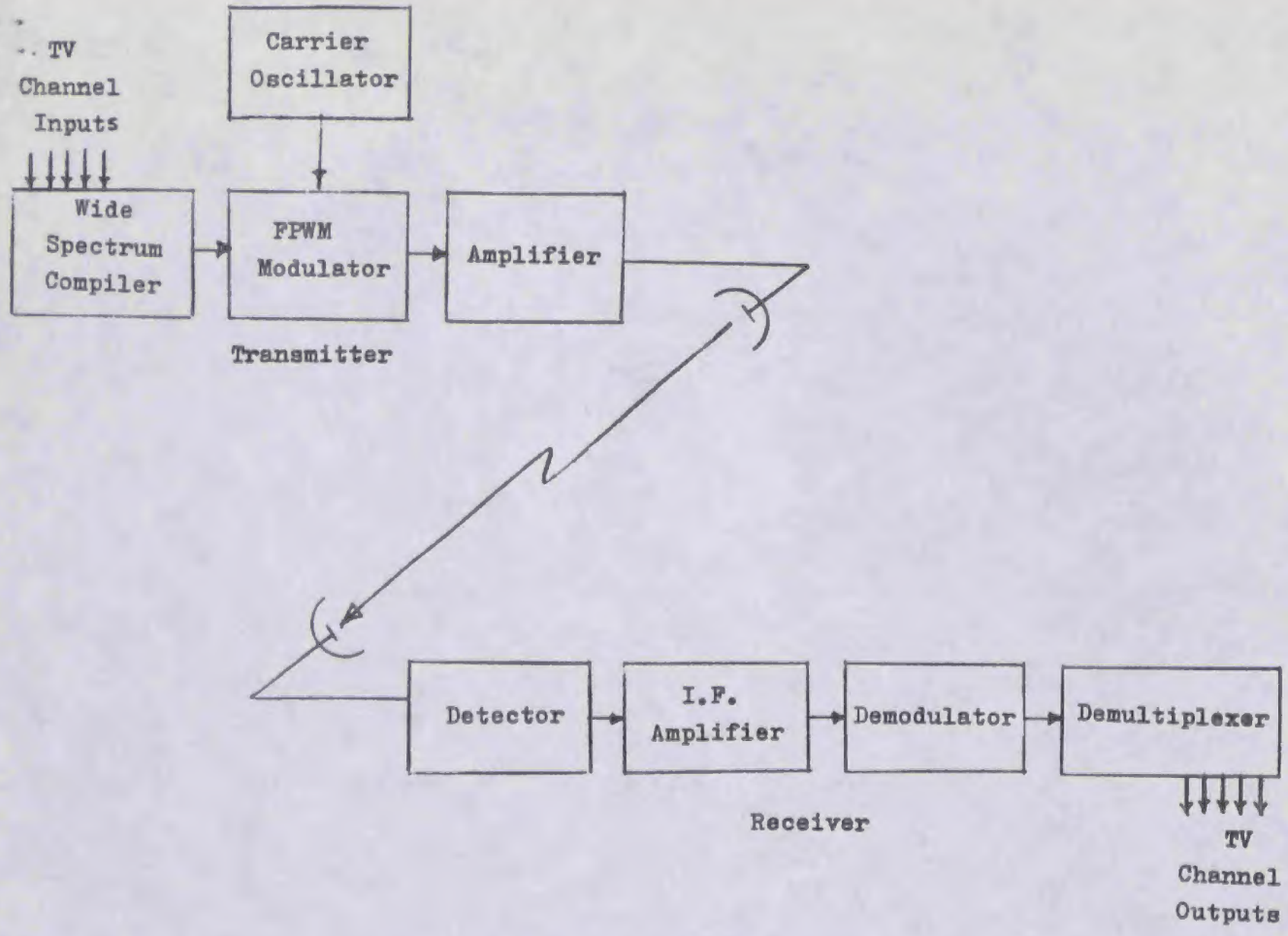


Fig. 5.1 FPWM System Block Diagram

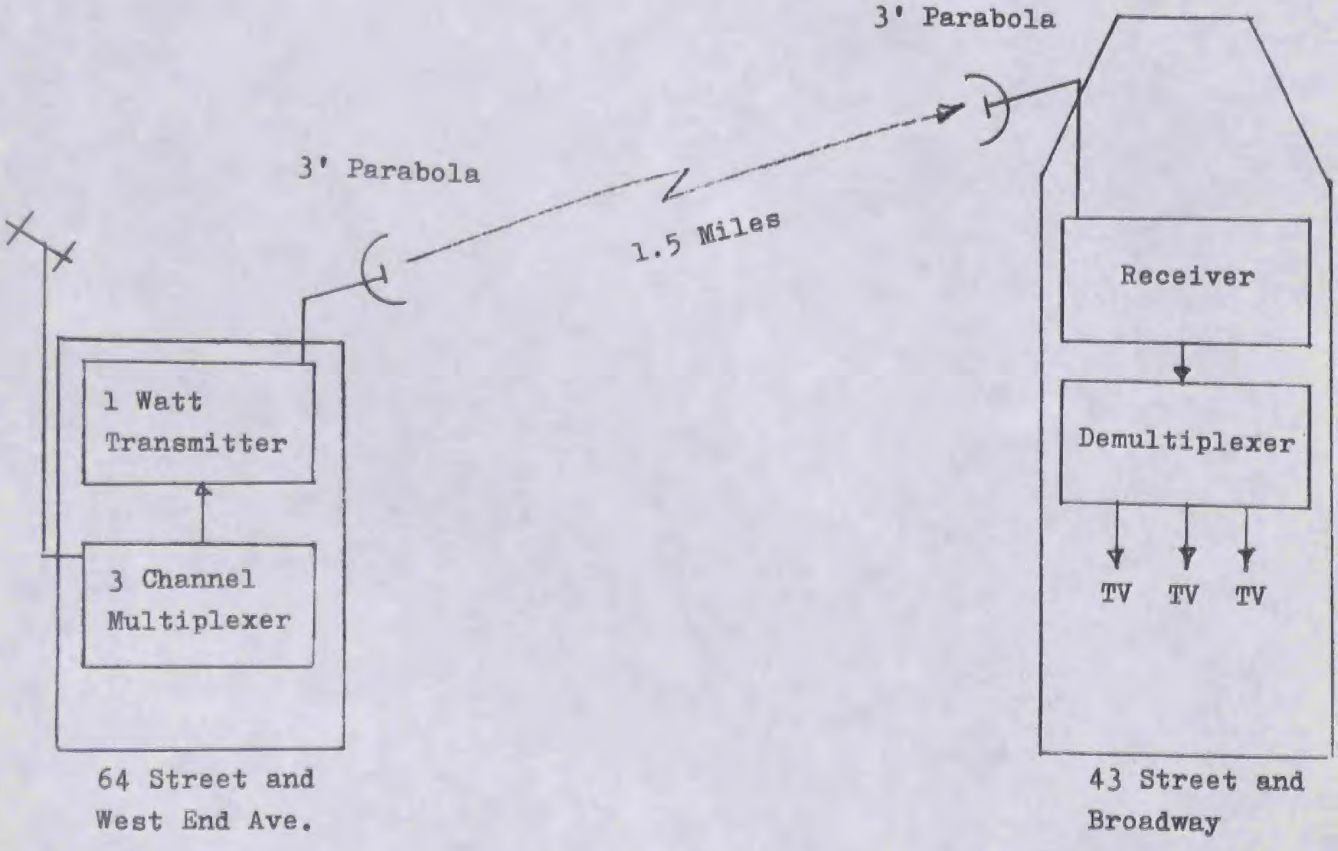


Fig. 5.2 -Experimental 18.5 GHz Radio Link.

Figure 6

WEATHER SATELITES

6 SATELITE NETWORK

VTR PHOTOGRAPH INPUT

TV OUTPUT 20:1 SPEEDUP

WORLDWIDE SEQUENCES
EVERY 2 HOURS FOR
PRECEEDING 12 HOURS

Figure 7

INTERNATIONAL
NEWS SERVICE

TIME SHARED 80 CHANNELS
OF VIDEO BAND WIDTH

40 VOICE CHANNELS PER
PICTURE

UPDATING EVERY TWO HOURS

MULTIPLE INPUTS - MULTIPLE
OUTPUTS

MANY LANGUAGES:
ENGLISH, FRENCH, SPANISH,
GERMAN, PORTUGUESE, GAELIC,
ITALIAN, RUSSIAN, YIDDISH,
FINNISH, SWEDISH, CHINESE,
NORWEGIAN, JAPANESE, DUTCH,
POLISH, TURKISH, HINDI,
SWAHILI, URDU, ETC.

Figure 8

EDUCATION

6 INPUT NETWORK

INTERSATELITE CONNECTED

40 CHANNEL BROADCAST OUTPUT

TABLE 1

FORECAST OF "TOTAL INVOLVEMENT SERVICES" OVER CATV

(Next Decade, X = Estimated Date for Operating Service)

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
20 TV Channels Start		X								
News and Weather	X									
Community Relations Channels	X									
TV Ombudsman		X								
Theatre TV Start		X								
Shoppers Channels		X								
50 Channels of FM Entertainment		X								
TV Security		Start	X							
Computer, Facsimile and Data Transmission Channels		Start	X							
Medical TV Uses		Start	X							
Air Pollution, Traffic Surveillance & Municipal Services			Start	X						
40 TV Channels				Start	X					
Direct Satellite Pick-ups					Start	X				
Credit Card Banking					Start	X				
20 Channels of ETV & 50 Channels of FM making every home a classroom					Start	X				
Access to Computer Storage Reference Material					Start	Advance	X			
Doing Business at Home							X			
Electronic Newspaper							Start	X		
Access to Channels from the whole World									Start	X

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C. 20554

In the Matter of	)	
	)	
Amendment of Part 74, Subpart J,	)	
of the Commission's Rules and	)	Docket No. 18452
Regulations Relative to	)	
Community Antenna Relay Stations	)	

PETITION FOR RECONSIDERATION IN PART

LASER LINK CORPORATION

By Mallyck & Bernton
915 Colorado Building
Washington, D.C. 20005

Its Attorneys

December 15, 1969

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C. 20554

In the Matter of	)	
	)	
Amendment of Part 74, Subpart J,	)	
of the Commission's Rules and	)	Docket No. 18452
Regulations Relative to	)	
Community Antenna Relay Stations	)	

PETITION FOR RECONSIDERATION IN PART

Comes now Laser Link Corporation and, by its attorneys, hereby petitions the Commission to reconsider in part its action herein to the extent necessary to incorporate into Subpart J of Part 74 of the Commission's Rules, the further amendments thereto that are set out in Appendix A to this Petition. These amendments authorize the use of Petitioner's Filtered Pulse Width Modulation (FPWM) System by CAR relay and LDS distribution stations operating in the 12.70-12.95 GHz band.

As cause therefor, Petitioner shows as follows:

Petitioner is a corporation that is owned 50% by Chromalloy American Corporation. The remaining 50% is divided among several other stockholders. Petitioner has pending before the U. S. Patent Office several patent applications, filed in 1967 and 1968, proposing the FPWM technique which is capable of providing multi-channel relay and transmission of television channels, independent of frequency, anywhere between eight and 10,000 GHz.

This technique was developed for the purposes of relaying and distributing multiple television channels in the manner now contemplated by Subpart J to Part 74 of the Commission's Rules. Unlike the Hughes system as now authorized by Subpart J, this system does have the capacity of relaying multiple channels with a single transmitter and, therefore, provides the answer to one of the specific problems to which the earlier proceeding on this subject was addressed (12 FCC 2d 936, 940). It is equally adaptable to long-haul relay and short-hop distribution functions.

A brief technical description of the system and its operation is attached as Appendix B. Its operation with 32 channels at 8 GHz was demonstrated to the Commission under the name of "Quasi-Laser Link System" on October 24, 1968. Other operations of the system have been conducted at 18.5 GHz, 30.0 GHz, 39.3 GHz and 42.0 GHz under experimental authorizations KB2XFL and KB2XGW issued to Chromalloy American. This experimentation has established that the system is not frequency sensitive so that it is readily adaptable to operation at 12.7 -12.95 GHz. In that range, the system can relay approximately 18 channels in a band-width of .25 GHz. Under identical adverse transmission conditions, and with the same beam width, it will provide television reception with greater signal-to-noise ratios than is possible with the Hughes system. It is far less susceptible to rain, snow, fog and other detrimental atmospheric conditions than are AML systems.

It requires no "pilot" subcarrier and no dedicated frequency. Changes in frequency assignment require only substitution of the frequency reference in the transmitter and, in the receiver, a frequency change in the local oscillator.

* * *

The Filtered Pulse Width Modulation technique transmits a multiplicity of TV channels with single or vestigial sideband for the visual signal and FM modulation for accompanying sound. The TV channels are frequency multiplexed in a manner akin to that used in the multiplexing of telephone channels for microwave transmission, with all transmitted channels being present throughout the modulation "envelope". Hence, as in telephone microwave systems, it is not possible to allocate a specific frequency band for relaying each television channel. There is, nevertheless, a direct correlation between the number of television channels to be transmitted and the frequency bandwidth required for their transmission. In the 12.75 GHz range, three to five standard 6 MHz television channels can be accommodated in any contiguous band of 75 MHz;[1/]

1/ It is perfectly possible to transmit a single channel in a 25 MHz band, but this is not, at present, an economic use of the system.

and six to eight channels can be accommodated in 125 MHz. If the entire band between 12.70 and 12.95 GHz is used, the system will accommodate up to 18 standard 6 MHz channels.[2/]

Where a lesser number of channels is required within a given bandwidth (i.e., 3 rather than 5 within 75 MHz; 6 rather than 8 within 125 MHz, etc.) there will be a saving on equipment cost.

A collateral advantage of the system is that it is not restricted to the standard 6 mc television channel. Within the assigned bandwidths set out above, it can transmit channels larger or smaller than 6 mc, depending on the resolution required.

* * *

The system provides interference-free on-channel repeatability at angular separations down to 3 beam-widths and vertical separations of 3 antenna diameters. For this reason, the alternate channels which the Hughes system requires for repeater functions are unnecessary; and the efficiency of this system is the same as that of the Hughes system for the repeater relaying or distribution of 18 channels.

2/ At higher frequencies, the system requires less spectrum space per transmitted bandwidth and, in the 18 GHz range, can accommodate 20-32 channels in 500 MHz.

Since the FPWM system can accept a lower carrier signal-to-noise ratio than AML systems (as much as 20 db lower), it tolerates greater interference and makes possible more co-channel operations in a given area. Polarization can further reduce the effect of interference where short range distribution hops are involved. However, as with other systems authorized to operate in this band, most applications of the FPWM system transmit only a narrow beam and interference occurs only when the receiver and interferring transmitter are located in each other's beamwidth. Crossing beams create no more interference with each other than flashlight beams crossing in a darkened room. Accordingly, even in the most congested areas, use of this system will not be precluded by, nor preclude, the use of any other system allowed to operate in this band; nor will it have any significant effect on the allocation of these frequencies for other authorized uses.

For local distribution or for relay, this system carries the VHF channels wherever possibe. UHF channels are translated to vacant VHF frequencies and other signals are rearranged so that each signal is capable of being selected at a different position of the VHF tuner. All of this is accomplished with conventional CATV "head-end" equipment. As with the Hughes system, FPWM provides channels capable of being selected by and viewed on a conventional receiver. As with the Hughes system, no modification would be required in receivers or CATV head-end or line equipment. As with the Hughes system, the

entire TV band can be transmitted "en masse" in the 12 GHz band but -- unlike the Hughes system -- this system will transmit all the signals with one transmitter.

* * *

For the reasons set forth above, the system can be operated within the rules contained in Subpart J, if they are enlarged to accommodate it. Recommended changes to effectuate this enlargement are included in Appendix A hereto; and it is particularly noteworthy that:

(a) These changes will not affect the operation of any other system authorized by the rules as pre-existing or as previously amended in this proceeding.

(b) These changes do not involve the allocation of additional or different frequency space than that allocated by the rules as pre-existing or as previously amended in this proceeding.

(c) These changes do not contemplate or allow the creation of any interfering signals or components precluded by the rules as pre-existing or as previously amended in this proceeding.

Proposed Paragraph (c) and revised Paragraph (g) in Sec. 74.1103 merely provide for the use of the assigned frequencies in a mode adaptable to FPWM use as an alternative to the other two modes presently authorized. As such, they merely parallel Paragraphs (b) and (f) which now allow the use of the frequencies in the mode adapted to the Hughes frequency as an alternative to the single mode previously authorized.

The revision proposed to Paragraph 74.1030(b) allows stations using FPWM to engage in the same activities as those using FM transmission.

The revision proposed to Paragraph 74.1039(a) imposes a power limitation on FPWM transmissions comparable to that applied to other systems. The revision proposed to Paragraph 74.1039(b) allowes the use of the FPWM system for LDS distribution.

FPWM operates within the tolerances already established by the Rules; and the proposed revisions of Sub-paragraph 74.1041(b)(3) and of Paragraph 74.1061(a) make those limitations applicable to this system.

On the other hand, Sec. 74.1065 has no applicability to this system, and Paragraph 74.1050(b) is proposed to be amended accordingly.

* * *

It appears that, as was the case with the Hughes system, operation of the FPWM system for CAR relay operations was probably within the scope of Subpart J prior to the amendments recently adopted in this proceeding. However, the amendments that authorized the LDS distribution service would not, without the revisions proposed herein, authorize the use of this system for that service. Petitioner is prepared to provide the equipment for both relay and LDS distribution service. Unlike Hughes who, at the time of the institution of this proceeding, merely "propose[d] to develop" its equipment, Petitioner has completed the development of its demonstration equipment for this service. As stated above, it has been demonstrated and tested in ranges from 8 to 42 GHz; and, not being frequency sensitive, can be readily used in the 12.7 GHz band.

It is not the function or purpose of this Petition to deprecate the Hughes system. However, FPWM can provide many benefits which the Hughes system cannot. Because it requires only a single transmitter to transmit multiple TV channels, it offers substantial economies to many users. Because of its ability to transmit channels with greater or less bandwidth than 6 MHz, it has an adaptability to special uses that the Hughes system does not.

It is anticipated that, after the next World Administrative Radio Conference, these services may be shifted to 18 MHz or some other band. Because the FPWM equipment is not frequency dependent, all equipment in use at that time could be changed to such new frequency without significant cost.

The FPWM system is little affected by rain and other atmospheric conditions. It is a hundred times less sensitive to ambient noise than is the Hughes system. It has a capability for co-channel repeater operations, not only back-to-back but at all angles down to three times transmitter beam-width. Its efficiency, in terms of frequency use, increases with the number of channels transmitted. Although the Hughes system appears, at first inspection, to provide a more efficient use of frequencies, the FPWM system will, for the reasons set out above, provide virtually as much relay and distribution capacity in a given geographic area.

For these reasons, it is clearly in the public interest that those desiring to engage in the relaying and distribution of CATV signals be given an option to use this equipment if they so desire.

* * *

Petitioner regrets that it comes into this proceeding now for the first time. Its failure to participate at an earlier stage was due solely to the fact that it had not been advised of its pendency. However, since petitioner seeks only an enlargement of Rules already adopted, consistent with the policies previously established in this proceeding, it believes that its entry at this time for this limited purpose is not inappropriate.

Because it endorses the Commission's determination that the institution of the LDS service in this band is in the public interest, Petitioner cannot, with good conscience, request a stay of what the Commission has already ordered. It does feel, however, that just as it is important that internal distribution of CATV signals be authorized and equipment standards adopted for that purpose, it is equally important that those desiring to operate in that service be allowed a choice of equipment and that this alternative be made available to them as quickly as possible. For that reason, Petitioner respectfully requests that action on this Petition be expedited and that, following its consideration of this matter, the Commission adopt the amendments herein proposed.

* * *

If Petitioner's patent applications for the equipment used in FPWM transmissions are granted, Petitioner will grant to any responsible party, at reasonable royalties, licenses for the manufacture of the apparatus covered thereby.

Respectfully submitted,

LASER LINK CORPORATION

By_____

Mallyck & Bernton
915 Colorado Building
Washington, D. C. 20005
Its Attorneys

December 15, 1969

APPENDIX "A"

APPENDIX A

Part 74, Subpart J, is amended as follows:

1. In Section 74.1003, Paragraph (a) is amended by adding Subparagraph (3), Subparagraph (g) is redesignated (h) and a new Subparagraph (g) is added as follows:

* * *

(a) (3) For community antenna relay stations using filtered pulse width modulation:

(i) For 3 to 5 TV 7 Mc/s bandwidth frequency multiplexed channels:

Group E Mc/s	Group F Mc/s
12,700-12,775	12,725-12,800
12,775-12,850	12,800-12,875
12,850-12,925	12,875-12,950

(ii) For 6 to 8 TV 6 Mc/s bandwidth frequency multiplexed channels:

Group G Mc/s
12,700-12,825
12,825-12,950

(iii) For 9 to 18 TV 9 Mc/s bandwidth frequency multiplexed channels:

Group H Mc/s
12,700-12,950

* * *

(g) For community antenna relay stations using filtered pulse width modulation, channels will be assigned from Groups E, F, G and H according to the number of 6 mc TV channels which are to be multiplexed for transmission from a single transmitter location. Where channels are to be multiplexed in groups of three to five, frequencies will normally be assigned only from Group E or only from Group F although, upon adequate showing, combinations of frequencies from both Groups E and F may be authorized on a case by case basis in order to prevent interference or to permit a more efficient use. Where six to eight channels are to be multiplexed for transmission from a single transmitter location, frequency assignment will be made from Group G. Where nine or more channels are to be multiplexed for transmission from a single transmitter location, the frequency in Group H will be assigned. The license will indicate the number of channels authorized to be multiplexed for transmission in the assigned frequency, but the transmission of additional channels and/or channels with bandwidths greater or less than 6 mc may be authorized upon a showing that such can be provided without degradation of the technical quality of the service.

* * *

2. In Section 74.1030, Paragraph (b) is amended as follows:

(b) The transmitter of a community antenna relay station using FM transmission or filtered pulse width modulation .....

* * *

3. In Section 74.1039, Paragraphs (a) and (b) are amended as follows:

(a) Transmitter peak power shall not be greater than necessary and, in any event, shall not exceed 5 watts on any channel. For transmitters using filtered pulse width modulation, the peak power shall not exceed 15 watts on frequency assignments in Groups E and F, 30 watts on frequency assignments in Group G and 60 watts on assignments in Group H.

(b) LDS stations shall use vestigial sideband AM transmission or filtered pulse width modulation.....

* * *

4. In Section 74.1041, the introductory text of Subparagraph (1) of Paragraph (b) is amended to read as follows:

(1) For CAR stations using FM transmission or filtered pulse width modulation:

* * *

5. In Section 74.1050, Paragraph (b) is amended to read as follows:

(b) Each transmitter authorized for use in the Community Antenna Relay Service (other than a CAR pick-up station) must be a type which has been type accepted pursuant to Part 2 (Subpart F) of this chapter, as capable of meeting the requirements of §74.1003, 74.1039, 74.1061 and (except where the transmitter employs filtered pulse width modulation) 74.1065.

* * *

6. In Section 74.1061, Paragraph (a) is revised to read as follows:

(a) The frequency of the unmodulated carrier of a community antenna relay station using FM transmission shall be maintained within 0.02 per cent of the center of the assigned channel, and for a station using filtered pulse width modulation, the average envelope frequency shall be maintained within 0.02 per cent of the center frequency of the assigned channel.

* * *

APPENDIX "B"

LASER LINK CORPORATION

770 Lexington Avenue, New York, N. Y. 10021 / Area Code 212 Plaza 1-6868

LASER LINK CORPORATION/
CHROMALLOY AMERICAN CORPORATION

Appendix B submitted in connection with

"Petition for Reconsideration In Part"
Sub-Part J of Part 74 of Commission Rules

December 11, 1969

TECHNICAL DISCUSSION AND EXPERIMENTAL RESULTS

1. Background

Laser Link Corporation and Chromalloy American Corporation recognized the need for a local distribution radio system, capable of providing a multi-channel high capacity service for use with CATV systems. Early considerations of the various modulation techniques available pointed out their shortcomings for use in such a high capacity system. Among the modulation techniques considered were, AM, pulse code modulation (PCM), pulse position modulation (PPM), pulse width modulation (PWM), frequency modulation (FM) and phase modulation (PM). For example: AM was rejected because of the extreme linearity required and the lack of noise and interference immunity it possesses. Conventional PCM, PPM, FM and PM were rejected because the complexities of creating the modulation made these techniques uneconomical for CATV applications. The following section discusses the various factors which effect the performance of radio systems at microwave frequencies and above.

Our continued search for a viable solution led us to our proprietary method of Filtered Pulse Width Modulation, (FPWM) which is capable of providing multi-channel relay and transmission of television channels, independent of frequency, anywhere in the frequency spectrum between 8 GHz and 10,000 GHz. The initial development conducted in our laboratories culminated in a demonstration before the FCC on October 24, 1968 of a FPWM system operating on a carrier frequency of 8 GHz with symmetrical side band, full carrier power. A full 32 channel capability was demonstrated with satisfactory performance being maintained down to signal to noise ratios as low as 3:1.*

Continued experimentation has been conducted under authorization issued to Chromalloy American on June 26, 1969 and July 4, 1968, reference file number 4536-ER-68 CALL KB2XGW and reference file number 4482-ER-PL68 CALL KB2XFL respectively.

*- Data furnished to the Commission at that presentation is attached.

These authorizations assigned the operating frequencies of 18.5, 30.0, 39.3 and 42.0 GHz. Experiments conducted at all these frequencies have verified that satisfactory performance is achievable using the FPWM technique even under adverse conditions such as major rainfalls.

We are currently applying for a renewal of our license to enable the continued study and improvement of the system, with particular attention towards optimizing the band width requirements.

II. General Technical Considerations

In evaluating any communication system the essential consideration is the optimum utilization of that valuable natural resource which is the frequency spectrum. There are a significant number of parameters which contribute to the utilization of frequency in an optimized manner. Frequently the narrowest band modulation technique is the most costly usage of this natural resource because its susceptibility to interference requires widely spaced usage and steals a significant amount of frequency band width thus precluding its use by others. From a natural resource point of view the optimum utilization is one in which the most densely packed combination of frequency and geography can be achieved. The more important factors which must be evaluated are: A. Intersystem interference, B. Propagation and Propagation Anomalies, C. Modulation Methods, D. Power Considerations.

A. Interference in Radio Systems

The three most important system parameters affecting interference are antenna discrimination, the modulation method used and the frequency assignment plan.

a) Antenna Discrimination

Increased antenna discrimination reduces interference between systems operating

in the same geographic area but a limit is set on antenna size and performance (beamwidth) by such practical factors as cost and mechanical stability of the supporting structure. The short wavelengths resulting from the use of super high radio frequencies reduce the overall size of an antenna having a given gain (beamwidth). The truth of this fact is not altered in any way by the type of information transmitted or the modulation method used.

It is highly desirable to design antennas with small side and back lobe radiation. This requires considerable sophistication in antenna design requiring precise construction techniques. Fortunately, this is one problem that becomes easier as frequency increases since size diminishes, making it relatively simple and inexpensive to design and fabricate the required structures. The increase in efficiency with which the spectrum and geography are used are well worth the extra care required.

In the past, antenna gain has been a dominant design parameter. For short range systems operating in an environment of potentially severe signal interference this is no longer valid. The angular response is of much greater importance. For maximum use of the spectrum in a given area, systems should be designed to be interference limited under normal conditions. Thermal noise is only a significant factor during conditions of deep fades - usually caused by heavy rainfall, or anomalous propagation.

The environment in which an antenna is placed is also of great importance. Reflections from natural and man made structures can distort the antenna pattern and severely reduce the discrimination produced by the antenna beam pattern. Systems such as AM which rely solely on antenna discrimination for immunity to interference can suffer considerably if forced to operate in an undesirable environment.

b) Modulation

Perhaps the most important factor in determining the maximum use of a frequency

assignment in a given area is the modulation method employed. Signals transmitted by a radio system are degraded by a variety of sources of noise and interference produced within a given system or induced by other nearby systems. If the total national usage of the spectrum is to be truly efficient, the system used must be resistant to these types of interference so that systems can be densely packed.

Interference resistance can be obtained by using large index frequency or phase modulation, pulse code modulation, pulse position modulation or pulse width modulation. Increased resistance to interference will allow more channels to be used in a given area but will also require more bandwidth so that an optimum will eventually be reached. Beyond this point total capacity will begin to decrease.

c) Frequency Plan

Most microwave radio systems use a so-called "two frequency" plan. This is because they must transmit information in two directions and the coupling between transmitting and receiving antennas must be less than the repeater gain. In LDS or CARS service, where there is usually no need for bidirectional transmission and the prospects for isolating the transmitting and receiving antennas are very good, a single frequency plan appears to be quite feasible. This is important because it implies <u>full</u> utilization of all the assigned spectrum.

d) Signal-to-Interference Ratios

The power received at a receiving antenna is given by:

(1) $$P_r = P_t \left(\frac{\lambda}{4\pi R}\right)^2 G_r(\theta_r) G_t(\theta_t)$$

Where:

P_r =power received

P_t =power transmitted

λ =wavelength

R =distance traversed

G_r =receiving antenna gain

G_t =transmitting antenna gain

θ_r =angle measured between axes of the receiving antenna beam and the transmitted beam

θ_t =angle measured between the axes of the transmitter beam and the receiver beam

From: (1) the signal received at the i th receiver is:

$$(2) \quad S_i = P_t \left(\frac{\lambda}{2\pi R}\right)^2 G^2$$

the interference at the same receiver is:

$$(3) \quad I_i = P_t \left(\frac{\lambda}{2\pi}\right)^2 \sum \frac{G(\theta_{ij})\, G(\theta_{ji})}{R_{ij}}$$

the signal-to-interference ratio is therefore:

$$(4) \quad \frac{S_i}{I_i} = \sum_j \frac{G^2}{G(\theta_{ij})G(\theta_{ji})} \left(\frac{R_{ij}}{R}\right)^2$$

The signal to interference is a function of antenna beam pattern and the relative spacing of the antennas.

e) Interference Resistance and Bandwidth

Resistance to interference can be increased by increasing the RF bandwidth. This is a well known fact and even the most casual observer is aware of this when comparing the performance of AM and FM broadcast receivers. This can be expressed mathematically by the relationship:

$$(5) \quad \frac{S_o}{I_o} \approx 2\beta^3 \frac{S}{I} \qquad \text{when } \beta \geq 2.5$$

Where: $\frac{S_o}{I_o}$ is the signal/interference at the baseband output

β is the modulation index

$\frac{S}{I}$ is the signal interference at the receiver input

This expression is equally valid for filtered pulse width modulation. The point of all this being that extra bandwidth provided for wideband systems is in no sense wasted. In addition to permitting a higher quality of transmission it may also permit a greater "packing" density of usable channels and may permit a really efficient use of available spectrum.

B. Propagation Above 10GHz

At 10 GHz and above the presence of liquid precipitation in the path of the beams ofpoint-to-point radio systems greatly attenuates electromagnetic waves. The severity of the problem can be seen by looking at Fig. 2.1. The repeater spacings were determined by assuming a fade margin of 40 db and a uniform rainfall rate of 4 inches per hour over the entire path. This is a "worst case" situation to be sure, but not at all impossible, particularly for very short range systems such as would be involved in LDS service.

Below 6 GHz rainfall attentuation plays no role in determining repeater spacing. Here it is determined by antenna heights and geographic features. Typical repeater spacings are between 20 and 30 miles.

Above 10 GHz the situation is entirely different. The spacing of repeaters is almost entirely determined by rainfall attenuation. Even a very short haul system may require a number of repeaters. If a system is to be economically feasible the system concepts must lend themselves to low cost implementation. The modulation system chosen must be of such a nature that processing in the repeaters will not seriously distort the signal or add significant amounts of undesired modulation products. Amplitude modulation, although apparently the least demanding on channel bandwidth, is the most fragile in this regard. It is certainly the most vulnerable to the amplitude non-linearities which are likely to occur. This would preclude multi-hop links using AM. It is also the most vulnerable to interference from other systems.

Our current knowledge of attenuation of radio signals by rainfall has been summarized in a paper of D.C. Hogg [1]. Fig. 2.2 shows for several locations in the United States and one in England, the number of minutes a year that a given level of attenuation at 30 GHz is exceeded. Large differences exist between various locations - due to the maximum rainfall rate prevalent in a given area. This means that repeater spacings for systems operating above 10 GHz will vary for different locations. The final adoption of standards for systems operating in this region will have to include considerations of this effect. Systems designed to operate under only the most favorable conditions will prove to be very unreliable or totally useless in areas where heavy rainfall is a common occurrence. Fig. 2.3 shows the minimum and maximum attenuation that has been measured across the microwave spectrum at a rainfall rate of 100 mm / hour.

Fig. 2.4 shows the correlation between path attenuation due to rainfall over a typical 6.4 km path in the heavily populated northeastern United States. The rainfall and attenuation curves are almost mirror images of each other.

Combining the typical rainfall data and the propagation equation it is possible to determine the transmitter power required to achieve reliable operation over a desired path length as a function of frequency. Fig. 2.5 shows the transmitter power required as a function of path length for a K factor of 135 db, where K is defined by:

$$(4) \quad K = G_t + G_r - S_r$$

Where: G_t and G_r were defined before and S_r = min. usable input signal at the receiver in dbm

The reliability factors are calculated assuming that the rainfall is constant throughout

1. Hogg, D.C. "Millimeter-Wave Communications Through the Atmosphere" Science 159 No. 3810 Jan. 5, 1968 PP 39-46

the path and is equal to the maximum value. Actual performance will be considerably better since high intensity storms are highly localized.

C. Considerations of Modulation Methods in Radio Systems Operating Above 10 GHz

It has been known for some time[1]. that band spread modulation techniques are not wasteful of fadio frequency spectrum if all factors, especially interference, are taken into account. Amplitude modulation (AM), particularly single sideband AM requires the least bandwidth for transmission. One is always tempted to think in that direction when trying to make efficient use of the radio spectrum. Unfortunately as so often happens in nature, you cannot get something for nothing. AM, it turns out is also the most susceptible to noise, interference and system non-linearities. Alternative modulation schemes such as pulse code modulation , pulse position modulation, pulse width modulation, frequency modulation and phase modulation , all require additional bandwidth for transmission. They do however give the transmission a degree of ruggedness not possible with AM alone. After careful study of many schemes and many influencing factors we have ascertained that a proprietary technique which we call Filtered Pulse Width Modulation (FPWM) is the most economical compromise for the transmission of wideband information in local distribution service (LDS) of multiple channel CATV signals. It is a technique which is flexible enough to be used in the currently assigned band between 12,7000 and 12,950 MHz and will also be useful as higher frequency assignments become available, as they surely must in the future. The introduction of lasers into the frequency band above 10 GHz will provide highly efficient coherent frequency sources. The FPWM technique is ideally suited to modulating such coherent sources. It is a technique which combines a practical degree of immunity to noise, interference and non-

1. Feldman, D.R. and Bennett, W.R., "Bandwidth and Transmission Bandwidth" BSTJ No. 3 July 1949, PP 490-595

linear distortion with equipment simplicity. This latter factor will manifest itself in the cost per channel-mile which ultimately will decide how practical any system is. Unlike AM, FPWM has the flexibility to trade channel bandwidth, channel capacity and interference immunity as required by the spectrum allocation and the public interest. For example, with a fixed bandwidth allocation improved interference immunity can be achieved by reducing the number of TV channels per transmitter or increased where the interference immunity is not critical. This flexibility permits an orderly expansion of facilities in the public interest in a most economical form.

The theoretical performance of a FPWM system in comparison to an AM system is shown in Fig. 2.6. The output signal to noise ratio in the demodulated baseband is plotted against input signal to noise ratio. The noise can be thought to include interfering signals which in many instances can be of greater significance than thermal noise. In the AM system the performance is given by a straight line of unit slope through the origin. In other words, there is no difference between the demodulated signal and the input signal so far as signal to noise or interference is concerned as long as all devices used are linear. On the other hand, a FPWM system with an index of 4 shows a 17 db improvement in signal to noise ratio once a threshhold level is exceeded (this does not include the further improvement resulting from the higher average power compared to AM as noted below). Even in situations where the index is reduced the FPWM system is capable of better operation than AM systems since it is not subject to the cross modulation noise caused by amplifier non-linearities.

D. Power Output in Modulated Systems

In amplitude modulated systems it is necessary to operate the amplifiers in a linear region to preserve the fidelity of the information bearing envelope and to minimize

intermodulation and cross modulation if multiple signals are present. This is particularly bothersome in an output stage which is required to deliver significant amounts of power. Often this means that the output device has to be operated far below its maximum output level, when non-linear (saturation) effects are large. The need to run a device far below its maximum output means that it is not being used efficiently and it must have performance capability far beyond its actual use.

This situation is further aggravated when the system is transmitting television signals where the sync tips represent maximum modulation. Under this condition wi th normal scene information the average carrier level is probably only 15-25% of the peak value. This further reduces the useful power available from a given device.

In wideband transmission systems such as Filtered Pulse Width Modulation there are no such limitations since no information is carried in the amplitude of the signal. As a result a power device can be driven (and usually is!) into the saturation region to obtain its maximum available power. This implies that the circuit will be both efficient and economical since it is performing at its maximum capability. For the case of video modulation this results in a further improvement in the signal to noise ration of the FPWM system over the signal to noise ratio obtained from an AM system beyond that shown in Fig. 2.6.

III. Experimental Performance

a) Introduction

The full capacity and diversified uses made possible by the FPWM technique have been enumerated before[1] so that for the purposes of presenting the experimental performance achieved the system will be shown in a relatively simple configuration. A block diagram of the FPWM system is shown in Figure 3.1. The transmitter portion

1. See list of publications attached

consists of a wide spectrum compiler, the proprietary modulator, a carrier oscillator and a power amplifier. The receiver portion contains a detector and IF amplifier, the demodulator, and the demultiplexer.

The wide spectrum compiler accepts independent inputs off the air and from locally generated sources as determined by the users need. By appropriate filtering, amplifying and combining a composite wide spectrum signal is constructed. In the modulator this composite signal is converted into very narrow pulses of variable width and variable spacing. These variations in width and spacing contain the information from which the signals can be extracted in their original form. The desired output frequency and power level are obtained by use of the proper carrier oscillator and power amplifier respectively.

At the receiver the signal is detected and amplified at the intermediate frequency. The demodulator extracts the original composite wide spectrum signal which is then demultiplexed and distributed according to the users plan.

b) First Experimental System Operation

Extensive tests on the transmission capabilities and subjective performance of the FPWM technique for use as a local distribution system were conducted under experimental authorizations KB2XFL and KB2XGW issued to Chromalloy American. The first series of on the air tests were made at the Carle Place, New York location of Chromalloy American. These tests were primarily designed to determine the performance of the system at different transmission frequencies. Therefore, the major effort was concentrated at the extremes of the frequencies allocated, namely 18.5 GHz and 42 GHz. Sufficient tests were conducted at the other two frequencies allocated, 30.0 GHz and 39.3 GHz to ensure complete evaluation. Table 1 shows the hours of operation on each of the frequencies assigned.

Assigned Frequency	Total Operating Time	
18.5 GHz	300 HRS.	Operations conducted over the period from January, 1969 - April 1969
30.0 GHz	20 HRS.	
39.3 GHz	20 HRS.	
42.0 GHz	300 HRS.	

TABLE I - AIR OPERATION OF EXPERIMENTAL SYSTEM

The seven New York TV channels, covering a frequency band of 54 through 216 MHz were transmitted in place with good picture quality being maintained. In order to make a more stringent evaluation, five channels of video programming were combined to form the wide spectrum signal. The VHF-TV channels 2, 4 and 5 were used directly and VHF-TV channels 9 and 11 were translated into the slots for channels 3 and 6 respectively. The detected signal to noise ratio in each channel, when using a transmission index of 0.75 is shown in Table II. The signal measured was that of the carrier only. The noise level was the highest level in the channel, determined by searching the band with a field strength meter. The noise measured is the total of idle noise plus cross modulation and as such results in the poorest ratio in each channel.

TV Channel	S/N + x mod.	
2	45.2 db	
3*	47.0	*Channel 9 Translated
4	45.0	**Channel 11 Translated
5	47.5	
6**	48.0	

TABLE II - DETECTED S/N RATIO FOR 5 CHANNEL MULTIPLEX TRANSMISSION

Due to the location of the test site relative to the source of local TV transmission the received signals were such that the signal to noise ratio into the receiver was only 51 db. However, the resulting S/N ratios are still well above the minimum acceptable level of 15 db S/N for the FPWM system so that good picture quality was always maintained. Furthermore, the experimental results indicate a significant fade margin available insuring satisfactory operation during adverse weather conditions.

c) Second Experimental System Operation

From these extensive tests under varying atmospheric conditions, it was determined that the FPWM technique is not frequently sensitive giving essentially the same performance at the four assigned frequencies. It was therefore decided to concentrate the experimental effort at 18.5 GHz. A new air link was established over a 1.5 mile line of sight path as shown in figure 3.2 The transmitter was located at the Times printing plant at 64th Street and West End Avenue and the receiving site was in the Times tower at 43rd Street and Broadway in New York City. This link was maintained over a period from May, 1969 through November, 1969, logging a total of 750 hours of operation.

In this instance, three channels of video information were transmitted by multiplexing VHF-TV channels 2,4 and 5 directly. The input signals were adjusted to produce identical output signal to noise ratios and the detected signal to noise ratios in the three channels are shown in Table III. The measurements were made in the same manner as described for the Carle Place link.

TV CHANNEL	S/N + x mod.
2	57 db
4	57 db
5	57 db

TABLE III - DETECTED S/N RATIOS FOR 3 CHANNEL MULTIPLEX TRANSMISSION

The transmitter TWT amplifier had a power output of 1 watt. Both the transmitting and receiving antennas were 3' parabolic dishes. This combination results in a range capability far in excess of the 1.5 mile path length established (See Section II). The effective path length was increased to 15 miles by use of attenuators. Because of the advantage of the Filtered Pulse Width Modulation technique in the presence of noise and fading this link continually performed in a satisfactory manner. Transmissions maintained during major rainfalls resulted in no degradation in the received picture quality, including September 3rd, 1969 when the rainfall during the 24 hr. period exceeded 3.32 inches.

IV. Future Program

We are currently applying for a renewal of our license to enable the continued study and improvement of the system. The first experimental evaluation under this new series of tests will be conducted over a three site link between Carle Place, New York, Garden City, New York and Westbury, New York. Figure 4.1 depicts the planned configuration for this link up. A one-way transmission path, 1.2 miles long will be available between Carle Place and Garden City with an option to repeat over the 4.6 mile leg to the Westbury site. Alternatively between Garden City and Westbury will be two one-way transmission links in opposite directions.

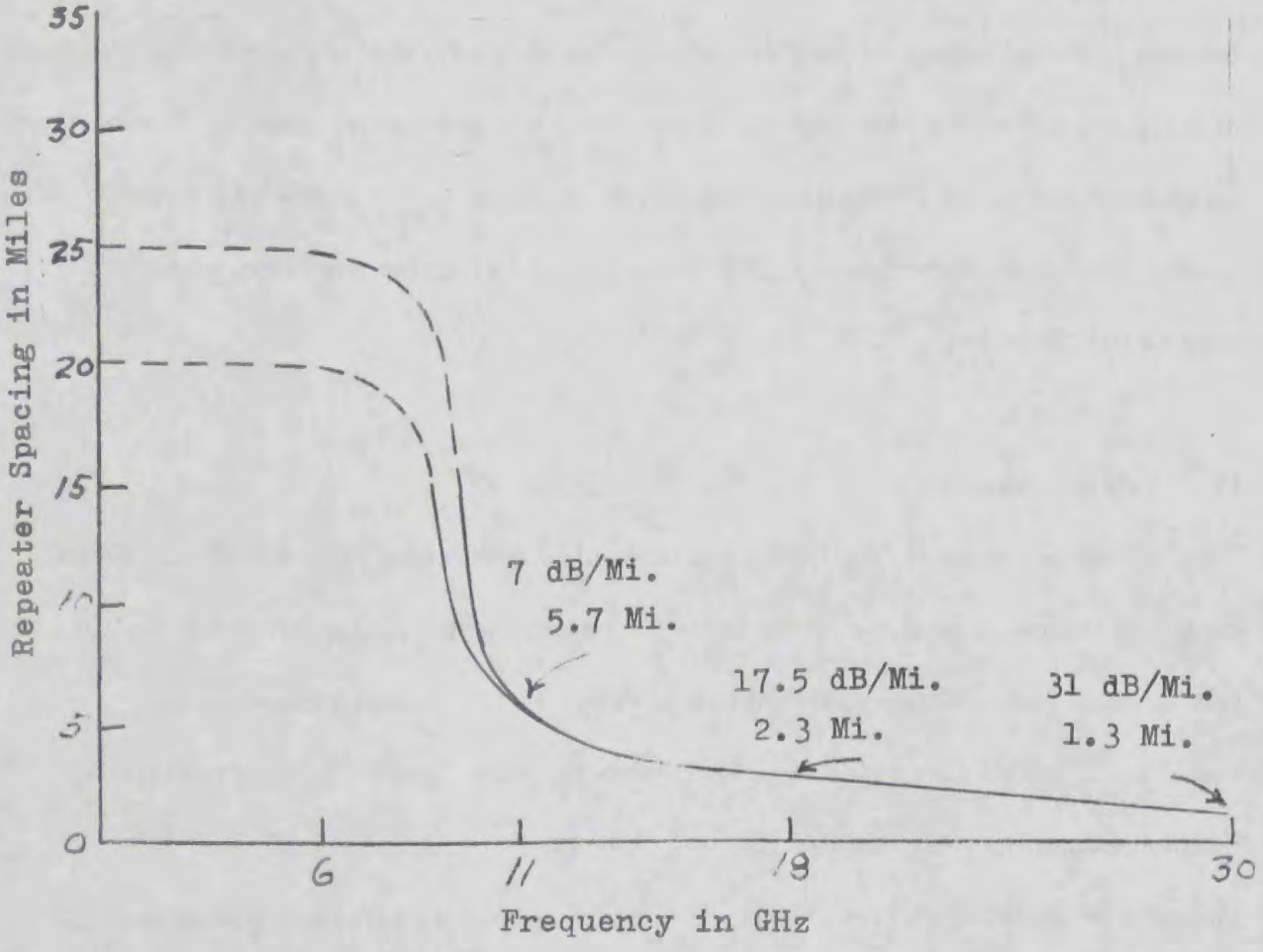


Fig. 2.1-Repeater spacing as determined by a rain rate of 100 mm per hour. This assumes uniform rain over entire path and a 40 dB fade margin. (after L.C.Tillotson, BSTJ, vol. 48, p1565.)

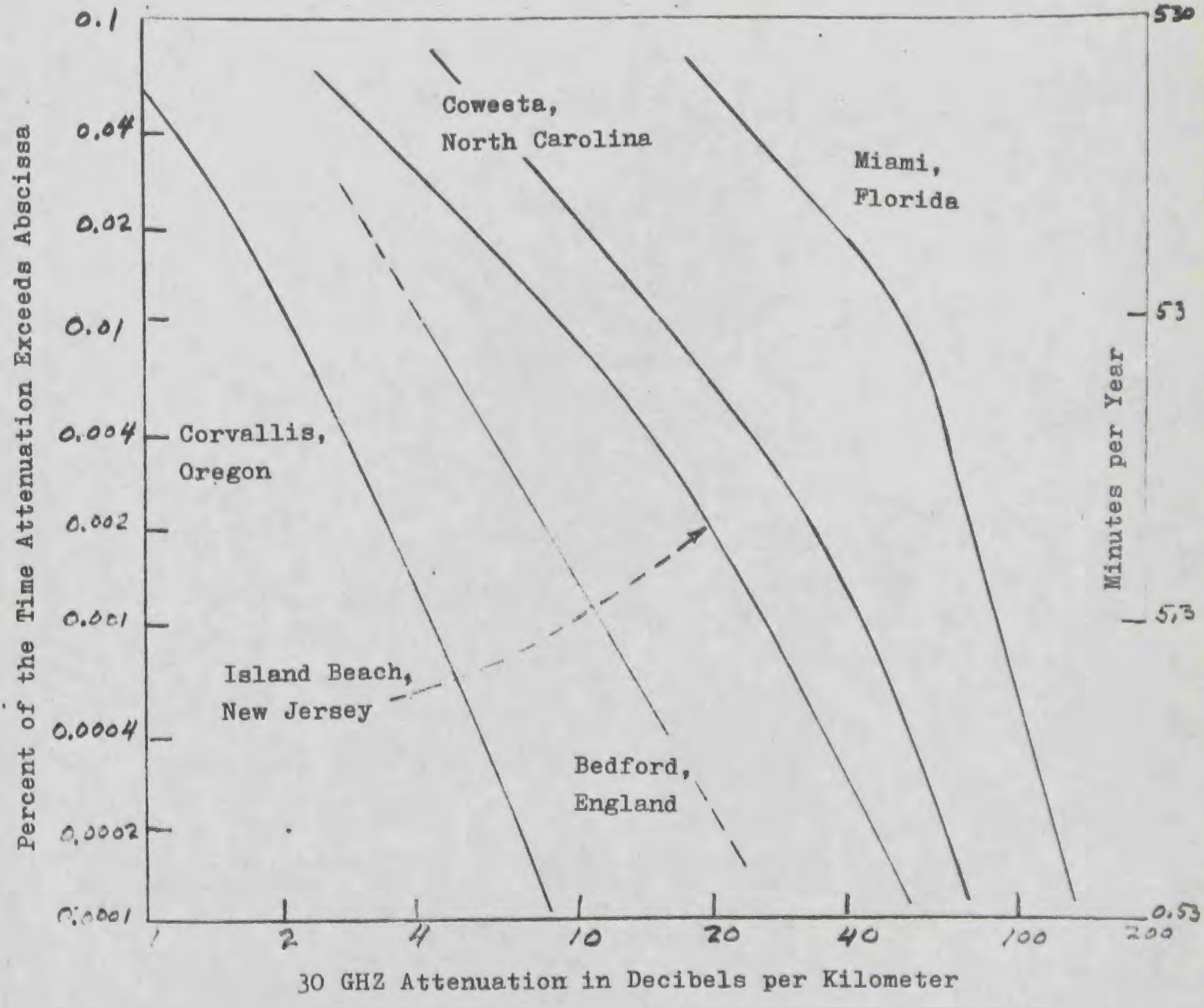


Fig.2.2-The number of minutes per year that a given level of attenuation at the United States and England. (after L.C.Tillotson, BSTJ, vol. 48, p1566.)

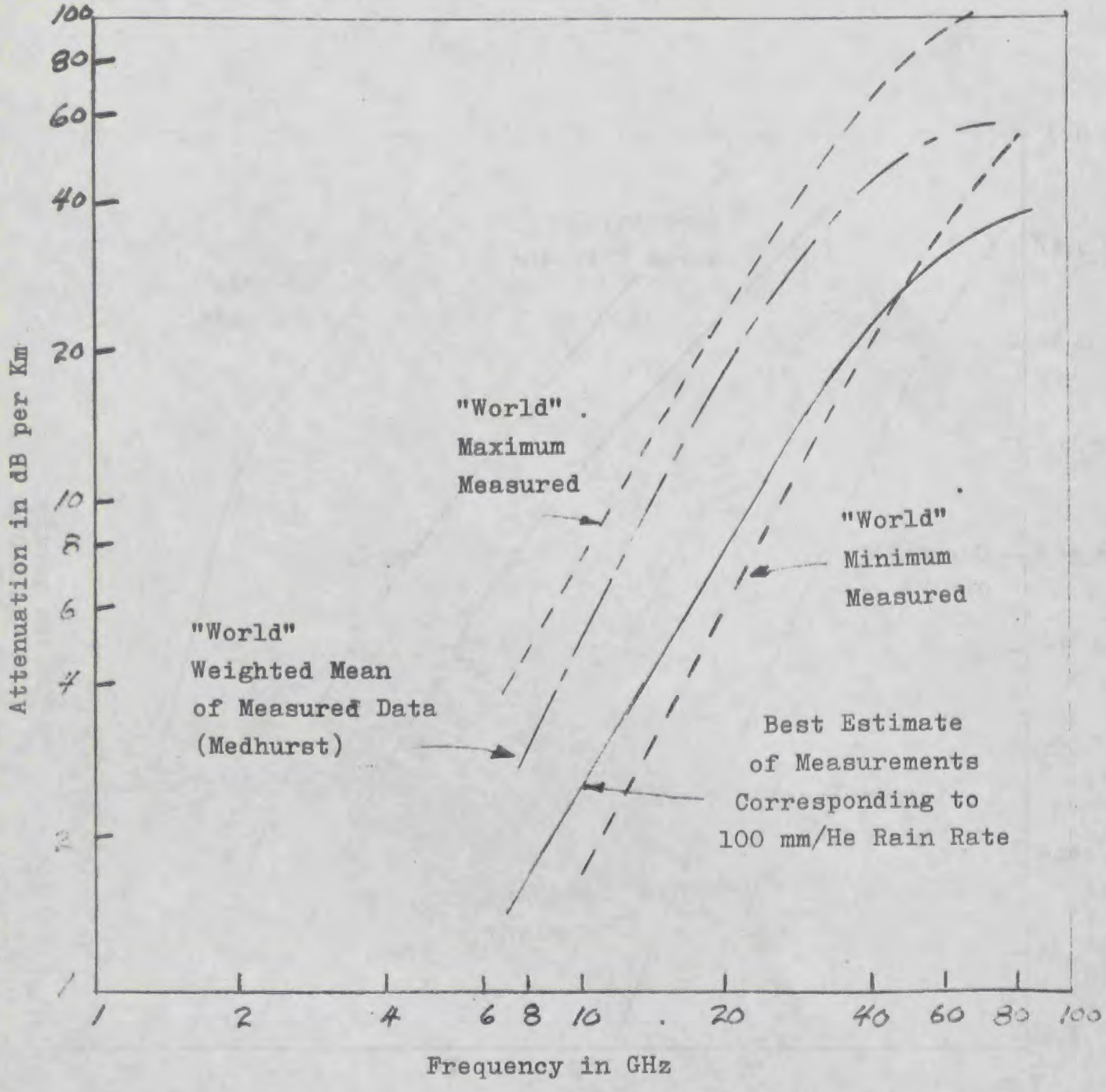


Fig. 2.3-Signal attenuation as a function of frequency at 100 mm/Hr showing minimum and maximum values. (after Semplak and Turrin, BSTJ, vol. 48, p1784.)

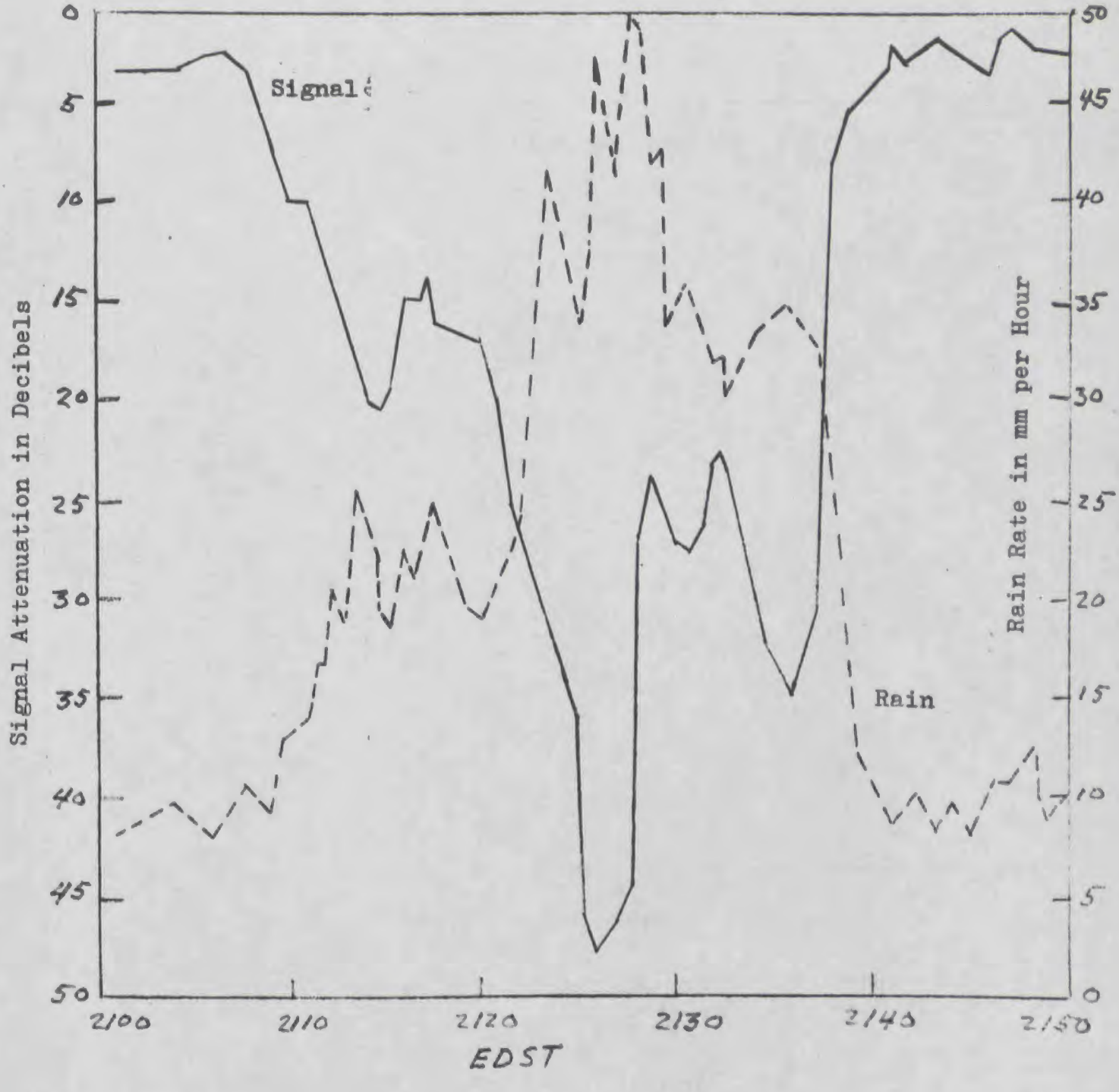


Fig. 2.4-18.5 GHz signal attenuation and rainfall versus time. Measured data of October 25, 1967 -for 18.5 GHz 6.4 km path- Cliffwood to Crawford Hill. (after Semplak and Turrin, BSTJ, vol. 48, p1774.)

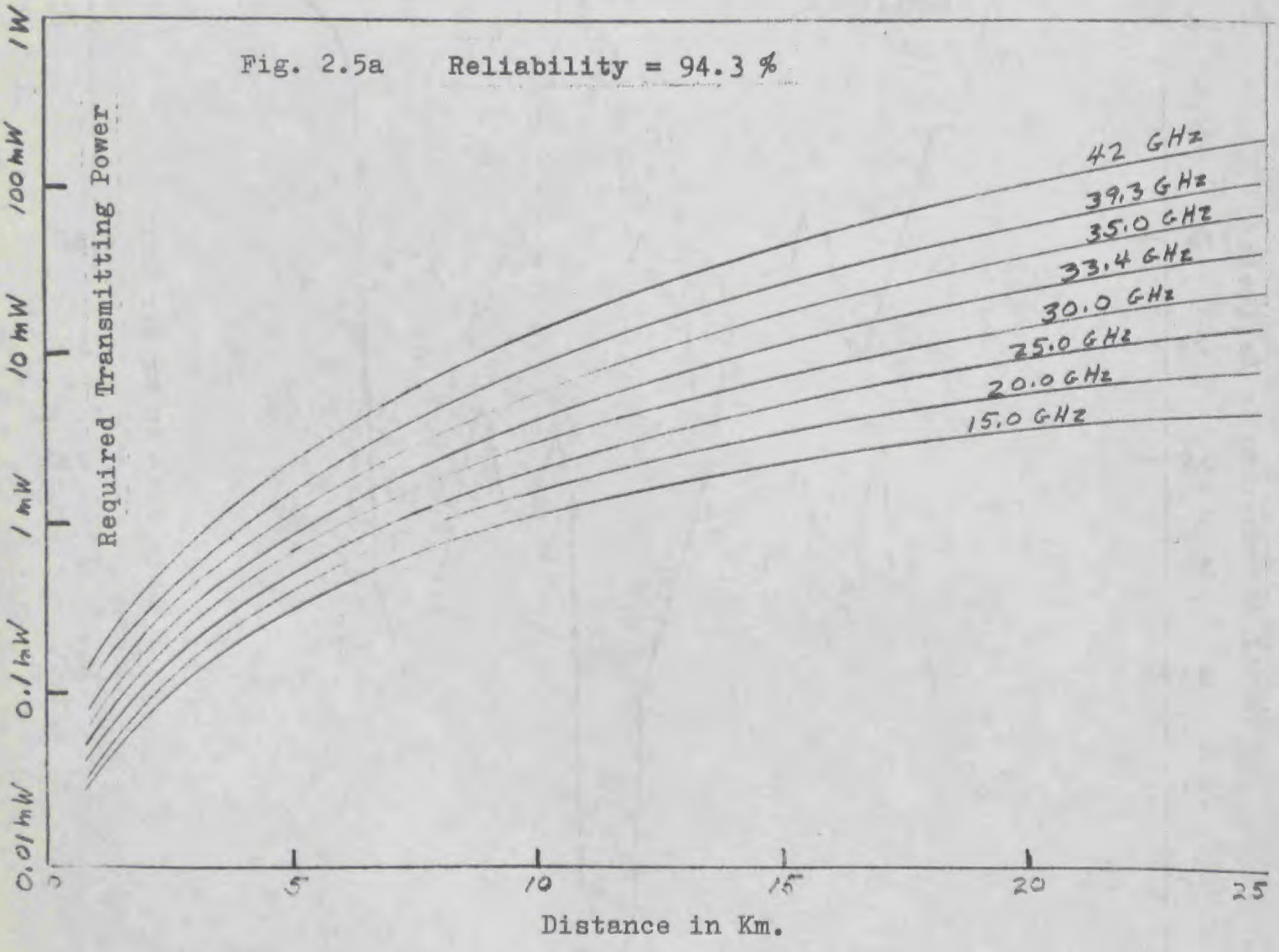
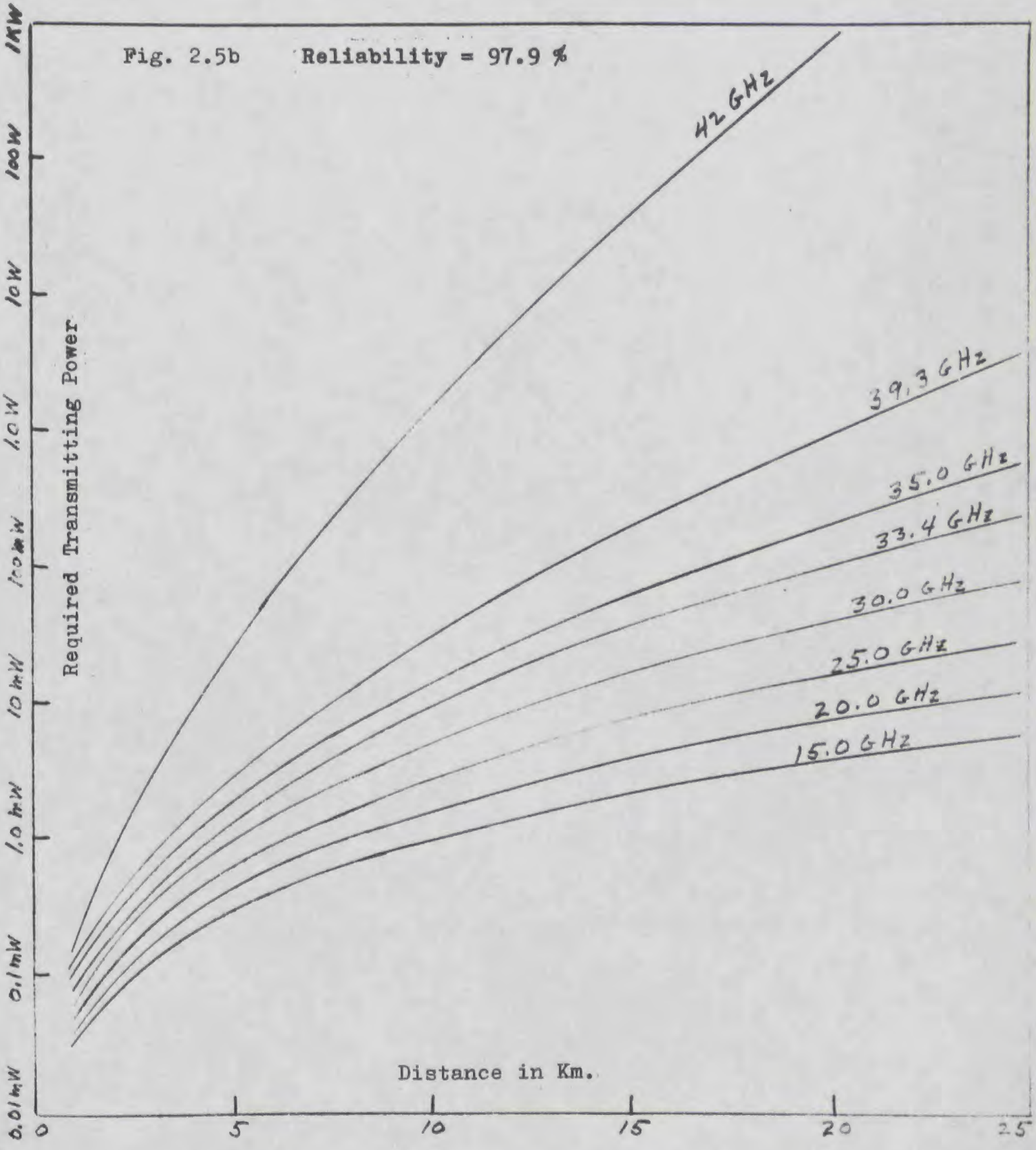


Fig. 2.5 - Transmitter power versus repeater spacing for a K factor of 135 db as a function of different reliability values.

Fig. 2.5b Reliability = 97.9 %



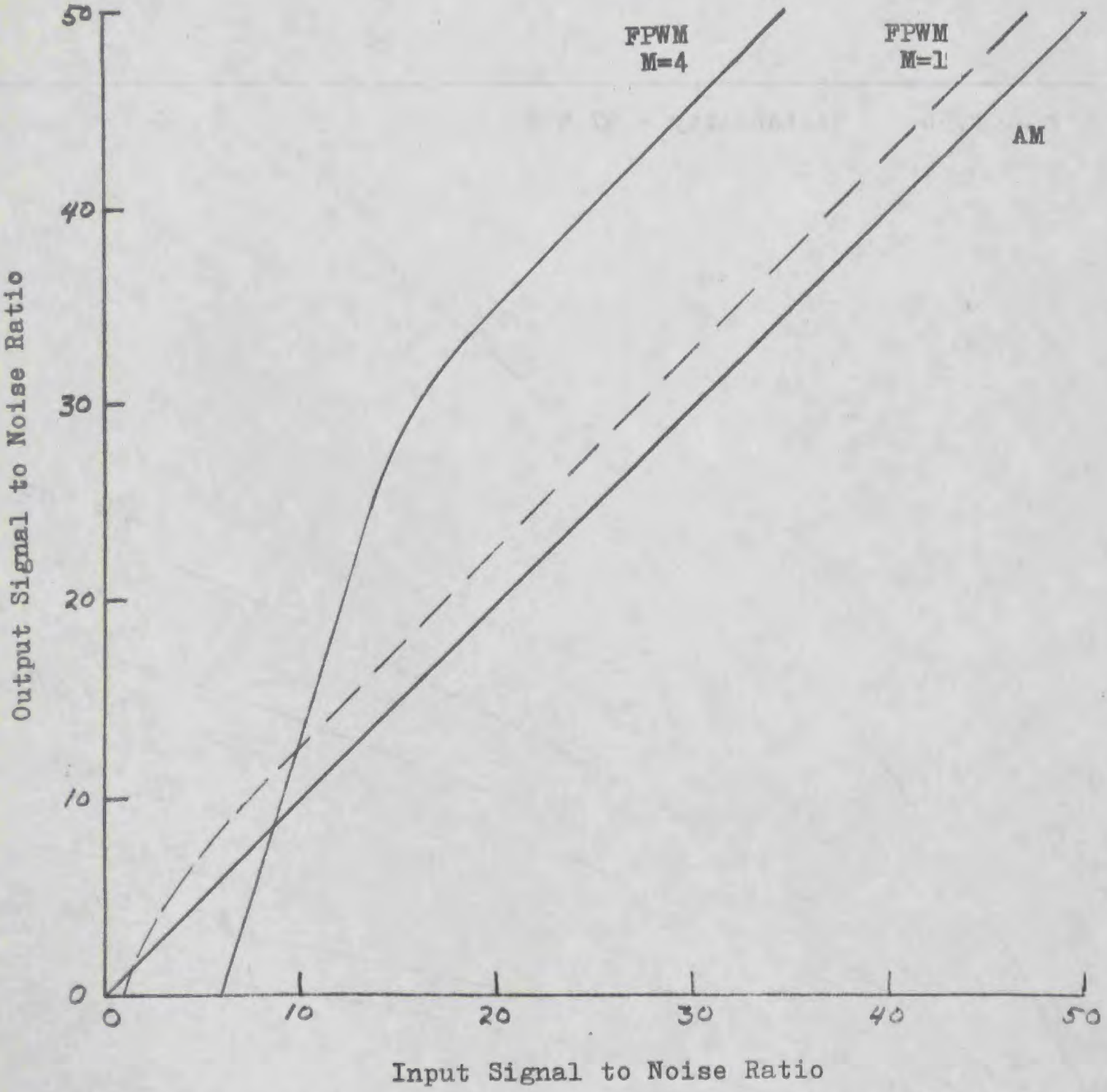


Fig. 2.6-Theoretical characteristics, FPWM and AM systems.

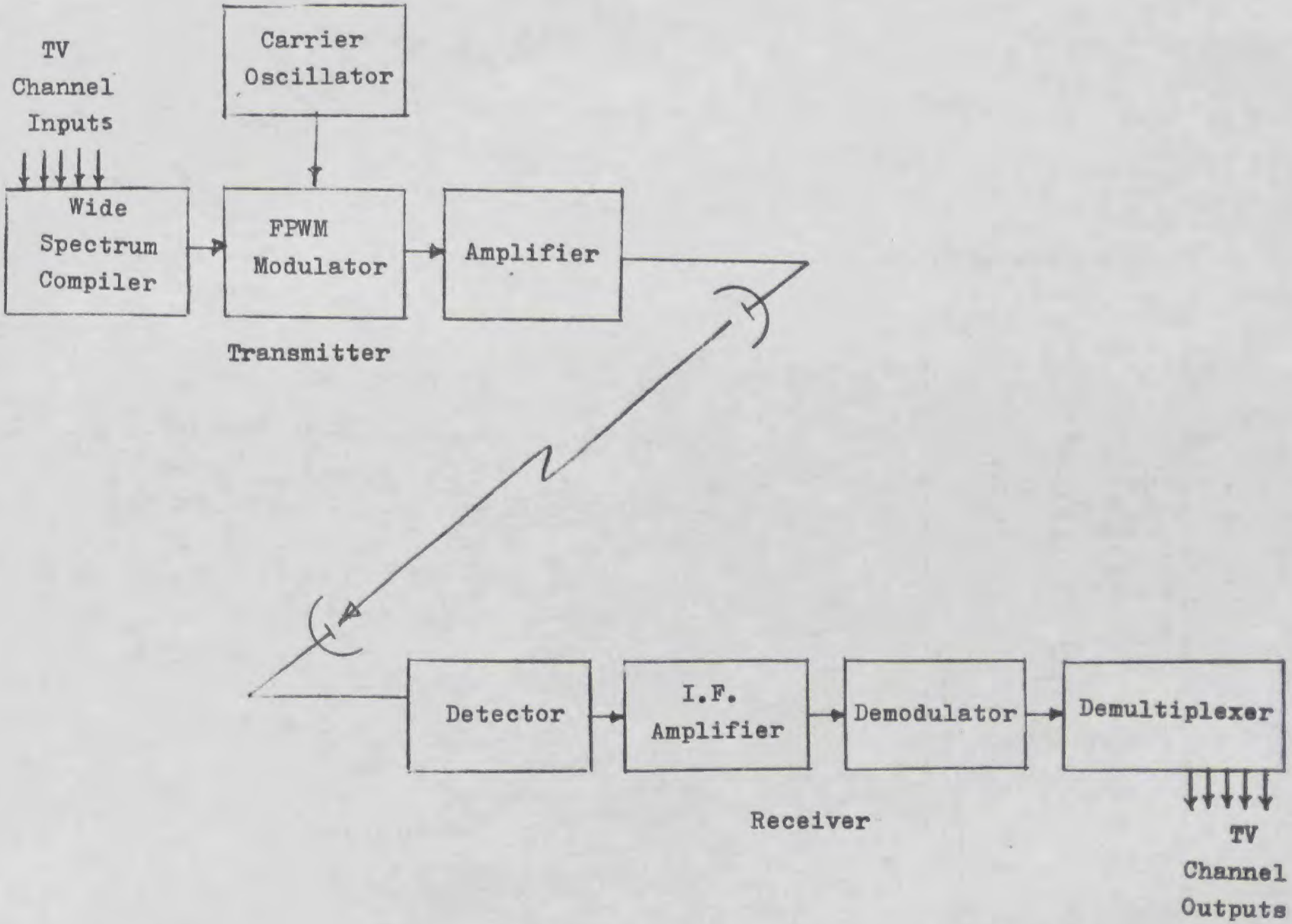


Fig. 3.1FPWM System Block Diagram

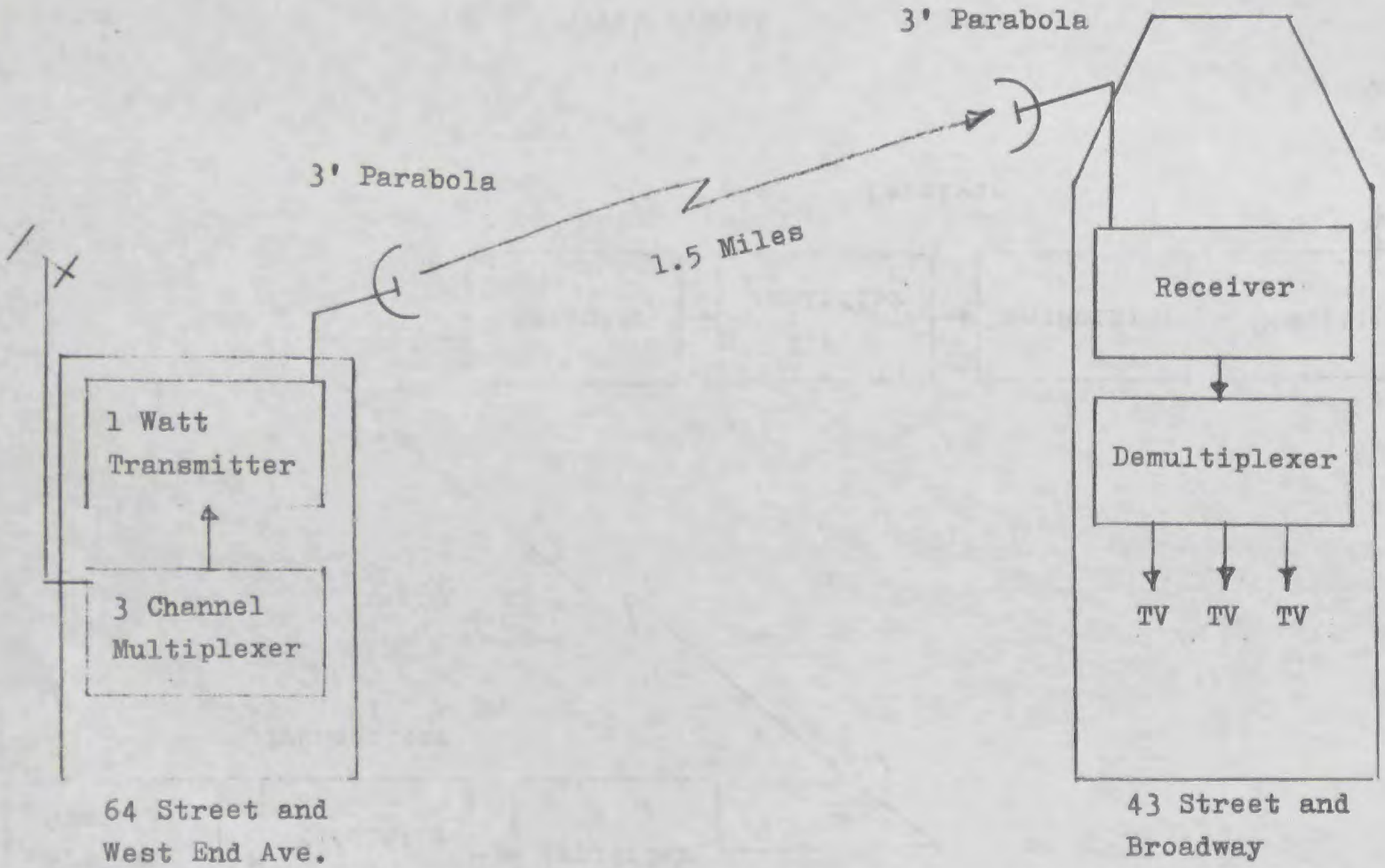


Fig.3.2-Experimental 18.5 GHz Radio Link.

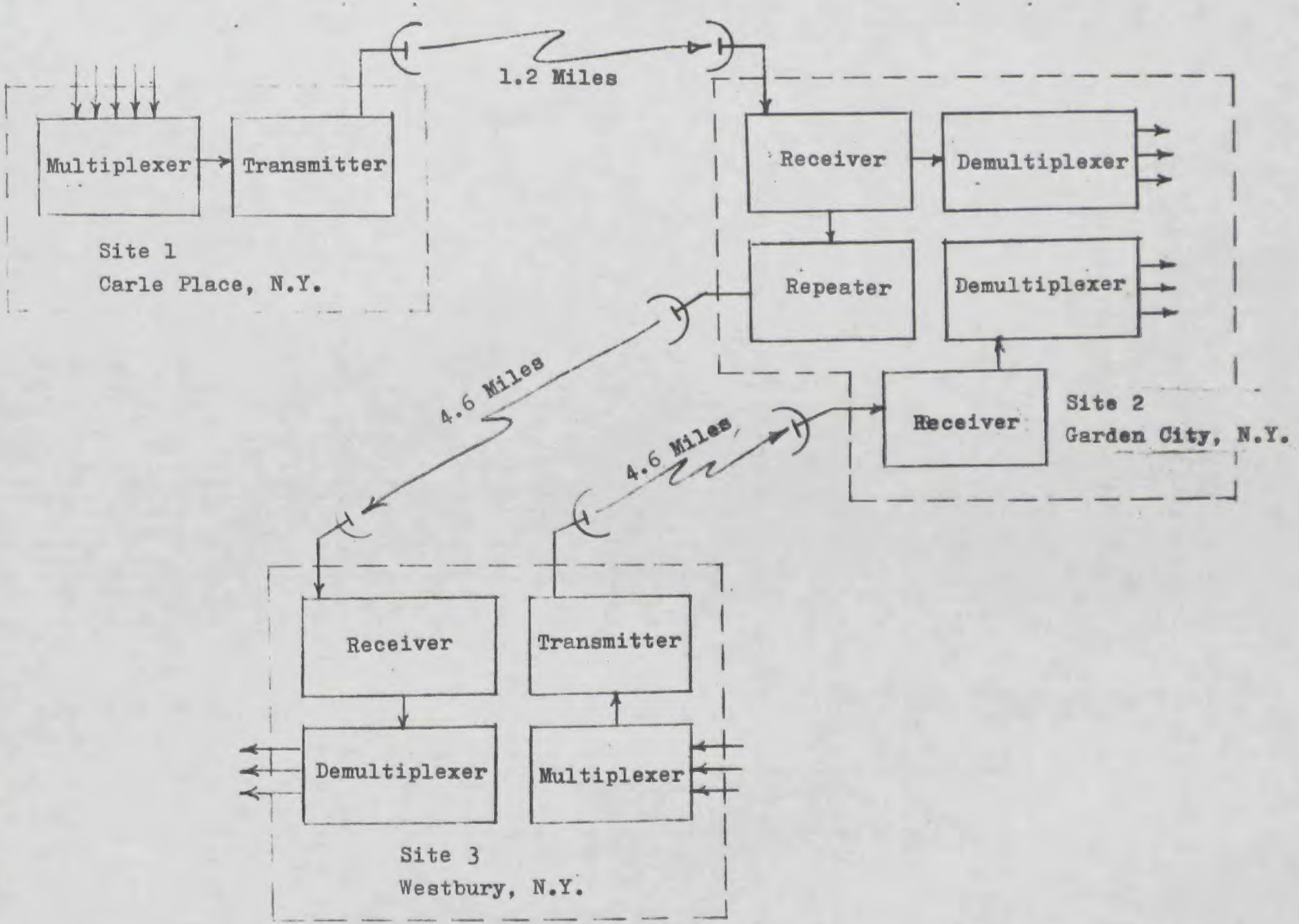


Fig.4.1 TRI-LINK Experimental Configuration

Papers Published Prior to July 1st, 1969 by Laser Link

Title	Author	Publication	Date of Publication
"The Quasi-Laser Link CATV System"	Dr. Vogelman Ira Kamen	Electronic & Appliances Specialist	April 1968
"A New Departure in Television Air Links"	Dr. Vogelman Ira Kamen	International Broadcast Conference IEEE LONDON	September 9/13, 1968
"Novel Modulation Means Opens Wide Spectrum Air Link Communications in Unused Frequency Range"	Dr. Vogelman Ira Kamen	Laser Link Presentation to FCC, Washington, D. C.	October 24, 1968
"The Quasi-Laser Link System for CATV"	Dr. Vogelman Ira Kamen	TV Communications	November 1968
"A New Dimension in Television Air Links"	Dr. Vogelman Ira Kamen	IEEE Transactions on Broadcasting	March 1969
"Tomorrow's Television -- Today"	John Minor	Pageant Magazine	February 1969
"The Congeneric Synergism of the Quasi Laser Link System"	Dr. Vogelman Ira Kamen	Broadcast Journal	March/April, 1969
"Laser Link Modulation Means for Wide Spectrum Telemetry World Wide and Urban Communications Systems"	Dr. Vogelman Ira Kamen	NTC '69 Washington, D.C.	April 23, 1969
"Cabling without Cable"	Ira Kamen	BME Magazine	June 1969
"Quasi-Laser Link Modulation Means for Wide Spectrum Airlink CATV Services"	Dr. Vogelman	N.C.T.A. Conference San Francisco	June 23, 1969

Papers Being Prepared

"Expansion of Communication System Horizons by New Modulation Means"	Dr. Vogelman Ira Kamen	1969 NEC, Chicago	December 8-9-10, 1969

Papers Under Consideration

"Novel Modulation Means opens Wide Spectrum Air Link Communications in unused Frequency Range"	Dr. Vogelman Ira Kamen	IEEE Convention Huntsville, Alabama	November 19, 20, 21, 1969

SUPPLEMENT

ABSTRACT

NOVEL MODULATION MEANS OPENS WIDE SPECTRUM AIR LINK COMMUNICATIONS IN UNUSED FREQUENCY RANGE

by Doctor Joseph Vogelman
Vice President of Electronics Research
Chromalloy American Corporation
Ira Kamen
President, Laser Link Corporation

The Quasi-Laser Link System opens a wide spectrum of services for the international community in the next decade. The paper describes the development of reliable communications in the relatively unassigned 10 GHz to infra-red range, employing novel modulation techniques which creates air links that compensate for all weather environments.

NOVEL MODULATION MEANS OPENS WIDE SPECTRUM AIR LINK COMMUNICATIONS IN UNUSED FREQUENCY RANGE

by Doctor Joseph Vogelman
Vice President of Electronics Research
Chromalloy American Corporation
Ira Kamen
President, Laser Link Corporation

The next decade will demand wide spectrum services which will make today's requirements for communication means just a small part of the needs of the total universe. The development of the Quasi-Laser Link System will meet the burgeoning needs of intra-city communications, television for entertainment, community antenna requirements, wide spectrum data transmission, and educational services. This system, which is a new departure in broadcast transmission means, provides for the simultaneous transmission of combinations of the foregoing on a single electromagnetic carrier in such a way as to provide highly reliable communication links under "all weather" environments.

In the United States' cities where all cable must be under ground, this system is an economical alternative to video cables operated by the telephone companies. Cities in the USA are composed of steel and concrete canyons where many multiple dwellings have their rooftop TV signals masked from the transmitter or crowded with reflected signals bounced from adjacent buildings which badly mar TV reception. These basic problems were made more acute by the growth of UHF-TV, the more critical needs of color TV and the fact that apartment house master antenna systems could not cope with the more stringent requirements created by the additional channels, color transmission, etc.

Before proceeding on this development we examined all the standard and known modulation techniques employed for microwaves. These techniques were found to

require excessive power levels, special frequency assignments in a crowded spectrum and very complex receivers. Even under the most favorable conditions, the results would be highly subject to distortion and fading as well as being very expensive to construct and maintain. The present microwave system requires receiving terminals of great complexity and high cost to overcome the inherent bandwidth and noise limitations. These currently used microwave systems are amplitude sensitive and intense rain creates noise in the system.

As forecast in Table 1, by the 1970's the average American home will be equipped with community antenna television (CATV), a new kind of communications system that lets you do everything from shopping by television to having your heart checked by a specialist who might be miles away. Instead of an individual antenna your set will plug into a communications powered outlet. In urban areas, by carefully focusing harmless super high frequency electronic waves from building to building, scientists, working together with city officials, communicators, business leaders and theatre owners, will be able to bring into every home and apartment in your city a wide range of entertainment and services. The systems in urban areas will add dozens of extra television channels to your current set. You select the new channels with a small converter box that is attached between your television set and the CATV outlet. That converter will allow you to make purchases of items you see on the special "shoppers channel." As soon as you make your selection, you'll dial your special credit card number into the box which, through signals to a computer, will then deduct the amount of the purchase from your bank balance. If you happen to be out of money, your TV set will say so and the purchase will not be made.

Municipalities will employ the added channel capacity for surveillance of public areas, air pollution conditions and to determine and correct zones of traffic congestion. Equal and inexpensive TV time can also be made available for local political candidates over municipally operated channels.

The "theatre channel" - activated by your placing a special movie house ticket card into a slot in the converter box - will take you and your family to first-run movies.

Educational channels will allow you and your family to take courses at home. That home converter lets you take active part by giving you a means of answering the program teacher's questions and getting a grade on your answer immediately.

Other newly available TV channels will allow accountants, engineers and all others who use computerized data to do much if not all their work from home. The new communications system will also make it possible for doctors to keep up with new knowledge by special broadcasts on the medical channel. Because of their tight schedules most physicians simply don't have the time to travel to and from lectures. Come the 1970's, doctors will be taking their lectures along after their suppers.

Imagine a morning review of the neighborhood's complaints with a TV ombudsman who you can talk to and see - an active, effective answerman.

One pleasant feature of the communications center to come will be separate sound channels on which you'll be able to get commercial-free music. Everything from the acid rock sounds of Country Joe and the Fish to the "Moonlight Sonata." Each type of music will have its own easily selected place on an extra dial.

The equipment is now developed and was demonstrated to the FCC October 24th, 1968. Figures 1, 2 and 3 show some of the system components. The initial system demonstrated to the FCC was a 12 channel (six megahertz per channel) system. This version serves the immediate needs of the industry but development of its current state allows channels to be added without disturbing the operational or physical integrity of the 12 channel installed system.

The Quasi-Laser System which has been demonstrated was developed to achieve these objectives:

1. To check out the predictions of the proprietary concept.
2. To gain insight into the product engineering necessary for making 12, 20 and 40 channel (6 megahertz per channel) systems.
3. To examine all applications for studio and communication links under intra-city conditions.

The Quasi-Laser Link System can operate on any assigned carrier frequency within the band from 10 GHz to 10,000 GHz. However, the current state of technology is such that maximum economies are associated with the lower frequencies closest to 10 GHz.

The greater need for multi-channel television transmission to improve the educational systems in this country and the long term benefits which would be derived therefrom, clearly call for the assignment of the lowest and most economical frequencies to education. The band from 11 to 15 GHz would provide optimum performance for educational transmission between educational institutions over moderately long paths

through a State. The Quasi-Laser Link system would be a far more economical method of transmitting six or more television channels than any other long line system offered at even the most preferred tariffs and would have the advantage of expansion to larger channel capabilities with lower cost of service.

The narrow beam width associated with the Quasi-Laser system would permit using the frequencies over and over even in closely associated geographic areas providing the antennas do not look at the main lobe of the potentially interfering sources.

A block diagram of the Quasi-Laser Link system transmitter and receiver is shown in figures 4 and 5. The Quasi-Laser transmitter when operated in the millimeter region is as shown in figure 4. The inputs are independently derived television signals using either one or more antennas to obtain the channels off the air. The system is divided into three blocks of seven channels each with the exception that channel A of block 1 is only four megahertz wide. This is done deliberately to make block 1 channels match exactly the lower half of the VHF television band.

Each of the channels receiving broadcast television signals is provided with an audio notch filter (ANF) to reduce the carrier by approximately 14 to 15 db. Channels of local originated information are provided with a band pass filter (BPF) to restrict the bandwidth to the available six megahertz channels. Each carrier with its sound, color and video content is amplified in a single channel amplifier (AMP) in such a way as to equalize all the outputs.

The RF signals are then combined in combiners C1 to C12 and applied to the modulator. Channels 7 through 13 are translated to the band 8 to 50 MHz by means of a local oscillator at 224 MHz. This is done in the interest of reducing the total bandwidth for 20 six megahertz channels and 1 four megahertz channel to 140 megahertz.

In the modulator the composite signals are converted into very narrow pulses of variable width and variable spacing. These variations in width and spacing contain the information from which the signals can be extracted in their original form.

In the case of millimeter operation, a traveling wave tube is used to increase the signal level to that required for the path length of operation.

Figure 5 shows the receiver components. Table 2 is a chart of the frequency distribution of the signals applied to the modulator, and received at the output of the receiver demodulator.

The performance of the Quasi-Laser Link system is designed to compensate for weather conditions by increasing the transmitter output as a function of the attenuations due to rainfall. The instantaneous fading does not appear as a picture element provided the signal during the fading interval is at least 6 db larger than the system noise.

In the interest of lengthening tube life for the transmitter output tube, we propose to operate the Quasi-Laser system at the minimum power commensurate with the instantaneous path loss, such that the transmitter power would be increased or decreased as the signal in the most remote receiving point decreases or increases respectively.

Figure 6 shows the attenuation in db per kilometer as a function of the rainfall in millimeter per hour for selected frequencies between 15 and 42 GHz.

Typical power levels required for a typical combination of gains and receiver sensitivity are shown in figure 7. This figure plots power versus range as a function of a K factor of 135 db where

$$K = G_T + G_R - S_R$$

Where K is measured in db:

G_T is the transmitter antenna gain in db.

G_R is the receiver antenna gain in db.

S_R is the minimum input usable signal at the receiver in db with respect to one milliwatt.

The required power for various degrees of reliability of performance are shown. The degree of reliability given is achieved under the assumption that the rainfall is constant throughout the path between the transmitter and receiver and is equal to the maximum throughout the path. In actual practice, the reliability will be considerably better than that indicated in the chart since high intensity storms are highly localized rather than uniformly distributed.

Figure 8 shows the required transmitter powers for various levels of reliability as a function of range for a system using 4 foot parabolas at each end and a minimum usable input signal at the receiver terminal of -40 dbm.

The advantage of the Quasi-Laser Link system in the presence of noise and fading is achieved by converting the information content into pulse width and pulse spacing modulation of the carrier. This type of modulation has the advantage of permitting operation in the presence of noise without effecting the reliability of the information content. By clipping the tops and bottoms of the pulses, a major portion of the noise can be removed and the signals can be repeatedly relayed without serious deterioration.

Figure 9 shows another application scheduled for the next decade using the capabilities of the system. While many newspapers have been doomed by television, the advancement of electronics as these integrate into the Quasi-Laser Link system will spell the death knell to newspapers as we know them today and bring forth a new and exciting electronic newspaper of the home. The techniques planned for use with the Quasi-Laser system transmit the newspaper to a low-cost magnetic tape playback on which will be stored the frames or pages via an FM transmission. This memory tape could be installed in conjunction with the existing TV set in the home. A member of the household could, at his convenience, turn on the set and punch up, for example, THE NEW YORK TIMES index button. An index frame would appear on the television screen defining which frame contains business, editorials, sports, news, comic strips, etc. The home subscriber would then punch up the code button for whatever number he chose and that frame would appear on the screen. Employing this system would preclude the need for a paper readout.

The delay in home facsimile readout has always been the readout. While the acceptance of this development might be slow, because the current type television set is not the most desirable readout. The TV sets of the mid-1970's will probably be wall-screen units with the excitement of newspaper transmitting its in-depth information in color. A remote-control device will enable the home tape unit to revolve in such a manner that the news copy can be rotated through the screen readout at a pace satisfactory to the reading speed of the newspaper subscriber. This means that each newspaper will have its own Quasi-Laser TV channel.

While the electronic newspaper is one avenue of those with special services, additional personal services for every home subscriber would be possible not only at their residence - but when they enter a business premise in the city being served by the Quasi-Laser system.

As confusing as the current credit card mess is, it is certainly easier than the old practice of carrying around cash. But if the Chromalloy-Laser Link people have their way, there will soon be only one credit card. And it will be a central bank computer number - yours. With it, you'll make every kind of purchase. Through Laser Link channels your bank balance will be deducted as you buy. When your account runs out, so does your purchasing power. Deductions on accounts will be made at the time of purchase.

Time, weather and what's going on in the city will also have channel potential in addition to possibly showing the training of, let us say, police departments for their own use. This would be helpful in proving that the city is trying to develop a police force which is objective in nature and planned to serve the community without bias. Pushbutton shopping and video communications for security purposes could lay claim to some of the potential of this new system.

All these services will not be realized without challenging the vested interests. Proponents of any new communication means must persuade the forces which will be arrayed against advancing technology. This Wide Spectrum Service, supported by industry and government progressives, may advance from adaption by our cities to adoption by our world.

Imagine watching the 8 am newscast from Peking, in English translation, while the Chinese view the Huntley-Brinkley report in Chinese. Imagine the instantaneous surveillance of every nation's military activities made available to every nation, effectively eliminating once and for all the chance of surprise attack and the need for missiles and fallout shelters.

These ideas are no longer the property of science fiction writers. The Quasi-Laser Link is designed to make them a reality, and bring the real communications explosion. Its creators have offered this breakthrough to:

- Ease international tensions by eliminating fear and suspicion among nations
- Create a new era of understanding among all races throughout the world

The Quasi-Laser Link system will offer a plan which could be implemented in the United Nations for worldwide Global Communications Corps through a system of satellites and new communication detection systems. Its multimedia devices can make total communications, education, information services available everywhere in the world and provide the basis for better understanding among all nations.

By reason of the total and immediate interchange of ideas, culture, etc., between any nations in the world, crises resulting in war, declared or undeclared, would be anticipated and avoided.

The program would involve setting up a system of low level satellites in orbit, as well as fixed satellites. Special, inexpensive transmitting and receiving devices would be set up at all of the desired stations throughout the world. The interchange would include weather information, news, navigation aids, emergency warnings, education, culture and surveillance. The interchange could reach or emanate from any remote part of the world where a transmitting or receiving station has been installed.

All of these services would be transmitted with multilingual audio transmissions accompanying the visual broadcasts through a system of multiplex subcarrier techniques.

To supplement this program it is recommended that we set up a worldwide communications corps with training available in any country via a new United Nations commission.

A uniform and correlated system of training under United Nations auspices could bring young people of the world together in this common effort and be instrumental in breaking down tensions which presently exist. It would provide exciting and useful careers for our young people who are dedicated to a new diplomacy.

This system is based upon proven technology which has remained unharnessed through the recent dynamic years of an exploding science and presentations have been made of this system to the cognizant groups in the US satellite program.

In addition to reducing present costs of communication and much of the expenditures for aid programs, the actual cost of the new system would be a small percentage of what our current budgets are for far less services. This plan would in turn release substantial funds which are sorely needed in our current crises in the cities.

Description of low level satellite broadcasting and communications system:

A group of satellites would be planned for launching by both the United States and other governments which would place the low level satellites in orbit in the vicinity of 5,000 to 6,000 miles from earth to assure reliable broadcasting to and from earth transmitting and receiving stations. At this level the satellites would make frequent periodic traverses of the earth and would lend themselves to programming of new communication information at frequent intervals and the continuous broadcasting of and rebroadcasting of many services and program materials. Any member of this Global Communications

System could receive this information by financing a low-cost receiving site which would be offered in complete design by those who plan the Global Communications System. Those receiving the signals could easily integrate the program material into its existing established network or station service.

The planned services:

In establishing Global Communications via United Nations oriented agencies, the following services could be offered which would add to the immediate upgrading of those nations on the lowest strata of society. Philosophically, it has been agreed that all revolutions have been created by the have-nots, and this would be an economical technique for allowing the have-nots to have access to all of the latest information, worldwide thinking, cultural exchanges and services which will be described in the following paragraphs.

Here are some of the services which the Global Communications System could offer:

Weather: This system would be so designed as to provide all the weather information any nation could use about its locale, as well as worldwide weather sequences as they would affect its own environment. A north-south orbiting satellite would cross every nation in the world as the earth turns on its axis. During the interval within which the satellite crosses any given nation it would be in a position to obtain from the satellite that portion of the current weather situation that applies to it and the prediction for future weather derivable from the worldwide weather sequences acquired by the international weather network.

International news service: It would be possible to integrate into all local networks and local stations news originating from any nation in the world which is participating in the Global Communications System. It should be noted that while not every country will be able to originate news, every country will have access to all of the news originated by others. By having each national news originating service provide a short time slot of news, a single pass of the satellite at any point of the globe would provide a complete series of these nationally originated broadcasts at any location. The complete series would be receivable, though not necessarily in the same sequence, insofar as the starting and terminating points are concerned.

The technology permits multiplexing of a large number of languages which can be selected according to the receiving nation's requirements. In the case of television broadcasts, the video information would, of course, be identical and the language of national choice would be available from the satellite. Even in those areas with esoteric languages a translator would translate the information from a multiple choice of widely used languages.

Worldwide navigation system: This system of worldwide navigation would make the most remote points in the jungle just as identifiable as the most urban community in the world, and this would be accomplished with low cost receiver instrumentation, as the major costs of the system engineering are incorporated into the satellite system. In addition, with the advent of supersonic jet travel, a worldwide navigation system would provide bearing information by means of stationary satellites in a manner similar to that currently provided by LORAN systems. This will permit automated flying throughout the world and relieve the planes of human errors which are intolerable at supersonic speeds.

Worldwide emergency system: As a matter of creating understanding any nation could make its problems understood to all other nations as well as benefiting from each others' art forms as may be economically transmitted through this system.

Worldwide educational system: This system would have the capability of bringing the educational material from anywhere in the world to everywhere in the world for its use in upgrading every society within its own language requirements or to provide multi-lingual capability for all those who wish to realize this accomplishment. The results will be mutually beneficial to all participants regardless of their state of advancement in the culture.

As of this writing, even the smallest African nation has a television station operating or planned. The instant escalation and subsequent total breakdown of the machinery of international propaganda could be prevented through the use of the Quasi-Laser system. Nations have proven themselves to be like individual men - scared of one another because they simply don't understand. Countries and the hostilities they have toward one another are similar to the American racial crisis where whites and blacks have come to hate and fear each other more out of a sense of ignorance than anything else.

Since this system will make possible the easy broadcasting and receiving of news from every country, each nation's propaganda mills will grind away at full speed as soon as the laser hook-up is complete. Soon after, the common exposure of all the different distortions of reality will make the truth the only credible medium. Imagine catching the 10 pm news from Washington followed by the 8 am news from Peking. It wouldn't take long for the two special interest viewpoints to disappear and a more objective reporting of things like the Vietnam War would be the logical outcome.

The instituting of an equality of surveillance system monitored by the United Nations with full access to the intelligence it gathers for every nation in the world would make sneak attacks impossible. So would the constant fear of them which drives entire countries into fever pitch of wasteful expenditures.

In the United States the most important fact about this development is that it links every building in the urban area via air and costs far less than trying to cable people for even partial TV service. It does take some business away from the telephone companies, will fragmentize some of the broadcaster's audience. However the FCC has always supported their responsibility to the people of the United States to make maximum use of the airwaves, and most of the frequencies needed from 20 to 40 GHz are unassigned. The system proponents are seeking the progressives in government to overcome the reluctance of those who do not recognize the growth of new communication services. It is time to overcome the fear of the future and break through the barriers and positively exercise governmental power.

It is anticipated that the synergistics of the Quasi-Laser Link system will open new entertainment, education and communications vistas for urban dwellers and businessmen who have the wit and the means to benefit from these Wide Spectrum Services.

This Quasi-Laser Community Antenna Television System opens a wide spectrum of services for multiple dwelling residents who may be airlinked by a grid of dispersed beams. The new air link systems will offer CATV, commercial and business subscribers all available TV and FM entertainment channels along with additional services associated with education, shop by television, business and computer data, continuous news and weather and for a host of other entertainment, industrial and educational purposes. The application of this principle to satellites will offer these services to all areas of the world on a very economical basis.

The new worlds the Chromalloy-Laser Link people believe they will create seem to confirm the words of Marshall McLuhan, the prophet of the media, who wrote only a year ago, "The medium, or process, of our time - electric technology - is reshaping and restructuring patterns of social interdependence and every aspect of our personal life. It is forcing us to reconsider and re-evaluate practically every thought, every action and every institution formerly taken for granted." The hope is that this total involvement technology will create new understandings, new attitudes and make possible a new will for peace.

CATV is a new urban medium at this time and all of the development work to use this medium for the purposes in Table 1 are in process by industry, entertainment and service leaders. Urban support is expected as city leaders realize that CATV can inform, educate and entertain the citizenry and that the plus services of CATV can advance a city's growth pattern, aid in protection of life, property and ease transportation problems. Most important is that the installation and usage of a total involvement system will enrich a city's social and cultural life as well as permitting all to participate in the political process.

We must possess courage and vision if the communications world we talk about is to come to fruition. Those of us who participate in this International Conference on Communications' society face our greatest test and challenges in the next decade. We cannot afford to make a wrong evaluation of the present or in our prediction of the future of communications which transform our world into a new electronic environment. We must exploit and keep pace with change but not fall victim to it.

TABLE 1

FORECAST OF "TOTAL INVOLVEMENT SERVICES" OVER CATV

(Next Decade, X = Estimated Date for Operating Service)

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
20 TV Channels Start		X								
News and Weather	X									
Community Relations Channels	X									
TV Ombudsman		X								
Theatre TV Start		X								
Shoppers Channels		X								
50 Channels of FM Entertainment		X								
TV Security		Start	X							
Computer, Facsimile and Data Transmission Channels		Start	X							
Medical TV Uses		Start	X							
Air Pollution, Traffic Surveillance & Municipal Services			Start	X						
40 TV Channels				Start	X					
Direct Satellite Pick-ups					Start	X				
Credit Card Banking					Start	X				
20 Channels of ETV & 50 Channels of FM making every home a classroom					Start	X				
Access to Computer Storage Reference Material					Start	Advance	X			
Doing Business at Home							X			
Electronic Newspaper							Start	X		
Access to Channels from the whole World									Start	X

QUASI-LASER FREQUENCY DISTRIBUTION

TABLE 2

CHANNEL NO.	FREQUENCY BAND MHz	VIDEO CARRIER	SOUND CARRIER	COLOR SUBCARRIER
2	54 - 60	55.25	59.75	58.83
3	60 - 66	61.25	65.75	64.83
4	66 - 72	67.25	71.75	70.83
A	72 - 76	-	-	-
5	76 - 82	77.25	81.75	80.83
6	82 - 88	83.25	87.75	86.83
B	88 - 94	89.25	93.75	92.83
C	98 - 104	99.25	103.75	102.83
D	104 - 110	105.25	109.75	108.83
E	110 - 116	111.25	115.75	114.83
F	116 - 122	117.25	121.75	120.83
G	122 - 128	123.25	127.75	126.83
H	128 - 134	129.25	133.75	132.83
I	134 - 140	135.25	139.75	138.83
TONE	6 MHz or 52 MHz			
7	174 - 180	175.25	179.75	178.83
8	180 - 186	181.25	185.75	184.83
9 (See note A)	186 - 192	187.25	191.75	190.83
10	192 - 198	193.25	197.75	196.83
11	198 - 204	199.25	203.75	202.83
12	204 - 210	205.25	209.75	208.83
13	210 - 216	211.25	215.75	214.83

NOTE A: Channels 7 through 13 are to be translated down to 8 - 50 MHz crystal controlled L.O. at 224 MHz.

QUASI-LASER CATV SYSTEM

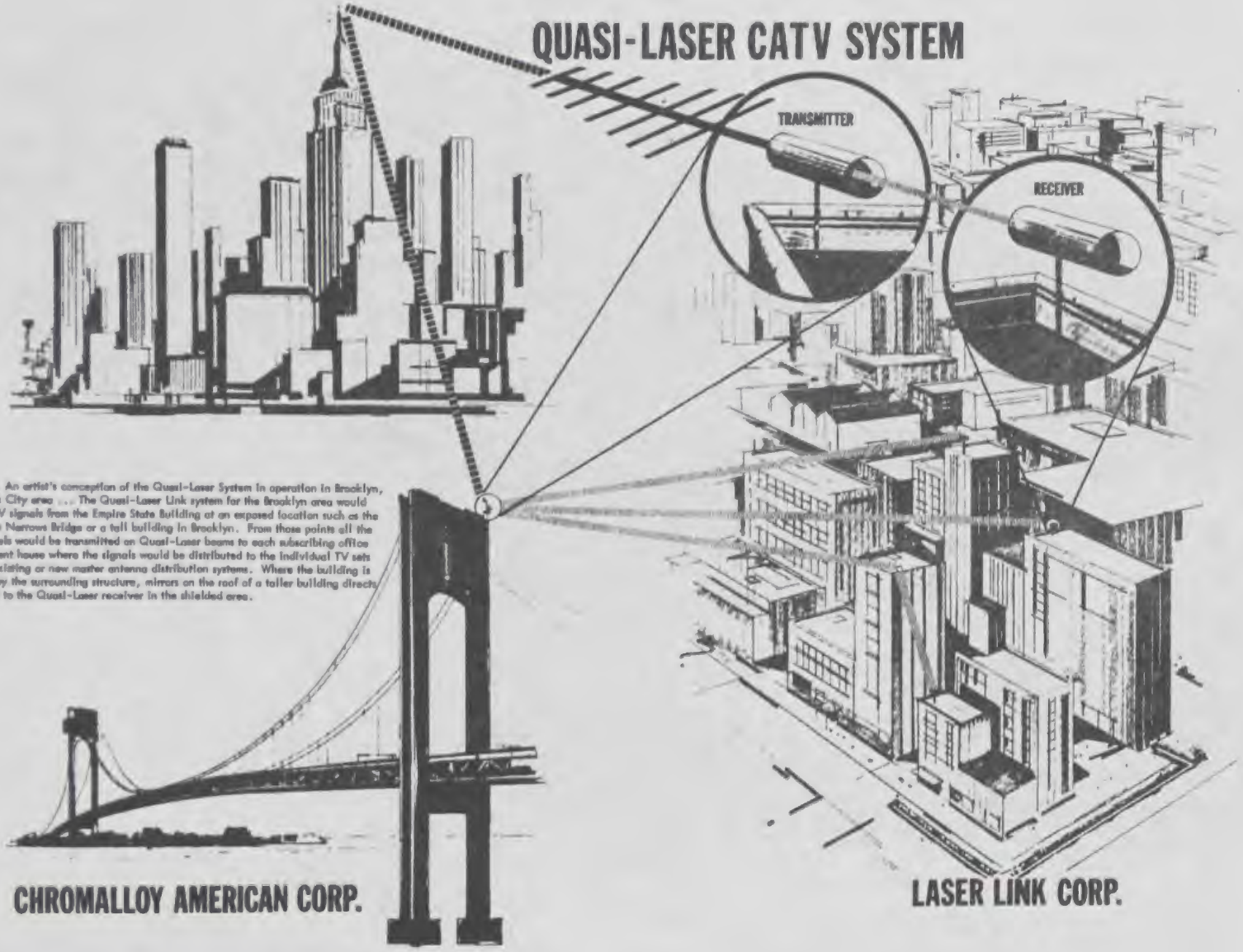


Figure 1. An artist's conception of the Quasi-Laser System in operation in Brooklyn, New York City area ... The Quasi-Laser Link system for the Brooklyn area would receive TV signals from the Empire State Building at an exposed location such as the Verrazano Narrows Bridge or a tall building in Brooklyn. From those points all the TV channels would be transmitted on Quasi-Laser beams to each subscribing office or apartment house where the signals would be distributed to the individual TV sets through existing or new master antenna distribution systems. Where the building is shielded by the surrounding structure, mirrors on the roof of a taller building directs the signal to the Quasi-Laser receiver in the shielded area.

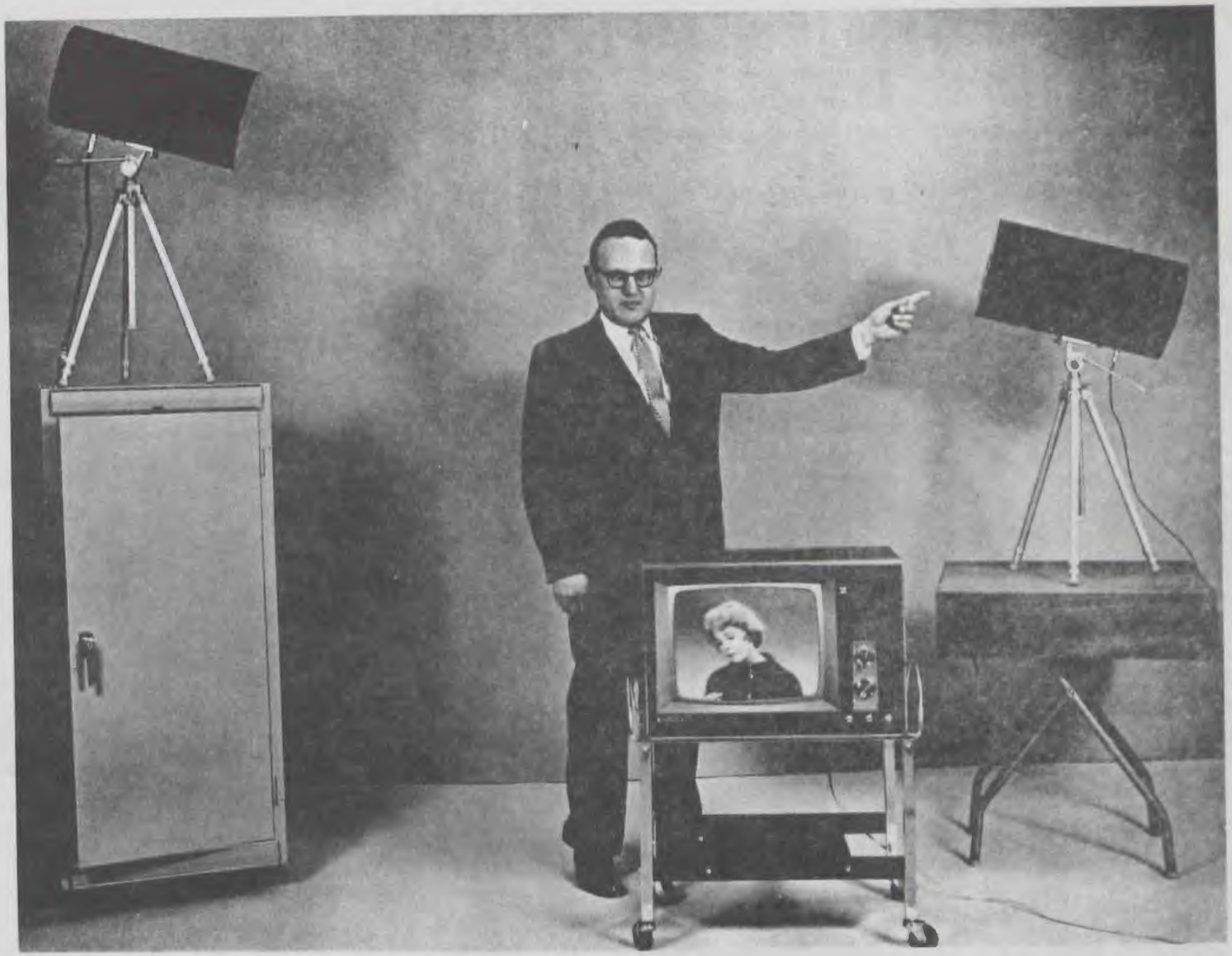
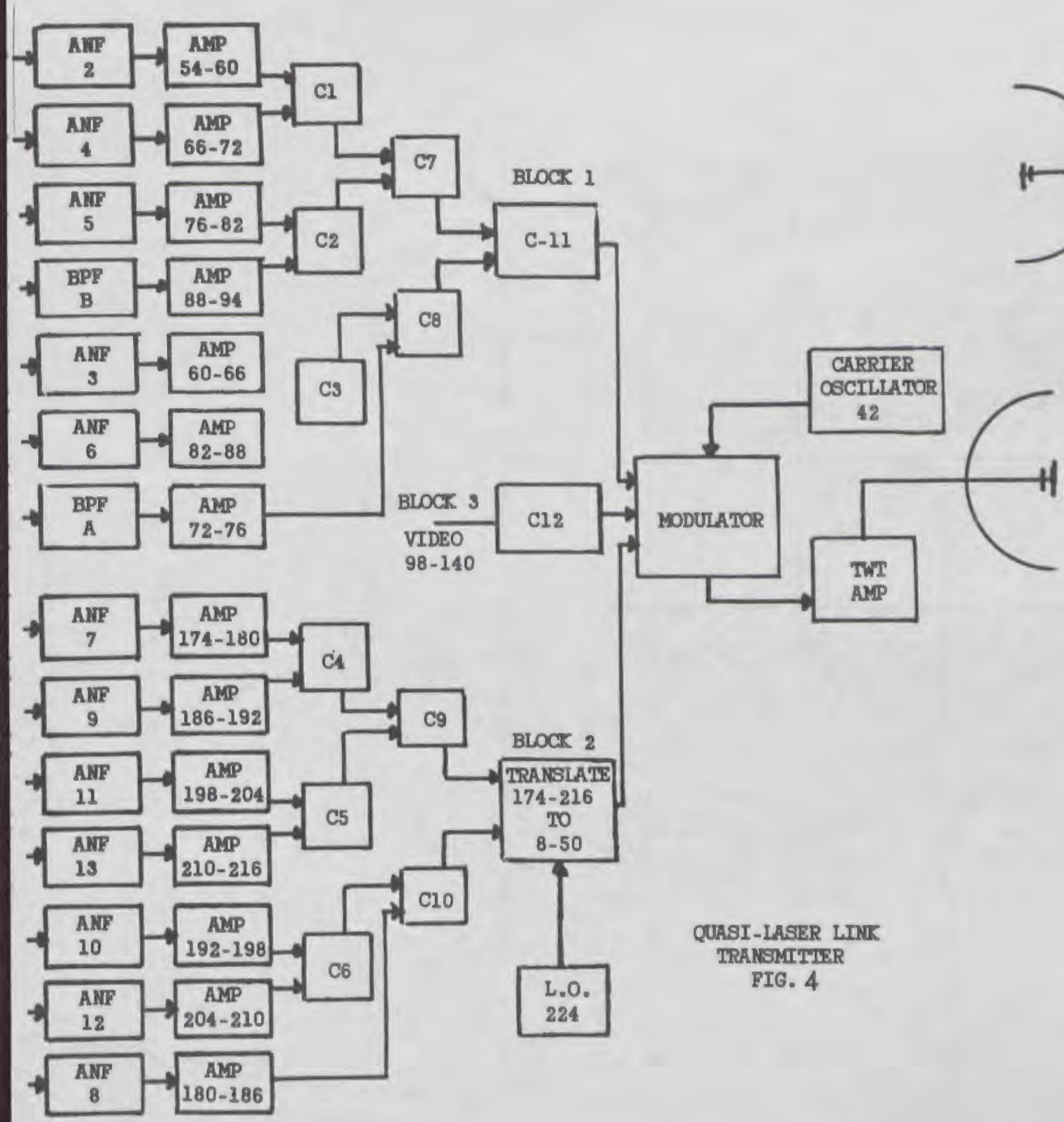


Figure 2. QUASI-LASER LINK SYSTEM IN EXPERIMENTAL OPERATION (with TV pix)

Model of Quasi-Laser Link system in Experimental Operation is being demonstrated by Dr. Joseph H. Vogelman, Chromalloy American Corporation Vice President, at conference. Unit on left receives all available TV channels and by proprietary modulation, system puts the signals on a Quasi-Laser beam transmitted from the transducer on top of the cabinet. The beam is received by the receiving equipment below the transducer. The output of this unit is fed to standard TV color set where all channels can be viewed in the normal manner.

Figure 3. Demonstration - Reflecting Quasi-Laser Beam to Change its Course (without TV pix)

Dr. Joseph Vogelman, Chromalloy American Corporation Vice President, demonstrates the effect of reflecting beam away from receiving transducer by inserting copper reflecting plate in the path of the Quasi-Laser beam demonstrating the optical characteristics of the system.



QUASI-LASER LINK TRANSMITTER
FIG. 4

RECEIVER

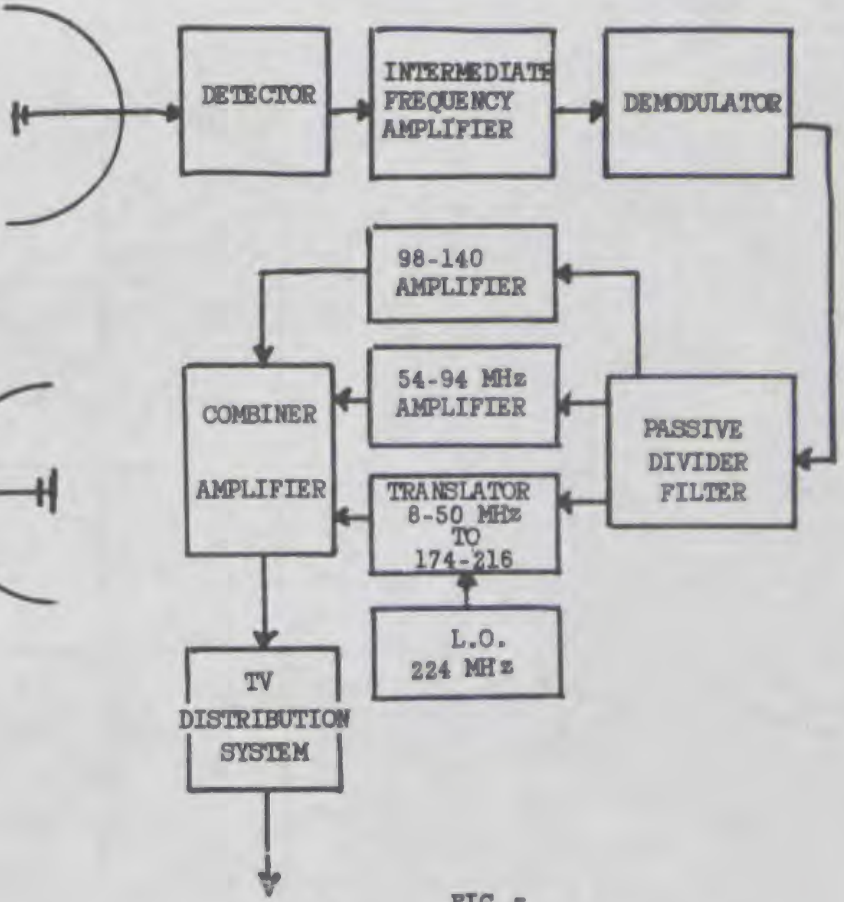
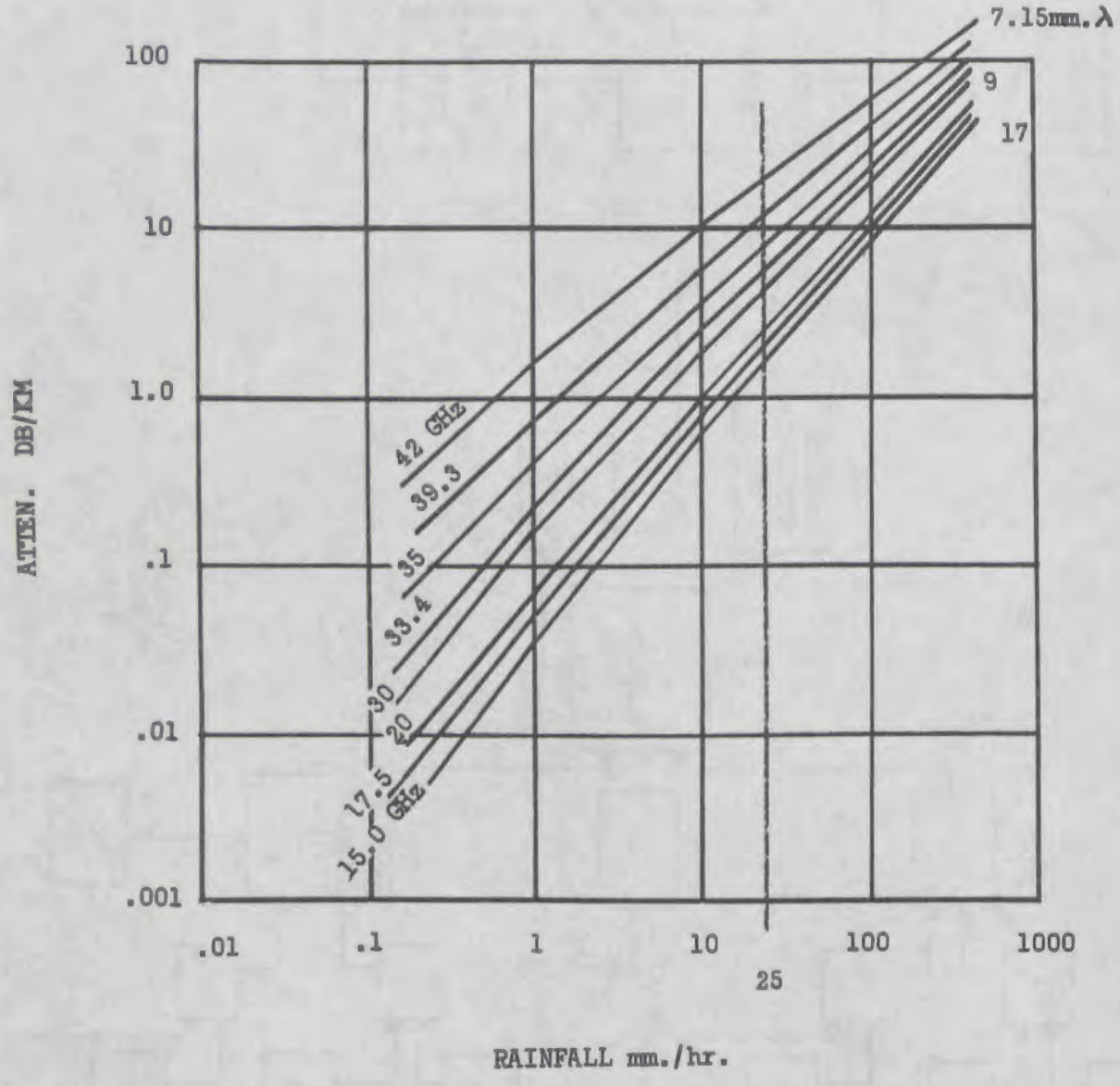


FIG 5

ATTENUATION VS RAINFALL

FIGURE 6

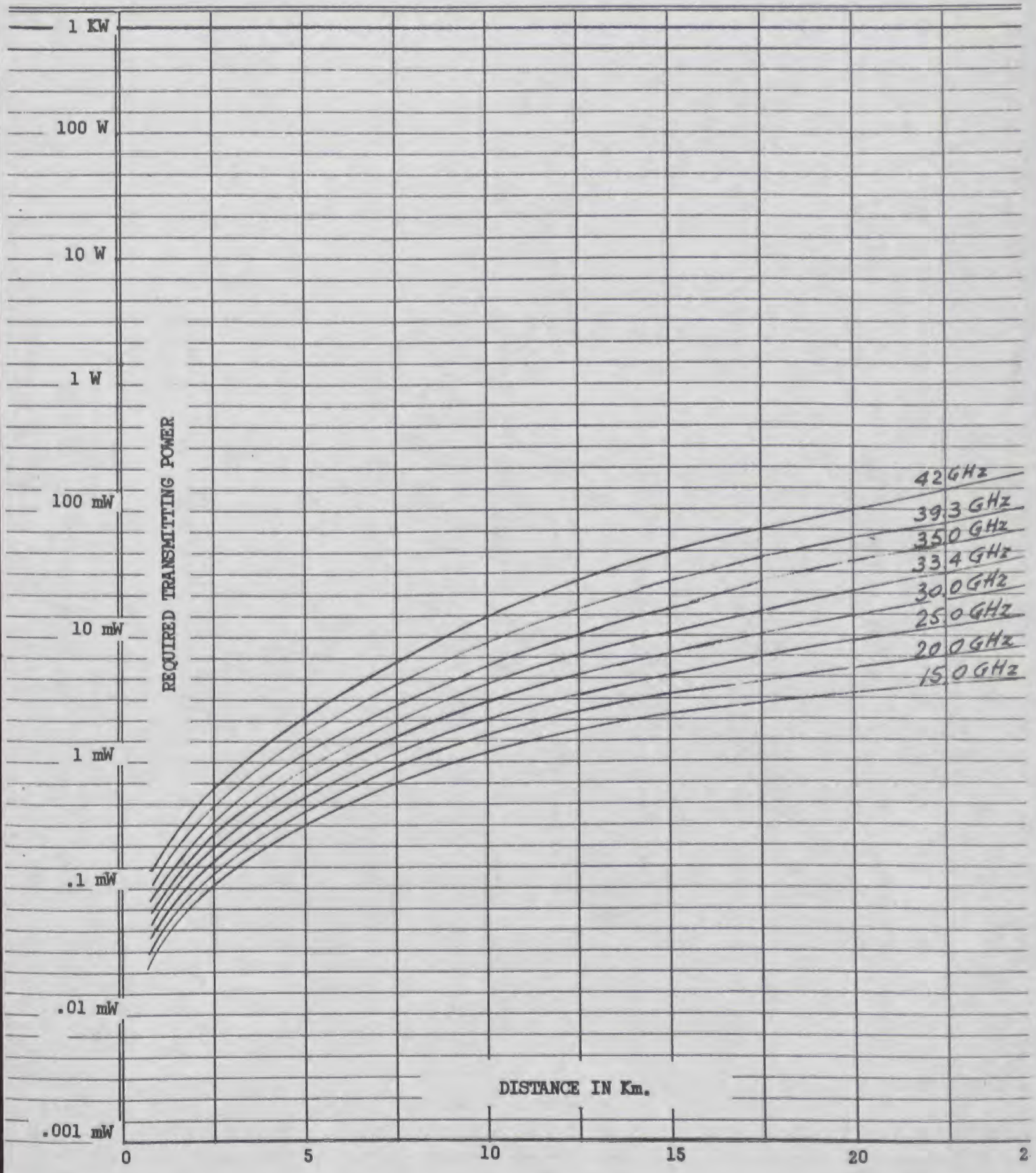


NATIONAL
42-384

$K = G_T + G_R - S_R = 135$ db

RELIABILITY = 94.3%

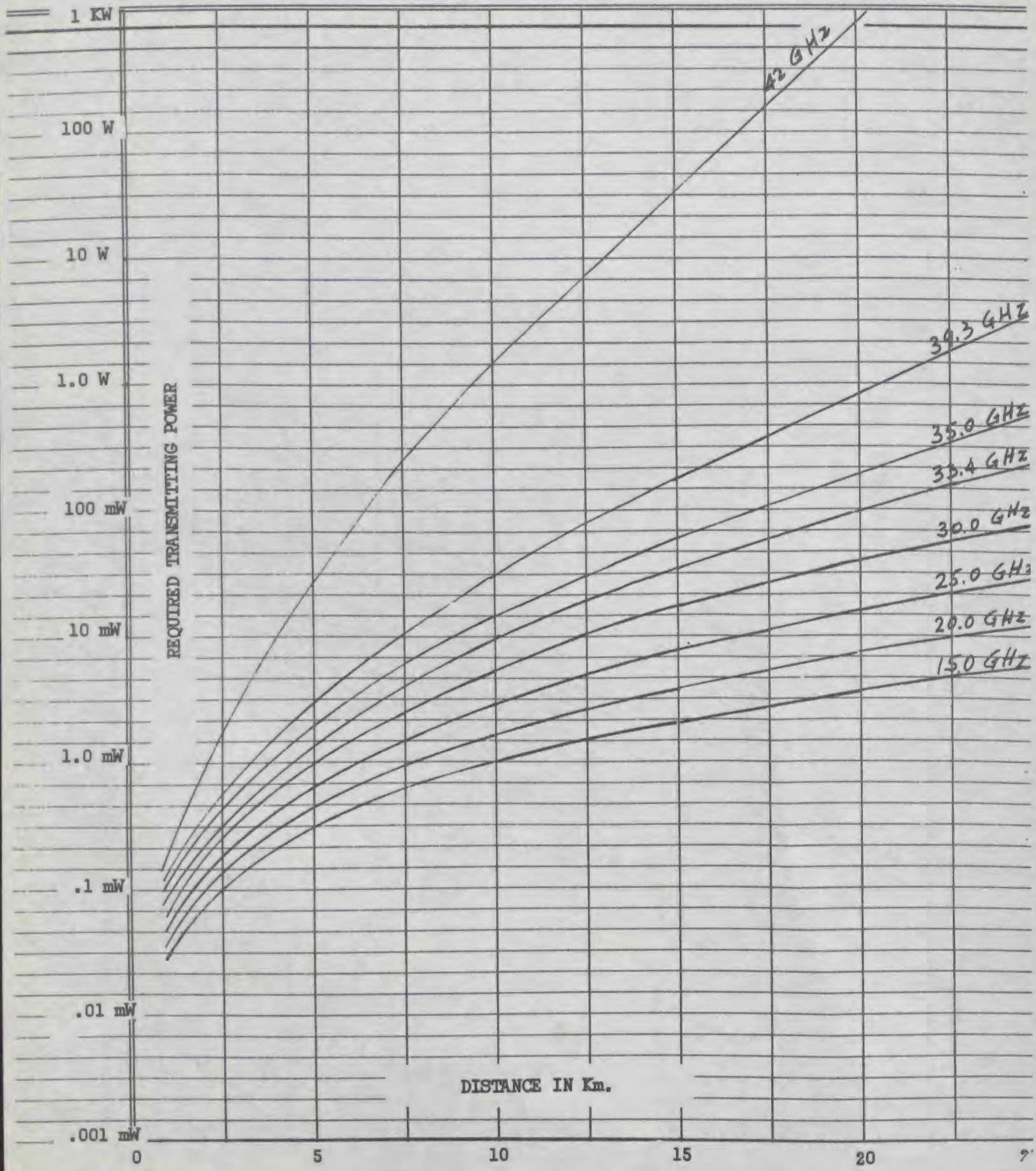
Figure 7 -A



$K = G_T + G_R - S_R = 135$ db

RELIABILITY = 97.9%

Figure 7-B

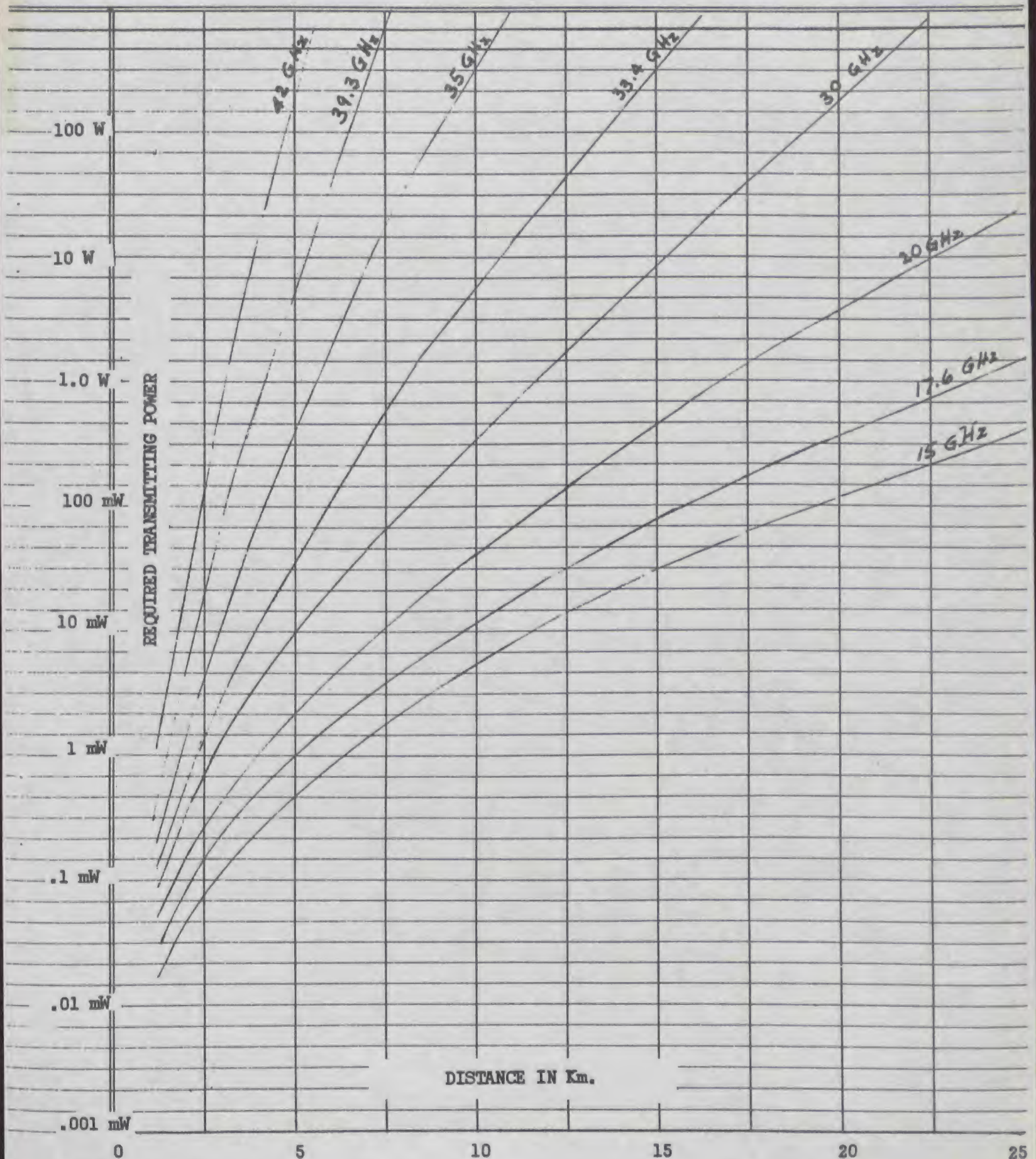


NATIONAL
42-364

$K = G_T + G_R - S_R = 135$ db

RELIABILITY = 99.8%

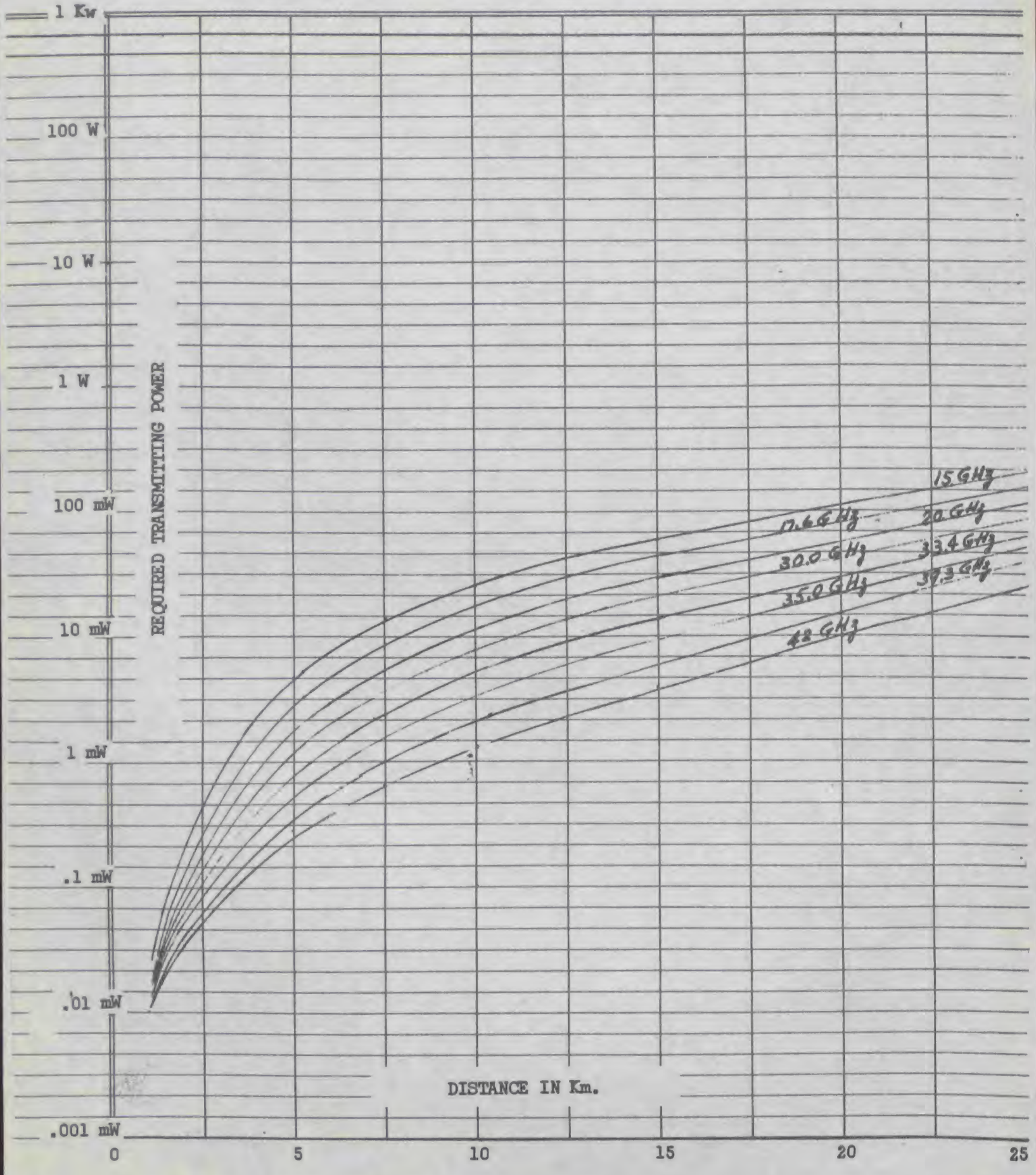
Figure 7-C



NATIONAL
42-364

COMPOSITE - 40 DBM MINIMUM RECEIVER SIGNAL PLUS 4' PARABOLICS - RELIABILITY = 94.3%

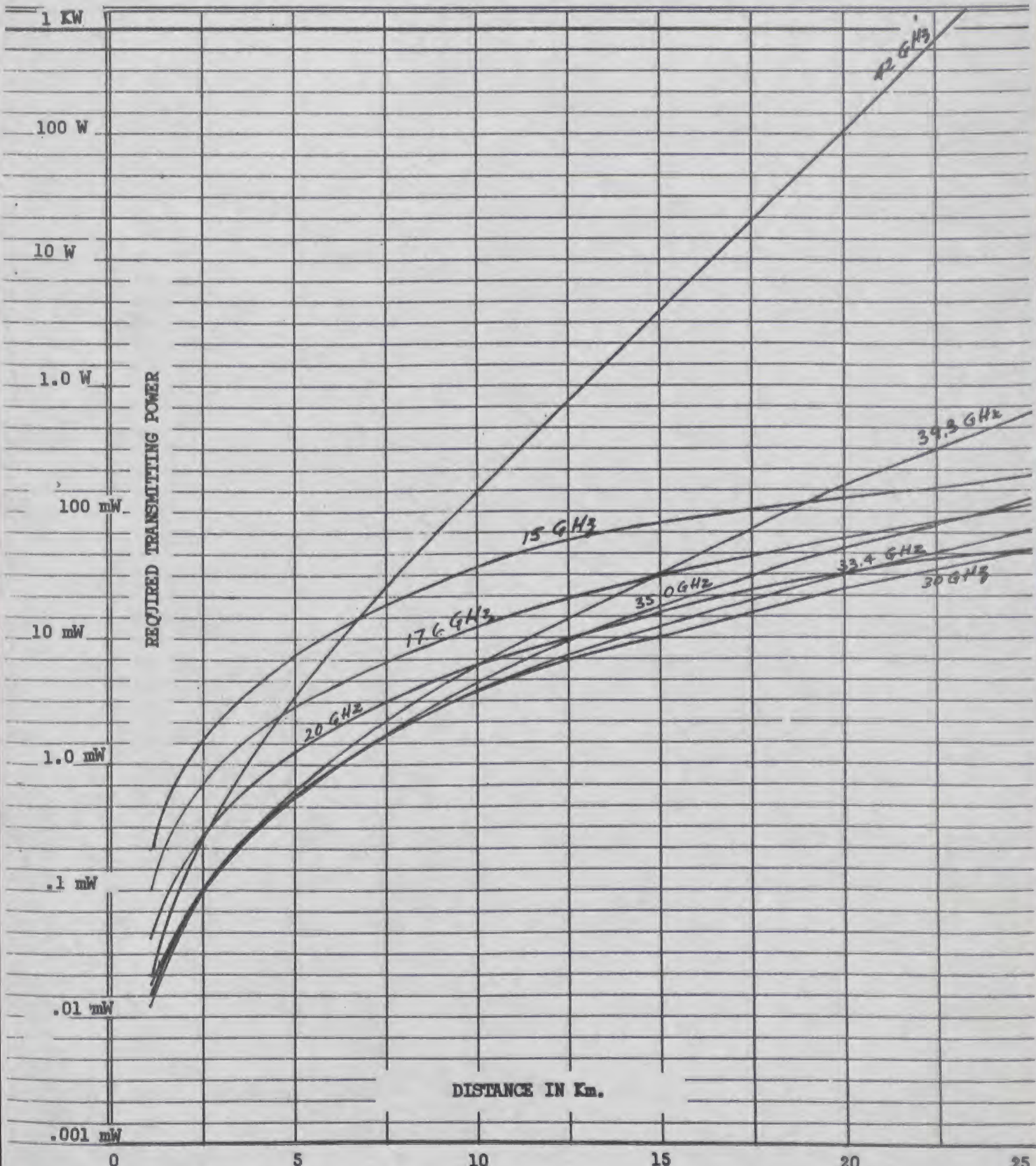
Figure 8-A



NATIONAL
42-364

COMPOSITE - 40 DBM MINIMUM RECEIVER SIGNAL PLUS 4' PARABOLICS - RELIABILITY = 97.9%

Figure 8-B



NATIONAL
42-384

COMPOSITE - 40 DBM MINIMUM RECEIVER SIGNAL PLUS 4' PARABOLICS - RELIABILITY = 99.8%

Figure 8-C

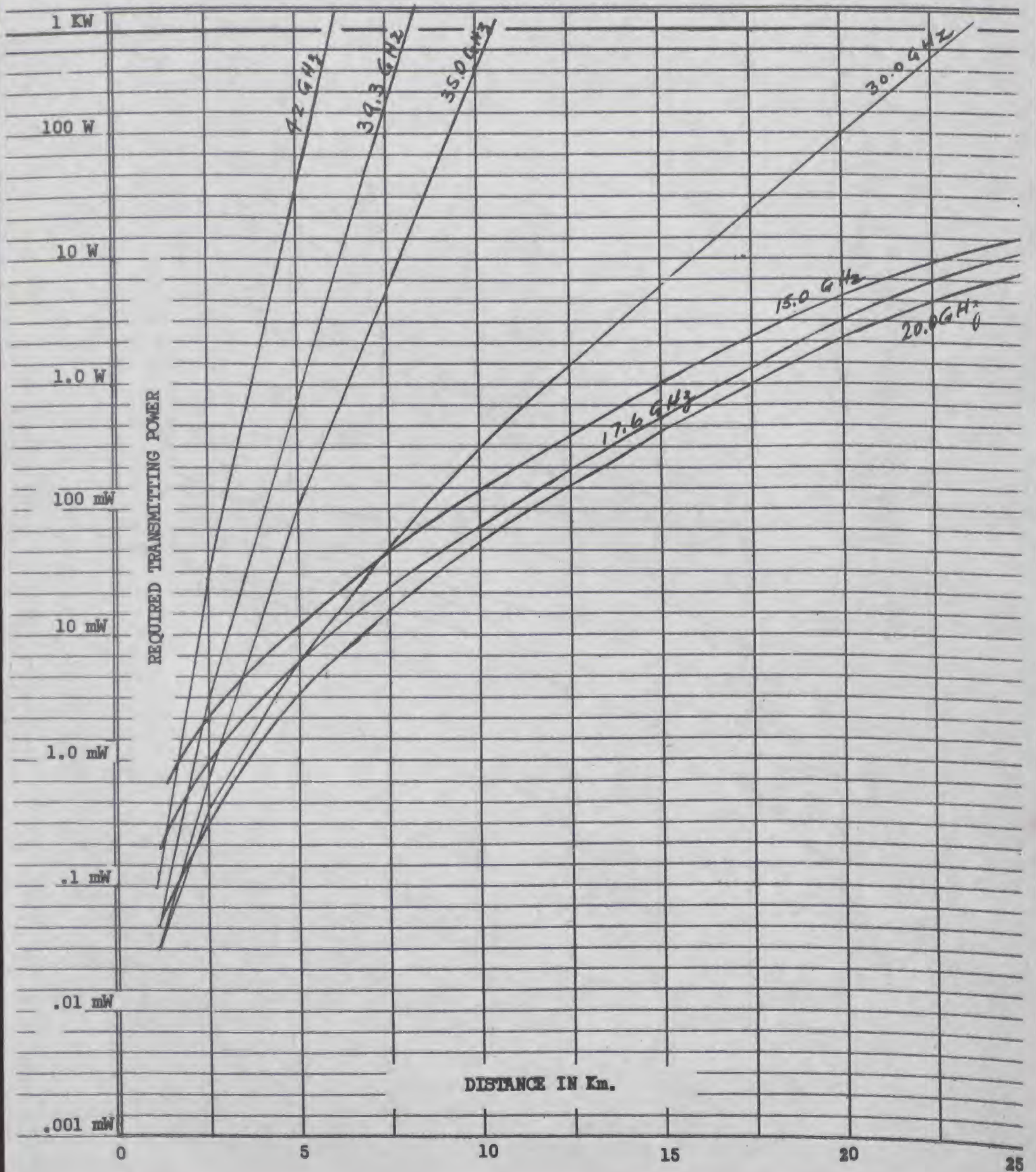
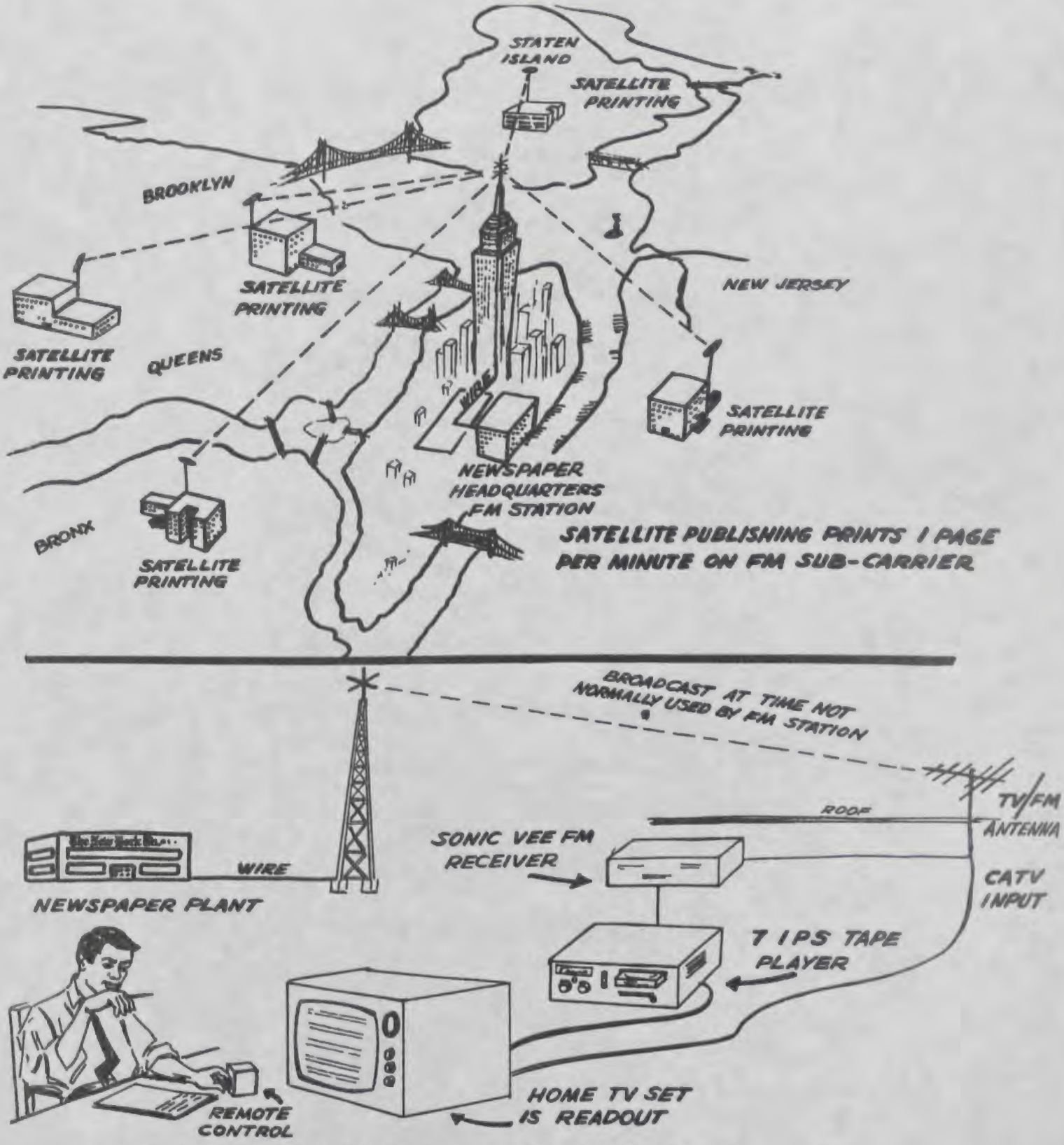


Figure 9



ELECTRONIC NEWSPAPER FOR THE HOME USING BAND COMPRESSION AND MEMORY STORAGE PRINCIPLES ON FM SUBCARRIER

THE QUASI-LASER SYSTEM DEMONSTRATES:

1. ACCEPTABLE TELEVISION RECEPTION WHEN THE SIGNAL-TO-NOISE RATIO IS: S/N-15db.

2. 32½ CHANNELS CAN BE TRANSMITTED SIMULTANEOUSLY ON A SINGLE CARRIER.

3. THE MODULATION BANDWIDTH CAN BE AS MUCH AS 25% OF CARRIER FREQUENCY.

4. 15db SIGNAL-TO-NOISE MEANS MULTIPLE USES OF THE SAME FREQUENCY IN THE SAME LOCALITY WITH SUITABLE BEAM ORIENTATION SITING, WITHOUT CO-CHANNEL INTERFERENCE.

DEMONSTRATION SYSTEM

SIMULATES RECEPTION AT MAXIMUM
SYSTEM DISTANCE

TRANSMITTING TERMINAL POWER OUTPUT:
TOTAL–0.0003 WATTS
PER CHANNEL–0.00001 WATTS

INFORMATION CONTENT:

FREQUENCY BAND	# OF CHANNELS	TYPE OF INPUT
8-50 MHz	7	Noise
54-66	2	Local Video
66-72 76-82 174-180 186-192	4	TV From Building Antenna
82-88 180-186 192-216	5	Local Video
72-76 88-174	14¾	Noise

DEMONSTRATION SYSTEM

SIMULATES RECEPTION AT MAXIMUM SYSTEM DISTANCE

RECEIVER TERMINAL.

NO RECEIVER BEING USED–DIRECT DETECTION AT ANTENNA

AVAILABLE SIGNAL TO NOISE RATIO AT DEMODULATOR INPUT:

Low Channels: 15db-S/N-6:1
High Channels: 12db-S/N-4:1

COMMERCIAL TV TRANSMISSION: 46db-S/N-200:1

RAINFALL IN SELECTED CITIES

1967

RAINFALL IN INCHES RAINFALL IN CENTIMETER	0 0	.098 2.5	.197 5	.393 7.5	.492 10	.590 125	.689 15	.778 175	.885 20	.982 225	1.08 25	1.18 275	1.28 30	1.376 325	1.475 35	1.7
CHICAGO, ILL.	484	66	27	7	1	2		2	1					1	1	
DETROIT, MICH.	534	68	17	3	2	1	2		1		1					
LOS ANGELES, CALIF.	172	30	9	1	1		1		2	1						
MOBILE, ALA.	297	70	55	13	7	1	3	4	2		1	1	2		3	
NEW YORK CITY, N.Y.	600	64	23	9	5	1	1	1	2						1	
SAN FRANCISCO, CALIF.	343	60	24		2	1										
SEATTLE, WASH.	866	63	7	3												
WASHINGTON, D.C.	402	87	21	4	2	3		3			1					

CUMULATIVE RAINFALL IN SELECTED CITIES

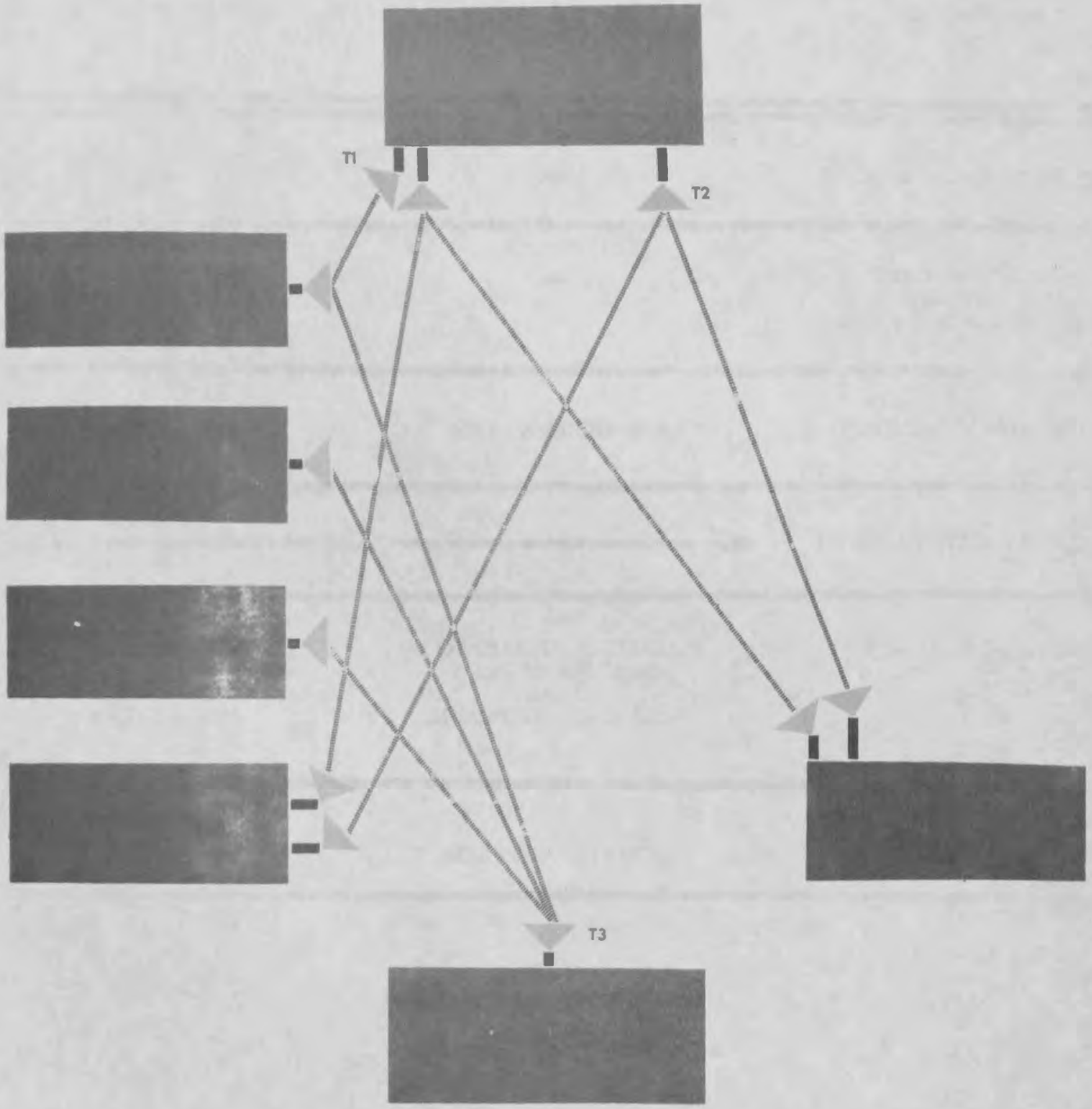
1967

RAINFALL IN INCHES	0	.098	.197	.393	.492	.590	.689	.778	.885	.982	1.08	1.18	1.28	1.376	1.475	
RAINFALL IN CENTIMETER	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25	27.5	30	32.5	35	37.
CHICAGO, ILL.	592	108	42	15	8	7	5	5	3	2	2	2	2	2	1	
DETROIT, MICH.	629	95	27	10	7	5	4	2	2	1	1	0	0	0	0	
LOS ANGELES, CALIF.	217	45	15	6	5	4	4	3	3	1	0	0	0	0	0	
MOBILE, ALA.	459	162	92	37	24	17	16	13	9	7	7	6	5	3	3	
NEW YORK CITY, N.Y.	707	107	43	20	11	6	5	4	3	1	1	1	1	1	1	
SAN FRANCISCO, CALIF.	430	87	27	3	3	1	0	0	0	0	0	0	0	0	0	
SEATTLE, WASH.	939	73	10	3	0	0	0	0	0	0	0	0	0	0	0	
WASHINGTON, D.C.	523	121	34	13	9	7	4	4	1	1	1	0	0	0	0	

COMPARISON CHART

CHARACTERISTIC	TRANSLATOR METHOD	QUASI-LASER METHOD
REQUIRED SIGNAL TO NOISE	40db	15db
LINEARITY IMPOSED AMPLIFIER POWER RATING TO OUTPUT SIGNAL RATIO	20db	0db
ATMOSPHERIC CONDITIONS	RAIN FLICKER & NOISE	NO EFFECT
SIGNAL POWER RAIN MARGIN	← SAME →	
CARRIER FREQUENCY	DIRECTLY RELATED TO MULTIPLE OF PILOT CARRIER FREQUENCY (72-76 MHz)	ANY FREQUENCY ABOVE 10 GHz
RECEIVER STABILITY	PHASE LOCKED LOOP	NOMINAL

TYPICAL LAYOUT SHOWING USE OF SAME FREQUENCY BY 3 DIFFERENT BROAD BAND QUASI-LASER TRANSMITTING SITES IN SAME LOCATION.



October 24, 1968

(Addenda to presentation of Quasi-Laser Link System by Chromalloy American Corporation and Laser Link Corporation before the Federal Communications Commission, Washington, D.C., October 24, 1968)

SCOPE OF COMMUNICATIONS HORIZONS IMMENSELY EXPANDED BY CAPACITY OF QUASI-LASER LINK SYSTEM TO PROVIDE 20 TO 40 ADDITIONAL CHANNELS OF TV SERVICE AT LOW COST TO BOTH URBAN AND RURAL COMMUNITIES IN U.S.

Objectives of the President's Task Force on Telecommunications Policy Attainable Through Authorization of Unassigned Frequencies in Spectrum

SUMMARY

Today's demonstration for the Commission of the Quasi-Laser System by Chromalloy American Corporation and Laser Link Corporation was highlighted by the following innovations in television transmission techniques that open a new spectrum for reliable television service - expanding the scope of television's horizons to provide from 20 to 40 additional channels of service at low cost to both urban and rural communities of the United States:

1. Acceptable television reception when the signal-to-noise ratio is: s/n = 15 db
2. 32-1/2 channels can be transmitted simultaneously on a single carrier
3. The modulation bandwidth can be as much as 25% of carrier frequency
4. 15 db signal-to-noise means multiple uses of the same frequency in the same locality with suitable beam orientation siting, without co-channel interference.

Advances in technology are an everyday occurrence; the only thing constant in an era of electronic evolution is change itself. The rewards of technological achievement, however, are in direct ratio to the ability to harness the potentials science has wrought and channel them in directions that provide the greatest good for the many.

Despite its enormous growth and popularity in the past 20 years, television's full potential has gone largely unrealized because of channel limitations which have restricted the medium principally to major centers of population, denying to thousands of smaller urban and rural communities the benefits of locally-oriented TV service. This barrier to television's ultimate fulfillment can now be lifted.

Radio found its niche in KiloHertz; television established its roots in MegaHertz. But the horizons of electromagnetic energy are limitless, and it was natural the next "turn in the road" was in an area of the spectrum as relatively unexplored - until now - as the surface of the moon: the region known as GigaHertz.

The potential of the Quasi-Laser Link represents another breakthrough - another milestone - in television development. It gives promise of a bright new era of television service.

The exploration is all the more meaningful since it adds to television, without impinging upon or replacing that which already exists in the MegaHertz range. It expands the scope of communications' horizons to provide from 20 to 40 additional channels of television - at low cost - to both urban and rural communities throughout the nation. As such:

- It provides a basis for the establishment of new types of communication services at the purely local level

- It provides a supplementary arm for educational television that assures ultimate fulfillment of visual broadcasting as an important "teaching tool", at scholastic and collegiate levels

- It provides an economic means of establishing Community Antenna Systems in urban areas by surmounting the obstacles of trenching through concrete, while "blending" its service into master antenna systems and coaxial cable installations

- It paves the way for expanded Community Antenna Systems in rural or suburban areas by joining contiguous small communities, jumping highways, crossing rivers, surmounting terrain barriers - and doing so economically in lieu of cable

- It makes possible channels for municipal and civic services; medical information for physicians and surgeons; community social service agencies, religious denominations - and more

- It provides outlets for "neighborhood" television stations in smaller communities "under the umbrella" of signals from network and non-network stations in larger adjacent cities and, like 250 watt and 500 watt AM radio stations that serve such smaller urban and rural areas,

provide an effective means of local expression and local advertising "to preserve values of localism rooted in the fundamental concepts of this country as a federation." *

In sum: The Quasi-Laser Link provides a communications highway of electromagnetic energy to accommodate a vast array of services - services which can implement in every detail the Staff recommendations of the President's Task Force on Telecommunications Policy, recently released.

The role of the Quasi-Laser Link in the future of communications could be appreciable since data collected in experimentation conducted under research licenses granted by the FCC to Chromalloy American Corporation, which is developing the system, indicate that it can operate on any assigned carrier frequency within the band of 10 to 10,000 GHz. The current state of the technology is such that maximum economies are associated with the lower frequencies closest to 10 GHz.

In instructional television, for example, a 20-channel instructional television broadcasting system operating under the Quasi-Laser Link principles could be made available at a cost approximately equivalent to that of a 3-channel service in the presently authorized 2,500 MHz ITFS band.

Recognition of the potential of laser-type transmission as a boon to CATV systems in major metropolitan centers is set forth in a voluminous report on cable television and

---

* Quotation from Staff recommendations of the President's Task Force on Telecommunications Policy - Broadcasting Magazine September 9, 1968

cable telecommunications in the City of New York, submitted to Mayor John Lindsay by his Advisory Task Force on CATV and Telecommunications on September 14, 1968. The report stated:

> 'The field of cable television is in constant technological flux. One significant possibility is the development of what the Task Force calls 'non-cable' cable television - the use of microwave frequencies in the super-high frequency band, or of laser beams, which transmit at light frequencies, as part of a cable system. Research on these techniques is already under way. If these techniques are proven, they could be used as a substitute for cable where the laying of cable would be particularly difficult or costly. When the Task Force speaks of cable systems in its report, it includes systems that may one day relay on microwave or laser beams ..."

Authorization of Quasi-Laser Link transmission in unassigned portions of the GigaHertz spectrum would herald a new approach to television at a purely local level, geared specifically to a community's needs and covering the gamut of communal activities suggested by the President's Task Force on Telecommunications Policy.

The staff report of the President's Task Force underscores the fact that the present system of television "falls short of our goals ... Ideally," the report states, "television should not only function as a leveler and homogenizer on a national basis, but as a vehicle for genuinely local community, even neighborhood expression."

Herewith are the goals set by the President's Task Force on Telecommunications Policy - and areas in which a Quasi-Laser Link service can meet the challenge of the Task Force's objectives:

GOAL: Serve as varied as possible an array of social needs, not only entertainment and advertising, as important as they are, but also information, education, community building and political expression.

The Quasi-Laser Link channel capacity is so expansive and versatile, two or more electromagnetic carriers, on the same frequency, each with a 20-channel capacity, can be utilized in contiguous areas and their beams diffused in different directions without interference. This versatility "removes the lid" on the number of services and applications possible in a locality, all beamed to roof-top, down-converters and thence, by intra-building cable into existing black and white or color television receivers.

Hence, the informational, educational and community-building services urged for integration into the existing pattern of commercial television broadcasting by the Task Force can be accommodated.

A single Quasi-Laser Link Central Control could serve as a focal point for distributing a wide diversity of community services - envisaged as follows:

PUBLIC AND PAROCHIAL SCHOOL INSTRUCTIONAL TV: 20-channel instructional television systems can be established in urban and rural communities (at a cost approximately equivalent to that of a 3-channel, 2,500 MHz ITFS system) and provide classroom television to all schools in a locality.

Importantly, the local 20-channel system can become a "satellite" of ETV broadcasting systems - VHF or UHF - and obtain over-the-air instructional material from these single-channel transmitters. At the local level, tape-deck and dial-access equipment can be serviced by the ETV broadcasting station serving the area - to supplement airlink transmissions - and thus solve one of the instructional television's most vexing problems - meeting the "bell schedules" of intermediate and high schools. A 20-channel Quasi-Laser ITFS service assures flexibility of scheduling courses of study to conform with the curriculum requirements of individual schools in each district.

Hence, a VHF or UHF ETV station's service to the educational community is greatly enhanced by expanding the scope of instructional TV at the local level in scores of cities and towns within reach of its signal.

HIGHER EDUCATION: Where colleges and universities exist, the Quasi-Laser Link transmission techniques make possible interconnection of intra-city campuses and linking all buildings - classrooms, laboratories, administration, dormitories, gymnasium, lecture halls, libraries, etc. A 20 channel capacity would provide the institutions of higher learning with a TV facility of great versatility - including conversion of college campus radio "stations" into TV operations, classroom instruction via "live" or taped courses; dial-access TV facilities in libraries for student use as reference material, and other educational TV services.

INFORMATION: Multiple channel broadcasting on the Quasi-Laser beam opens doors to municipal and civic uses of television for dissemination of information. These take various forms:

(a) Municipal: New York Mayor John Lindsay's Advisory Group on CATV and Telecommunications in its recommendations suggests its City Government use at least three channels of a proposed 18-channel system "in any way that helps it to carry out municipal functions or that serves the interest of the general public."

Such services, in any community, might include forums on important local issues; transmission of city council or city commission meetings; fire prevention information; traffic information, civil defense instructions, vocational training programs; cultural events from points of civic interest and other areas.

(b) Community Services: Utilization of available channels by civic, social and service groups in support of worthy activities: United Fund, Red Cross, and Hospital Drivers; Rotary, Exchange, Lions, Kiwanis and other service organizations projects; parent-teacher association information, Boy Scout and Girl Scout presentations.

(c) Medical: State and County Medical Associations could utilize one of the multiple channels at the local level for dissemination of information to physicians and surgeons.

Special encoded receiving devices could be adapted to the system which would restrict information to homes or offices of members of the medical group.

(d) Religious: Multiplicity of channels in a community can provide an outlet for each of the three major faiths and enable them to use the visual medium for a diversity of religious and community service programs.

(e) Ethnic: Programming geared to the specific interests of ethnic groups can add a new dimension to local service, informational TV. It opens an area of broadcasting heretofore limited because of a lack of channels at the local level.

GOAL: Provide an effective means of local expression and local advertising, "to preserve the values of localism rooted in the fundamental concepts of this country as a federation."

The "Neighborhood Television Station" can emerge with the advent of Quasi-Laser Link broadcasting. Every town or city - from 10,000 population upward - in urban or rural areas, could establish its own "Neighborhood TV Station" as part of a multi-channel system. Local merchants, long barred from use of the visual broadcast medium for lack of locally-created TV service or their inability to pay the cost of commercials on VHF or UHF stations serving their area from adjacent cities, will at last find an outlet for TV advertising.

Such neighborhood TV stations - like the local newspaper or local radio station - can provide a useful service of news, sports, entertainment and local expression, supported by the advertising income from local sources. It should be noted that as a "broadcaster", the neighborhood operator merely operates a studio and business offices. The "transmitter" is the Quasi-Laser Link beam, into which he connects his studio via the Quasi-Laser

Central Control. The economics are in his favor!

Furthermore, a new form of transmission - Facsimile - can find an outlet in the multi-channel capacity of the Quasi-Laser system and become an important source of "local expression." Supplemental Facsimile editions of local newspapers, tied into a community's beam system, would add another dimension to the broadened horizons in communications resulting from authorization of frequencies in the GigaHertz region of the spectrum for multiple-channel, local service television broadcasting.

The Staff Report of the President's Task Force on Telecommunications Policy, in its TV goals, sets forth these criteria:

(a) Cost as little as possible to those using the medium
(b) Be made available to as many people as possible, rural and urban, poor as well as affluent
(c) Cater to as wide a variety of tastes as possible. It states: "A medium of expression as pervasive as television should reflect the cultural pluralism of America."

The Quasi-Laser system provides the facility, the modus operandi and technological means of achieving the objectives of the Task Force. It blazes a new trail in visual communications through these innovations achieved in the laboratory:

1. Provides acceptable television reception when the signal to noise ratio is: s/n = 15 db

2. 32-1/2 channels can be transmitted simultaneously on a single carrier

3. The modulation bandwidth can be as much as 25% of carrier frequency

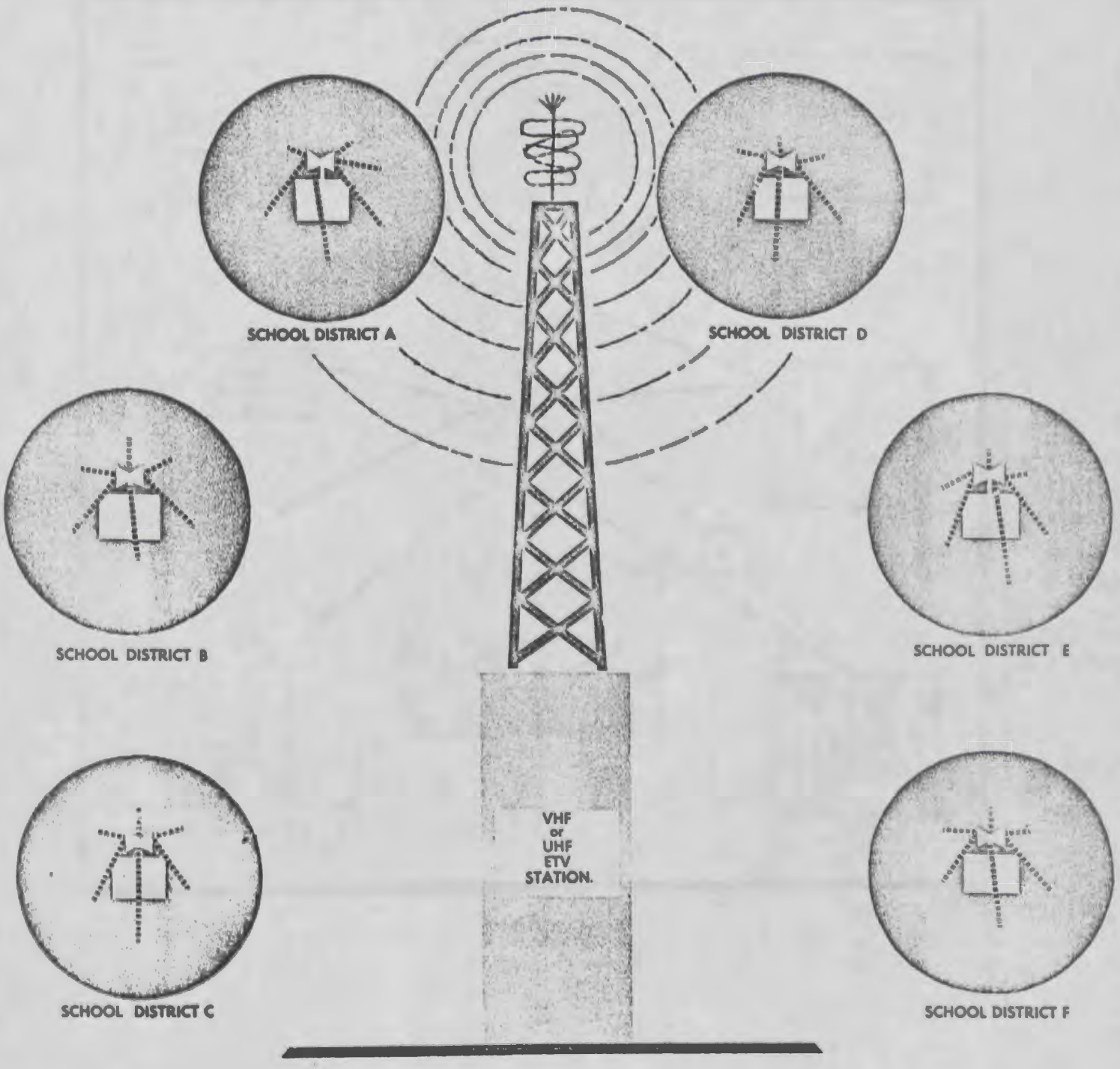
4. 15 db signal-to-noise means multiple uses of the same frequency in the same locality with suitable beam orientation siting, without co-channel interference.

It is for those with vision to harness the potential and bring it to fruition.

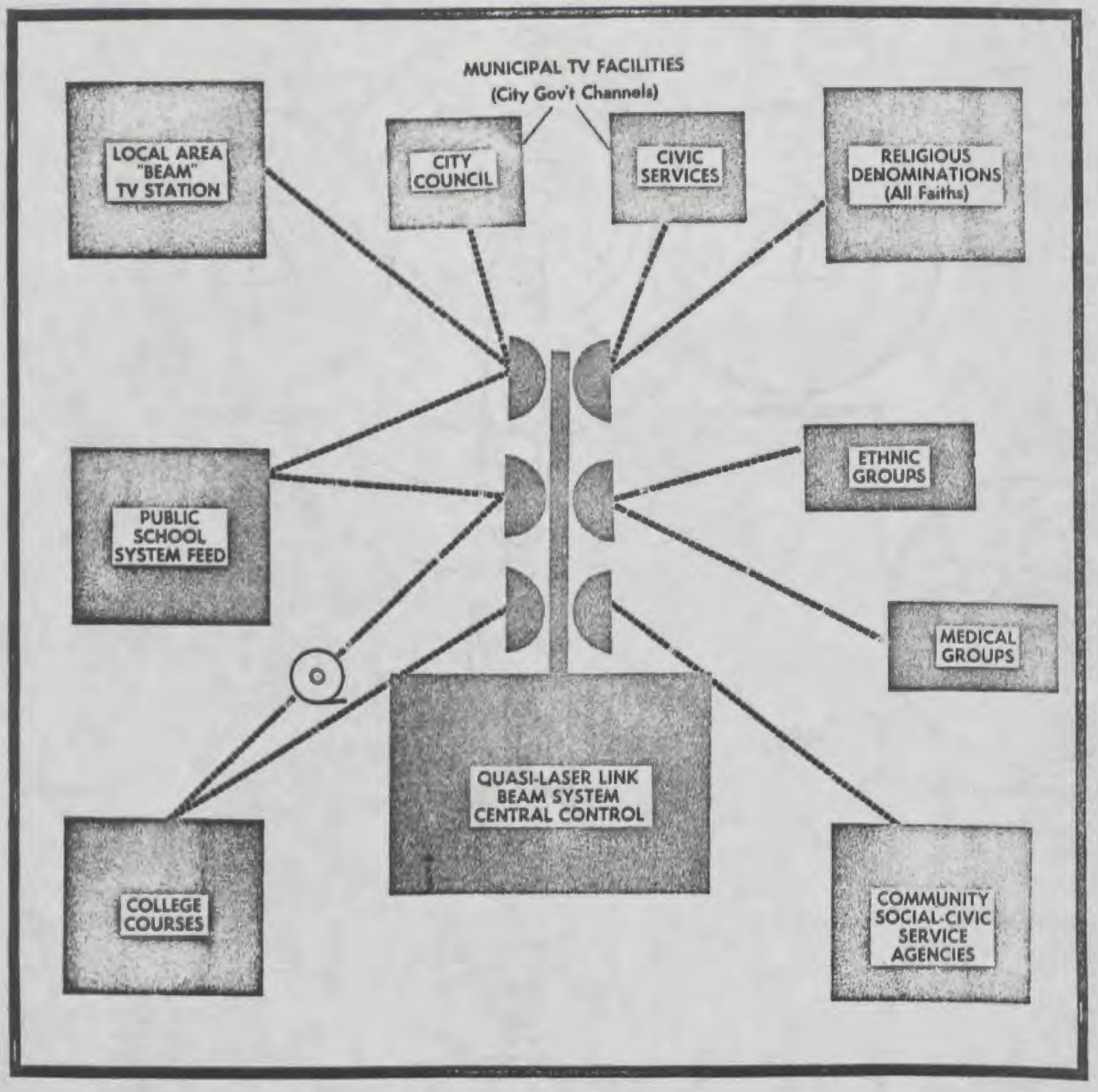
(Charts and block-diagrams illustrating the potential of the Quasi-Laser System at the local level are attached herewith.)

****

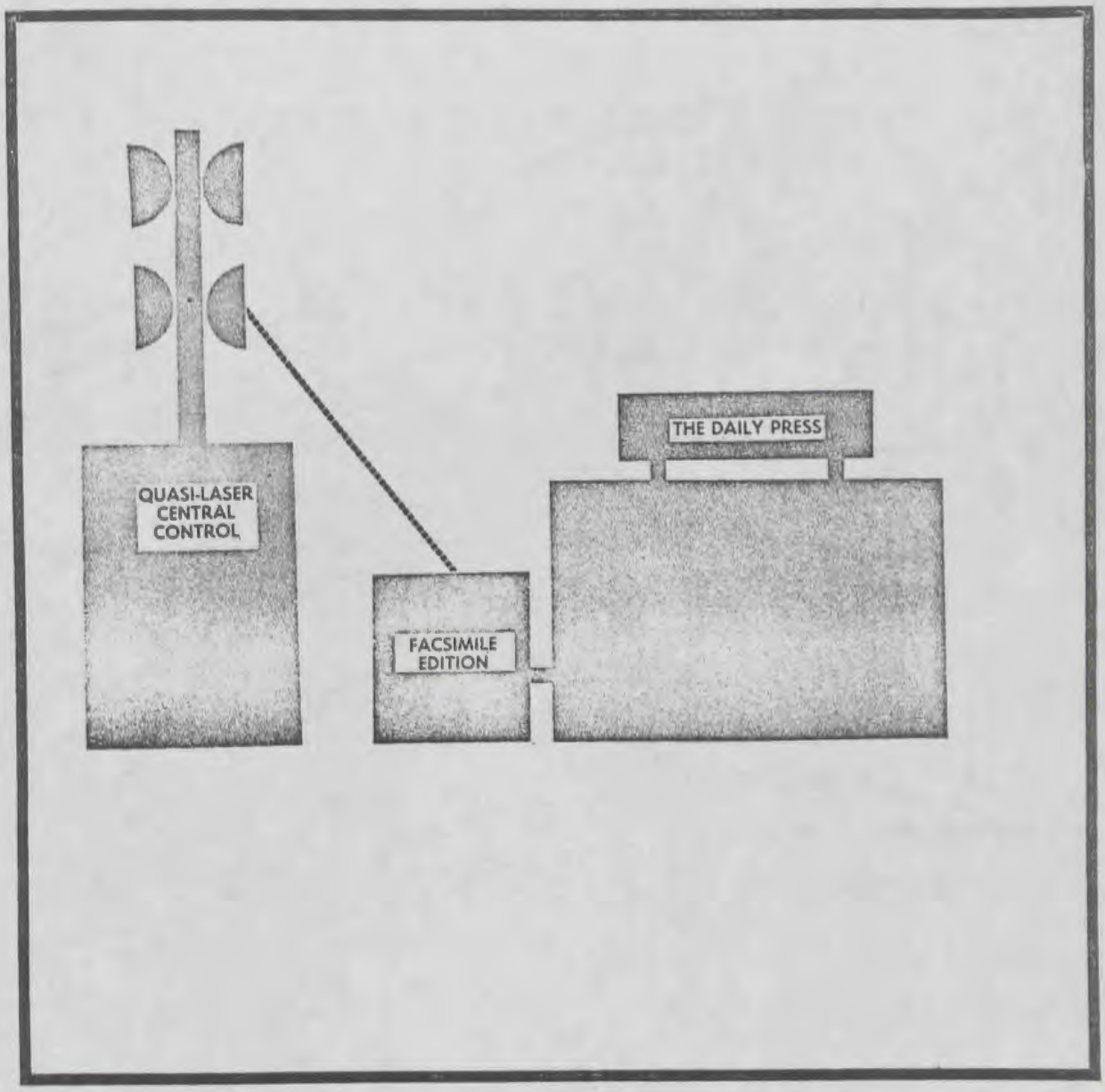
20-CHANNEL ITFS QUASI-LASER SYSTEMS IN LOCAL SCHOOL DISTRICTS TO SUPPLEMENT ONE-CHANNEL VHF OR UHF ETV STATION INSTRUCTIONAL PROGRAMS AND CONFORM WITH "BELL SCHEDULE" OF GRAMMAR, INTERMEDIATE AND HIGH SCHOOLS

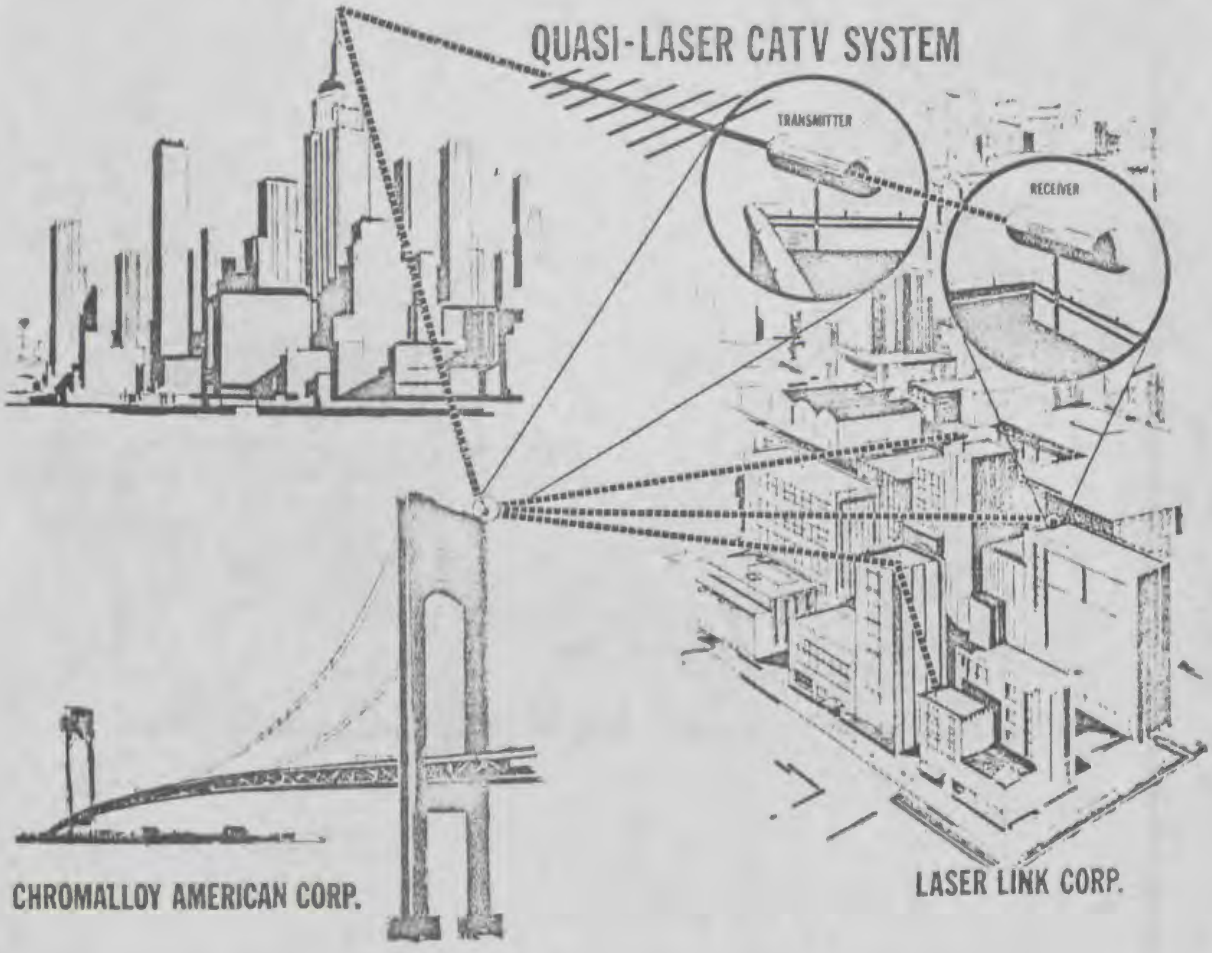


EDUCATIONAL, MUNICIPAL, CIVIC, RELIGIOUS AND
INFORMATION SERVICES
POSSIBLE ON MULTI-CHANNEL, QUASI-LASER LINK TV SYSTEM



TRANSMISSION OF FACSIMILE NEWSPAPERS VIA QUASI-LASER SYSTEM




QUASI-LASER CATV SYSTEM
TRANSMITTER
RECEIVER
CHROMALLOY AMERICAN CORP.
LASER LINK CORP.

Tom - I would approach this gingerly. By exposing our internal - we give opponents opportunity to shoot at it. They should have opportunity at the hearings.
Pete

March 23, 1970

MEMORANDUM FOR

Dr. Lee A. DuBridge
Dr. Paul McCracken

We have had many inquiries regarding the backup analyses of economic and technical matters relating to our domestic satellite policy statement. Both Tom Moore and Russ Drew did an outstanding job in developing these analyses. I think it would be very worthwhile to have them released so that they would be available to a wider audience, both in Government and in the industry.

However, I think it would be worthwhile to polish these reports up a bit before releasing them publicly, since much was added in order to reflect the interests of various members of the working group. I would suggest, therefore, that Moore and Drew be given the opportunity to revise these papers and to release them, not as the working group reports but as analyses that grew out of the policy review deliberations that are released as an example of the kinds of analysis that are required in the telecommunications policy area.

Clay T. Whitehead
Special Assistant
to the President

cc: Mr. Flanigan
Mr. Whitehead
Central Files

CTWhitehead:ed

March 27, 1970

Dear Mr. Gilmour:

The President has asked that I reply to your letter of March 4 regarding the recent White House policy announcements with respect to domestic communications satellite policy.

It is important to recognize that the Communications Satellite Corporation was created to establish a global communications satellite system. This has been achieved most ably by COMSAT and the system continues to grow. We do not propose any competition with COMSAT in this area.

Our recommendations for domestic satellite services were designed to encourage a healthy industry structure for the operation of satellite communications into our domestic communications industry, and we continued that COMSAT should stay interested to participate in this area.

We are pleased to have your views on this matter and appreciate your interest.

Sincerely,

Clay T. Whitehead
Special Assistant
to the President

Mr. Bryant F. Gilmour
H. F. Gilmour Co., Inc.
352 Forty-Third Street
Brooklyn, New York 11232

cc: Mr. Whitehead
Central Files

CTWhitehead:jk/ed

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HEATING EQUIPMENT

March 4, 1970

The Honorable Richard M. Nixon, President
White House
Washington, D.C.

Dear Sir:

Several weeks ago you announced that there should be competition, in your opinion, with the Communication Satellite Corp. known as Comsat. When this corporation was formed, it was understood that considering the research and the amount of money involved, that others would not be admitted to compete with Comsat.

Investors took a speculative risk and bought all of the stock that was offered. Two members of my family have a small amount. I do not see how you can retroactively change the game. This is very much like what happened to me when at one time life insurance was free in one's estate but gradually this was brought down to a point where people who took out that life insurance and paid for it over a period of years actually would have been better off in other investments. This is not honest treatment.

Yours very truly,

Bryant F. Gilmour

BFG:mh

Dimond

March 27, 1970

Dear Mr. Pay:

Thank you for your letter of March 4 enclosing your Project Delphi paper regarding a system for providing technical aid to developing nations by means of a consulting services satellite. This is certainly an important area.

I think it is useful to focus discussion, as your paper does, on the potential of space to contribute to the solution of many of the problems of developing countries. However, it is also important that we not oversell our technicalities nor underestimate the complexity and cost of providing it. We will need much further study, both of technology and its impact on social and economic problems, to make the kind of contributions you foresee. It is an important area of research.

Thank you for your interest.

Sincerely,

Clay T. Whitehead
Special Assistant
to the President

Mr. Rex G. Pay, Manager
Development Planning
Science and Environmental Systems Operation
Systems Group of TRW, Inc.
One Space Park
Redondo Beach, California 90278

cc: Mr. Whitehead
Central Files

CTWhitehead/jm/ed

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

OFFICE OF THE ADMINISTRATOR

MAR 24 1970

Dr. Clay Thomas Whitehead
Staff Assistant
Executive Office
The White House
Washington, D.C.

Dear Dr. Whitehead:

This forwards the draft reply you requested to the letter from Rex G. Pay in which he asks for comment on his paper outlining a consulting services satellite system to provide technical aid to developing nations.

Sincerely yours,

Willis H. Shapley
Associate Deputy Administrator

Enclosure

D R A F T

Mr. Rex G. Pay, Manager
Development Planning
Science and Environmental Systems Operation
Systems Group of TRW Inc.
One Space Park
Redondo Beach, California 90278

Dear Mr. Pay:

I have read with great interest your Project Delphi paper outlining a system for providing technical aid to developing nations by means of a consulting services satellite. I would raise only a few questions.

First, I wonder about the fundamental justification for a consulting services satellite. The paper lays great stress on the potential effectiveness of a video-telephone link in providing face-to-face contact with all the sense of immediacy and direct contact it would convey, but to what extent does the objective of assisting economic growth actually require the exchange of information in real time? Is there an adequate base of technical expertise in the countries most needing assistance to make real-time consultations feasible? The paper assumes 240 field users in the Central American region posited for a pilot system, but it does not present evidence to support either this assumption or the assumed number and distribution of field centers. Even if we assume that

the necessary base exists, what institutional structure will be available to support the implementation of real-time consultations?

Another question arises in connection with the paper's assumptions regarding the length and number of consulting sessions necessary. What is the connection between these assumptions and the need for and effectiveness of such consultations as a method of providing technical cooperation and assistance to developing nations, particularly as a substitute for present programs? Would experts need to talk to each other as much as twelve hours a week? How effective would consultations by videophone be in comparison with the display of figures, graphs and tables? The latter could be supplied with a video-character display substantially smaller in bandwidth than the 400 kHz currently used for videophone with quite adequate definition, while link calculations indicate that videophone picture quality, at greater bandwidth, would be quite poor. I do not suggest that new methods of communications might not be effective in connection with aid programs but only that more attention needs to be given to analyzing the content and impact of the communications themselves.

I also have questions about the section on system costs. In actual practice, the costs of operating a system,

taking into account redundancy and risks, have run much higher than the initial hardware costs of satellites in orbit, and field center costs should include installation, land, roadways, and annual costs as well as the costs of communications terminals themselves. All of these costs would provide only one type of aid--expert consultation--which would not be an alternative to the capital expenditures and other services in economic aid budgets which could not be provided by video telephone conversations.

I think it useful to focus discussion, as your paper does, on the potential of space and other advanced technology to contribute to the solution of many of the problems of developing countries. Nevertheless, there is so much uncritical faith among the developing countries in technology that we must take care not to oversell our technology nor to underestimate the complexity and cost of providing it.

Sincerely yours,

Clay Thomas Whitehead

HOLD

March 12, 1970

To: Mr. Willis Shapley

From: Tom Whitehead

Could you please prepare a draft reply to the attached letter from Rex G. Pay.

Attachment

TRW

8800.9-215

04 March 1970

Dr. Clay Thomas Whitehead
Staff Assistant
Executive Office
The White House
Washington, D. C.

Dear Dr. Whitehead:

I enjoyed your discussion of domestic space communications policy at the IEEE Wincon Conference in Los Angeles. I hope that the relationship with international policy will be touched on in the President's message on the space program. You seemed to imply that this might be the case in referring to the timing of your speech.

My interest is in the possibility of using international space communications for foreign aid, as described in the enclosed paper. I believe the system has advantages for both the donor and the receiver of foreign aid and conforms to the broad outlines of the present administration's foreign aid policy. If you can comment on the proposal and indicate whether it is worth pursuing, I would be most grateful.

I realize that a great deal more analysis could be done on the system proposed. However, this looks like a clear case where Gresham's law of analysis will apply : the quantitative will tend to drive out the unquantifiable. And here the unquantifiable is of particular importance.

Yours sincerely,

Rex G. Pay

Rex G. Pay, Manager
Development Planning

Science and Environmental Systems Operation

RGP:hec
Encl.

Project Delphi -- Technical Aid to the Developing Nations by Consulting Services Satellite

Paper for the AIAA 3rd Communications Satellite Systems Conference
April 6-8, 1970
Los Angeles, California

NATIONAL TV TRANSLATOR ASSOCIATION

This Letter From
Roundup, Montana

March 14, 1970

President Richard Nixon
The White House
Washington, D. C.

Dear Mr. President:

Our Association, made up of people, TV tax districts, cities, counties, and non-profit TV clubs operating TV translators, has just concluded a convention in Salt Lake City, Utah. We herewith submit for your consideration two resolutions. One of these resolutions deals with the re-appointment of FCC Commissioner Kenneth A. Cox, who we have found to be an honorable and just man of high integrity. We realize Mr. Cox is not a Republican, but we hope for the good of the people at large, you will re-appoint him at this time and appoint a Republican to fill the vacancy which will occur June 30, 1971.

Our second resolution deals with what we consider to be a most serious problem we will be facing in the very near future, and that is satellite to home radio and television broadcasting. We urge your most serious consideration of this problem. We wish in every way to protect our regional and local expression from the oblivion which one-world broadcasting is very likely to bring upon us.

Sincerely yours,

NATIONAL TV TRANSLATOR ASSOCIATION

Nat Allen

Judge Nat Allen
President

REAPPOINT KENNETH A. COX

Whereas Kenneth A. Cox served ably and with distinction as special counsel to the Committee on Interstate and Foreign Commerce of the United States Senate; and

Whereas Kenneth A. Cox served diligently and eminently as Chief Broadcast Bureau, Federal Communications Commission; and

Whereas the President of the United States having reposed special trust and confidence in Kenneth A. Cox with the advice and consent of the United States Senate appointed him a Commissioner of the Federal Communications Commission for a term to end June 30, 1970; and

Whereas Kenneth A. Cox has served the public interest with the highest integrity, leadership and distinction; and

Whereas in this era of rapidly advancing communication technology it is vital to the Nation and the public interest that men of distinction and expertise in communication serve as members of the Federal Communication Commission; No Therefore Be It

RESOLVED by the National Translator Association in convention assembled, that the President of the United States be urged to reappoint Kenneth A. Cox to a full term to the Federal Communications Commission upon expiration of his present term.

LIMIT SATELLITE TO HOME EXPERIMENTAL SERVICE TO
A SINGLE CHANNEL FOR TWO YEAR TRIAL

Whereas the problem of satellite to home radio and television broadcasting is in the offing; and

Whereas no decision on access availability to such microphones and cameras has yet been determined; and

Whereas such broadcasting must be multi-national or even world wide in scope; and

Whereas such service can not serve local, regional or even national needs; Now Therefore Be It

RESOLVED by the National Translator Association in convention assembled, that the President, the Congress and the FCC be asked to devote no more then one single channel to such service until a trial program service of at least two years duration has been experienced so determination as to the desirability for such service may be made by our people.

Dorsal

March 30, 1970

Dear Judge Allen:

The President has asked that I reply to your letter of March 14 regarding the National TV Translator Association's resolutions with respect to the reappointment of FCC Commissioner Cox and satellite to home radio and television broadcasting.

We agree with your finding that Commissioner Cox is a man both honorable and of high integrity. We appreciate your interest and the opportunity to consider your views in these two important matters.

Sincerely,

Clay T. Whitehead
Special Assistant to the President

Judge Nat Allen
President
National TV Translator Association
Roundup, Montana 59072

cc: Mr. Flanigan
Mr. Whitehead
Central Files

CTWhitehead:jm/ed

April 6, 1970

MEMORANDUM FOR

Dr. Thomas Moore
Dr. Russell Drew

After suggesting in my memorandum of March 23rd that the economic and technical analyses done for our domestic satellite review be polished up and released, I have had second thoughts.

In particular, with the FCC rule-making now in prospect, I would like to have the opportunity to review these reports one final time for any political problems before they are released. This does not detract in any way from my views of their quality and significance.

Clay T. Whitehead
Special Assistant to the President

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

CTWhitehead:ed

(7)

Western Union Seeks Sat System For Data Traffic

NEW YORK.—Western Union Telegraph Co. will submit an application to build and operate a domestic satellite system to handle its rapidly growing data traffic, Russell W. McFall, board chairman and president, said yesterday.

Mr. McFall's statement came on the heels of a Federal Communications Commission announcement (See related story, Page 10) seeking applications for domestic satellite systems.

WU has maintained an option on six sites for ground stations for such a system. It applied to the FCC to build a domestic satellite system in 1966, but the Commission turning it down, indicated it was premature.

American Telephone & Telegraph Co., yesterday, said it is developing plans to apply to the FCC to use satellite circuits domestically in the Bell System.

Its plans AT&T said, do not include applications by Western Electric Co., the Bell System's manufacturing unit.

TelePrompTer Corp., a major cable television operator, also indicated it would file an application.

In its statement, the FCC said it was requesting comments on "what initial role of AT&T in the domestic satellite field would be appropriate in order to achieve a market environment conducive to innovation and the vigorous exploration and development of the special communications service potentials of satellite technology."

...from ELECTRONIC NEWS
March 25, 1970

FCC Calls for Domestic Sat Bids

By HAL TAYLOR

WASHINGTON.—The Federal Communications Commission last week asked industry to submit applications to build a domestic communications satellite system.

FCC Chairman Dean Burch said that he hoped a decision on who will develop a system will be made by the end of 1970. He estimated that a domestic communications by satellite could be a reality in two years.

The Commission apparently has decided to drop its earlier plan to build a pilot system with Comsat responsible for its development.

The FCC decision also means that after some four years of considering the problem it is still not ready to decide who will build the system or exactly what kind of system is needed.

Mr. Burch said the Commission was unable to determine on the basis of information it now has whether a domestic satellite program could best be developed by authorization of a multi-purpose or specialized or a combination of systems or through an "open entry" policy.

The Commission, by a 6-1 vote, decided that it was not now in position to authorize any specific proposals, and concluded that it would be preferable "to permit potential applicants to take the initiative in submitting concrete system proposals for consideration."

Only one firm, Comsat, has definitely said it plans to submit an application. In the audience Tuesday, however, as FCC announced its decision were representatives of Hughes Aircraft Corp., Page Communications, Northrop and the Columbia Broadcasting System.

The Commission said that "it expected applicants to file complete and comprehensive proposals for entire systems including all technical and operational aspects." It said once an application is submitted it will issue a notice of proposed rulemaking. The notice will include the filing deadline for other applicants who wish to have their proposals considered.

"In this way we will have before us the complex of applications and comments we believe necessary for a determination as to policies," the FCC said.

Burch said he assumed Comsat and AT&T will file applications, "but I don't know whether broadcasters will file."

He estimated that the system will cost $100 million.

VARIETY March 25, 197

Applications for Domestic Comsat Systems Are Up for Grabs at FCC

Washington, March 24.

The FCC today (Tues.) threw itself open for any and all applications for domestic communications satellite systems. Applicants can ask for multi-purpose satellites or dedicate their plans to one service, such as network television, and the commission will not decide on whether to grant several or one of the different types of applications until the information is at hand.

Essentially, the FCC is buying more time and, as FCChairman Dean Burch pointed out at a press conference, finding out what dollars-and-cents proposals communicators can come up with. The FCC eventually may decide on a single multi-purpose system, combining broadcast, telephone and other uses, or it may opt to approve diverse and separate systems, Burch stressed.

"This agency is not a hardware agency," Burch said in underlying the FCC's reliance on industry to come up with hard and fast proposals. "We have not closed out any particular options at this time."

He refused to set a date when one or more applications would be approved, but he did mention the possibility of action by the end of this year, and he noted that estimates are that it will take two years from approval to operational status.

Commissioner Kenneth A. Cox was the only dissenter, and he concurred in part. But he said that instead of keeping the question open the commission "should affirmatively seek, as the foundation for the development of this important field of communications, proposals for a high capacity multi-purpose system." He also demurred from the commission's leeriness of American Telephone & Telegraph Corp., which it fears might dominate space as much as it does land. The FCC asked for comments on AT&T's role.

Applications are sure to be plentiful at the FCC, which has its hard decisions ahead of it. It had planned last summer to authorize a pilot system under Comsat, but deferred action pending a White House review. The White House suggested an "open skies" policy of accepting all applications, and the FCC still hasn't finally settled that issue, either.

FCC Throws Open Domestic Satcom Field

By Katherine Johnsen

Aviation Week & Space Technology, March 30, 1970

Washington–Federal Communications Commission last week invited all comers technically and financially qualified to apply for construction permits for domestic satellite communications systems.

"At about $100 million a throw," FCC Chairman Dean Burch said, the commission does not expect to be flooded with applications.

FCC estimates there are about 15 slots available in the synchronous orbit for U.S. domestic service, but the saturation of frequencies in the 4-gc. and 6-gc. bands near population centers could limit the ground segment.

In effect, the commission shifted the initiative to industry in the domestic satellite case that was formally instituted Mar. 2, 1966.

Uncertainties cannot be resolved by another round of written proposals, studies and comments, FCC said.

At this point, the commission wants to know "what persons, with what plans, are presently willing to come forward to pioneer the development of domestic communications satellite services according to the dictates of their business judgment, technical ingenuity and any pertinent public interest requirements . . .

"In short, it appears to us that domestic satellite communications do have the potential of making a substantial contribution to the nation's communications system. That being so, we should proceed with the authorizing process as promptly as possible . . ."

FCC's order was publicly welcomed by American Telephone & Telegraph Co., Western Union, the community antenna television industry (CATV), broadcast networks and others interested in the right of access in the domestic satellite communications field.

Communications Satellite Corp., which has maintained it is the only entity authorized by Congress to own and operate U.S. space communications systems, appeared glum.

The FCC order sets forth a formidable listing of technical and financial information that must be included if a construction permit application is to be accepted for consideration by the commission. For example, it must include separate applications for each space station and each earth station, including receive-only stations, transportable stations and stations for tracking, telemetry and command.

Meeting the application requirements established by the commission will take several months and an expenditure of about $250,000, one prospective participant estimated.

Following are responses to the FCC order, implementing an earlier White House policy statement on domestic satellites (AW&ST Feb. 9, p. 67).

■ CATV industry is thinking in terms of a satellite system linking its local community operations and emerging as a fourth broadcast network also supplying other communications services.

TelePrompter Corp., which now operates CATV systems in five states, last week announced its intention to file for a construction permit, and said:

"We consider our industry's full participation in a domestic satellite program a logical step toward a nationwide broadband communications system providing the American public with a greater diversity of television programing, access to computer technology and many other new services.

"We believe we have a convincing case for a major CATV role in this important new area of communications."

Hughes Aircraft Co., which has a minority interest in TelePrompter, has already made studies for the company.

TelePrompter hopes to merge with H & B American Corp. by mid-year. The merged organization would consist of about 100 CATV systems.

■ Network consortium of American Broadcasting Co., Columbia Broadcasting System and National Broadcasting Co. plans to await the outcome of a study of their transmission requirements before taking any action. The first phase of the study, being performed by Page Communications Engineers, Inc., will be finished in July.

Satcom Dissent

Washington–U.S. should give top priority to establishment of a single high-capacity multi-purpose domestic satellite communications system. Federal Communications Commissioner Kenneth Cox stated in a dissent from FCC's order last week establishing an open door policy for all types of systems.

Cox said "the general tenor of the . . . order downgrades this approach in favor of one which stresses multiple proposals for smaller, separate, specialized systems."

He predicted it will "engender relatively inefficient proposals involving no expansion in the technology and probably in such numbers that there would be conflicting requests for orbital slots and frequencies."

■ Western Union said that its electronic data and message traffic is rapidly growing and that the company will apply for construction of a satellite system to handle its requirements.

■ Data Transmission Co. is considering using satellites as part of a nationwide common carrier data transmission system linking 35 major metropolitan areas. Last November, the company asked FCC authority to construct the land microwave system at an estimated cost of $375 million.

■ RCA Alaska Communications, Inc., is studying an intra-Alaska satellite communications system. The company's purchase of Alaska's communication system for $28.5 million from the Air Force, recently approved by FCC, requires an investment in new Alaska facilities of $27.5 million over a three-year period.

■ Comsat reassured last week that it will apply for a construction permit.

Comsat's position that a single common carrier multi-purpose system should be established was supported in a minority dissent by FCC Commissioner Kenneth Cox (see box).

Comsat is now shopping for customers for either a multi-purpose system or a specialized system.

■ AT&T is developing its requirements for satellite circuits to add backup and flexibility to its vast terrestrial network. After these have been determined, the company said last week it would confront the question of whether it should own its own satellite facilities or lease. AT&T is expected to insist on owning of its own ground terminals.

FCC as well as the White House are concerned that AT&T ownership of a satellite system might discourage or foreclose other prospective entrants.

Questions raised in the FCC order, on which the comments of applicants were requested, included:

■ Whether AT&T might eliminate satellite competition by subsidizing its specialized services with revenues from its public message monopoly?

■ Whether innovative satellite planning by AT&T would be constrained by its existing terrestrial facilities and services?

■ Whether AT&T expansion into the satellite field will prevent Comsat or another entity from proposing a common carrier multi-purpose system since they could not compete on an equal footing with a similar proposal by AT&T? For example, AT&T not only has the financial resources at hand, but it is the only organization that could project a system based on a 100% traffic factor.

Draft

April 6, 1970

I know the question of domestic communications satellite policy is a matter of considerable interest to broadcasters. As you know, the Administration recently made recommendations to the FCC suggesting, subject to appropriate constraints, that Federal policy should encourage maximum use of this resource to the extent that it is economically and operationally feasible.

This policy approach is designed to encourage the potential users of satellite service to think carefully about their needs and the costs of satellite service. It also encourages potential suppliers of these services to be responsive to the customers' needs.

One of the first major uses of communications satellites in domestic service is likely to be for television program distribution. As you know, the networks are now studying the feasibility and economics of this approach. If the broadcast community decides that it can best achieve program needs through a satellite system, the recent FCC action on this matter makes it possible for them to apply directly for permission to establish a system or to make other arrangements with specialized or common carriers.

We are hopeful that this new approach to communications policy will encourage service innovations that will be beneficial in a timely way to the industry and to the public.

Domsat

February 7, 1970

Dear Dr. Bensman:

In response to your request for the report I submitted on our domestic satellite policy, I am enclosing a copy of our press release and our memorandum to the FCC over Peter Flanigan's signature. This memorandum was the final product of my work in this area; there was no other report, since our internal working papers are not to be released.

Sincerely,

Clay T. Whitehead
Staff Assistant

Enclosures

Dr. Marvin R. Bensman
Associate Director of Broadcasting
and Director of Graduate Studies in R-TV-F
Department of Speech and Drama
Memphis State University
Memphis, Tennessee 38111

cc: Mr. Whitehead
Central Files

CTWhitehead:jm

MEMPHIS STATE UNIVERSITY
College of Arts and Sciences
MEMPHIS, TENNESSEE 38111

Department of Speech and Drama

January 27, 1970

Mr. Clay T. Whitehead
Special Assistant to the President
President's Office Building
Washington, D. C.

Dear Mr. Whitehead:

I heard that you recently submitted a special report to President Nixon concerning Communication's Satellites and their development.

I am conducting research on the history and development of satellite communications and would appreciate receiving a copy of your report.

Thank you very much for your consideration.

Sincerely,

Marvin R. Bensman

Dr. Marvin R. Bensman
Associate Director of Broadcasting &
Director of Graduate Studies in R-TV-F

YALE UNIVERSITY
LAW SCHOOL
NEW HAVEN, CONNECTICUT

EUGENE V. ROSTOW

February 2, 1970

Mr. Clay T. Whitehead
The White House
Washington, D. C.

Dear Tom,

Many thanks for sending me the long awaited domestic satellite policy statement of January 23. As you can imagine, I read it with great interest, and generally with enthusiasm. I had only two questions, on a first reading.

What position do you take on the Comsat-broadcasters plan? Will it go forward at all without the assurance of at least a trial period of monopoly? The economics of the technology are pretty dubious, vis-a-vis the A.T.&T. long lines, and perhaps those of the new technologies just over the horizon as well.

Secondly, is the rather general sentence on Intelsat, at the end, sharp enough to indicate that we think the 1964 agreement requires us to follow the same procedure ourselves that we persuaded the Canadians -- and, prospectively, the Japanese -- to use?

It's well written, too.

With every good wish,

Yours sincerely,

Gene Rostow

EVR/pam

Comsat

February 10, 1970

Dear Gene:

I was pleased to hear that your reaction to our domestic satellite proposal was "generally enthusiastic."

With regard to your question about the Comsat-broadcasters plan, the honest answer is that we will just have to see if Comsat can convince the broadcasters it has something to offer. The big question, I think, is how all this will relate to AT&T. Our approach is to give the industry the flexibility to accommodate satellite technology as economically useful vis-a-vis AT&T, prospective technologies, and likely market developments.

With regard to your question about INTELSAT, it may well be that our single reference to INTELSAT could have been more specific. However, in view of the upcoming resumption of the plenary conference and the uncertainties about future developments, it seemed appropriate to establish only the general principle without getting into too much detail.

We will have to follow closely the industry developments as a result of this policy, since I realize that we have raised as many questions as we have answered. After you or some of your colleagues have had a chance to study this document in more detail, I would be interested in any further reflections you might have.

Sincerely,

Clay T. Whitehead
Staff Assistant

Mr. Eugene Rostow
Yale University
New Haven, Connecticut

cc: Mr. Whitehead
Central Files

CTWhitehead:jm

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

UNITED STATES GOVERNMENT

Memorandum

Draft

TO : Dr. C. T. Whitehead **DATE:** 13 February 1970

FROM : IOP/PA - William N. Lyons L

SUBJECT: Domestic Satellites

Felines are killed by curiosity, but mine was aroused when you told me some reporter observed that there was much similarity between the Rostow report on a domestic satellite system and your recent memorandum to the FCC. Any comparison is of marginal value for you, I know, but this may save you the time of rereading the Rostow report, as you indicated you might do.

Measured on a line-inch basis or by word count, with no attempt to weight substance, of course, there is considerable similarity. After all, you both were dealing with the same problem. To claim similarity here is like saying an aeroplane and a thrashing machine are similar in that both are composed of identical nuts and bolts.

I read again, this time in juxtaposition, the two documents. Detailed analysis has no useful function, but for answers to stray correspondents this attempt at a ready reference may have some value.

Issues on which there is agreement:

1) All policy objectives;

2) Feasibility of the technology;

3) Economic potential of satellites in immediate future;

4) Inability, at present time, to identify major economies of scale;

5) Necessity for a tentative trial run;

6) Obligations to INTELSAT and ITU; and

7) Security needs.

Two items cannot be cast on the Procrustean bed of "either-or." Both agree herein that further study is called for, but the Rostow recommendations are premised on a greater proclivity for caution:

1) Spectrum scarcity; and

2) Orbital parking.

5010-106

But there is no similarity between the two on what the Fourth Estate somewhat indelicately refers to as the "gut" issues:

	Task Force	You
1) Public interest involved	Considerable	Little
2) How public interest best served	Pilot monopoly	Competition
3) Are satellite communications a natural monopoly?	Yes (by indirection)	No
4) Effect of competition	"Cumbersome"	Healthy
5) Degree of regulation required	Considerable	Little as possible
6) Nature of satellite	Multiple-purpose	Makes no difference
7) Role of Comsat	Monopolistic trustee	Competitor
8) Who monitors trial period?	Executive Branch	FCC

Monday 2/16/70

2:10 Lois Vermilion, McGraw-Hill, called. She said there was a quotation in the article by Jack Gould in Feb. 12th issue of NY Times that seemed contradictory to the policy set forth in the memo to Dean Burch on domestic satellites. She wants to know if this practice would or would not be allowed.

Unclear what the quote means. Wouldn't want to comment on such a slim foundation.

737-6630

2/18 Advised Miss Vermilion

NEW YORK TIMES
Thursday February 12, 1970

Networks Will Discuss Satellite As Way to End A.T.&T. Costs

By JACK GOULD

The three commercial television networks have curbed their immediate interest in using a domestic satellite system to relay their programs across the country. They have engaged Page Communications Engineers, Inc., of Washington, to study all possible methods of interconnecting their affiliated stations, whether by ground or microwave facilities.

Representatives of the networks and the Page concern will meet in New York tomorrow to discuss the study, which has for its primary purpose finding some means to avoid repeated rate increases asked by the American Telephone and Telegraph Company for relaying shows. The National Broadcasting Company will be host to the opening meeting at 30 Rockefeller Plaza.

Contracts with Page Engineering have been signed. There will be a review of the differing relay requirements of N.B.C., the Columbia Broadcasting System and the American Broadcasting Company.

Options Are Kept Open

None of the parties to the arrangement wanted to be identified by name. They said it should not be concluded that there might soon be an all-satellite system, or that there was no possibility of setting up land-line facilities, either under the networks' own management or under lease from other companies.

"All possible options are being kept open," one official remarked. "There are still many unexplored possibilities in ground facilities either in microwave circuits or coaxial cable. We must be sure which are best suited to our needs and offer a real opportunity to avoid A.T. & T.'s escalating rates."

The first phase of study by Page, which has had extensive experience in both ground and satellite television technology is to be ready by July 1. After that, probably, will come many months of examining the legal, economic and engineering aspects of the proposals.

"We're still talking about things three to five years away," one official said.

System Needs a Base

The heavy daily use of relay facilities by the television industry has been regarded as the essential economic base for a domestic satellite system. Such a system has been proposed by the Communications Satellite Corporation the Ford Foundation and others.

Page Engineering, as part of its study, will confer with COMSAT and A.T.&T. before submitting its report. One official noted that in the heavily congested Eastern Corridor land lines might be the most practical, while for the long haul to the Pacific time zone limited use of a satellite might be adequate.

Over recent years A.B.C., N.B.C. and, most recently, C.B.S. have suggested a satellite system intended solely for TV, but tomorrow's meeting bares out informed speculation that many months of research would be a necessary prelude. One official said over emphasis on a domestic TV satellite system could seriously mislead the public, because as yet it was only one of several concepts and by no means a certainty.

Nonprofit Unit to Attend

At the commercial TV networks it was said a representative of the Corporation for Public Broadcasting, the network of noncommercial stations, would attend the meeting. It was reported to be the consensus of the commercial industry that under whatever system was finally adopted, the public broadcasting agency would receive network service without charge.

Among the complexities to be reviewed in the Page study, it was said, would be the position of the Hughes Sports Network, which has shown interest in becoming more of a regular national service, and the cable TV industry.

"I think there is one common interest in avoiding entirely or checking now the rising rates of A.T.&T., which lumps together its TV revenue with its other services," an official said. "If the commercial networks make any use of a public relay facility, then I think we would have to allow all others to come in on it. But if we decide to establish all or part of the ground system at our own expense, or lease facilities from an A.T.&T. competitor in some sections of the country, then other interests might have to fend for themselves."

Need of Others Greater

Another official remarked that the United States actually might be the fourth or fifth country to become interested in domestic satellite TV, because this country is already so highly developed electronically.

For a nation like India, with no national TV service, he added, the satellite is a logical and sensible solution he said the same could be said for Canada and the Soviet Union, which are faced with the task of getting TV signals to remote areas inaccessible by conventional ground relay facilities.

An A.T.&T. increase to the commercial networks went into effect on Oct. 1, but the money is being held in escrow pending a hearing on a challenge by the chains before the Federal Communications Commission. It has been widely reported that at the hearing or shortly thereafter A.T.&T., may submit a petition for still another boost, asserting that its costs have risen since it asked for the first increase over 18 months ago.

Network officials said that of all fixed charges for so-called hardware in television, the most onerous expense was the interconnection of stations.

.... from TELEVISION/RADIO AGE, 9 February 1970, page 11

Publisher's Letter

Domestic satellite system can be a boon, but it also has problems

The long-awaited White House recommendations on domestic satellites carry with them several important qualifications. One of these is the speed with which the FCC can act on these recommendations. The other is the speed with which the networks can move in getting a domestic satellite system launched and operative.

Over the past five years, there has been much more talk than action on domestic satellites. The first job facing the networks is to come up with a common denominator of what is actually needed. This will include determining how many channels are needed, what and how wide the coverage. Page Communications has been engaged to study the cost as well as the physical plant needed. The networks are currently spending about $60 million a year with AT&T on interconnections. It is expected that these costs will continue to climb, but that a statellite system would save 20-30 per cent of AT&T costs.

Through the years AT&T and the broadcasters have had an uneasy alliance. A domestic satellite system will give the networks as well as the broadcasters an opportunity to pull free from the stranglehold that the AT&T now exerts.

Should the domestic satellite be a reality within two to three years, it could be the most constructive and enduring monument of Dean Burch's administration. It would benefit the public as well as the broadcasters. It would encourage fourth network competition. It would help such news gathering organizations as UPI and Associated Press, who are faced with staggering line costs. In short, it would help everyone. If we can reach the moon in 10 years, we should be be able to launch a domestic satellite in two.

Agency expansion overseas will have impact at home

Back in 1968, top U.S. agency executives were saying that expansion abroad was leveling off, that the best agencies in Europe and elsewhere were either already linked to or part of U.S. agencies, and it was too risky to start from scratch in major foreign cities.

These executives may well have been covering up, because last year and the first month of this year saw an unprecedented expansion by U.S. shops in foreign fields. At the end of January, it was announced that SSC&B had bought 49 per cent of Lintas, which translates into about $90 million in billings, and the talk is that the U.S. firm may yet buy the remainder of the Unilever agency. A week earlier, a three-way linkup of Needham, Harper & Steers; S. H. Benson of England and Univas/Havas Conseil of Franch was revealed, yielding a major complex.

Both moves had been heralded last year, but the dimensions of the new international organizations were unexpected. Last year Leo Burnett acquired $85 million in billings from the London Press Exchange, and Lennen & Newell completed formation of a 30-member partnership.

These developments are a reflection of pressures from U.S. clients, who are expanding abroad. They augur a faster spread of U.S. marketing techniques, which is one reason agencies abroad seek the linkages that have taken place. Other factors may be at work, though there is some dispute about them. One is the theory that U.S. agencies, foreseeing a contraction of agency functions here, are looking abroad for new sources of income. Another is the idea that U.S. clients prefer one agency or one agency network to handle all their international advertising. The international expansion is bound to have an impact on the U.S. agency business.

Cordially,

S. J. Paul

70 NATIONAL JOURNAL
1/31/70 p. 228

Federal Communications Commission

White House proposes commission permit satellite competition

The domestic satellite issue—a multi-million-dollar sleeper for the last four years—is on the verge of resolution.

The White House has recommended that any corporation or group with enough money be allowed to establish a domestic satellite system, with a minimum of regulation by the Federal Communications Commission (FCC).

The final decision on who will be allowed to operate a domestic satellite system rests with the seven FCC commissioners. The Communications Satellite Corp. (Comsat) and American Telephone and Telegraph Co. (AT&T), both subject to FCC regulation, have high stakes riding on the commission's decision. The television networks, airlines (which maintain a constantly changing list of reservations across the country) and computer sharing companies are major potential customers for or operators of a domestic satellite system. *(See satellite box.)*

Presidential study: On Jan. 26, the White House recommended that the FCC act immediately to open the field of domestic satellites to competition among private and governmental entities, rather than grant a monopoly to a single corporation. The recommendation is the result of a domestic satellite study begun last fall. *(For make-up of study group, see box.)* It came in a memorandum signed by Presidential assistant Peter M. Flanigan, which encouraged the FCC to minimize "unnecessary regulatory and administrative impediments" to satellite development and to foster "innovation and flexibility within the communications industry." The FCC, it asserted, should exercise its regulatory powers over satellite owners only to guard against anticompetitive practices such as discriminatory pricing, and subsidization of a satellite system by proceeds from a service over which the system owner has a monopoly—for example, telephone service.

No mention was made in the memorandum of providing free satellite service to educational television.

Johnson task force: The recommendations of the Nixon White House are in striking contrast to an earlier task force report which suggested that Comsat alone be authorized to establish a pilot domestic satellite system. The report was ordered but never endorsed by President Johnson. The Johnson task force recommendation, however, is understood to be the same as the position informally adopted by the FCC and submitted to the White House in early 1969.

Satellite Parking Places

Communications satellites occupy space about 23,000 miles above the equator. There are now six commercial communications satellites in orbit around the earth for international use. Because of their position, they revolve in an orbit at the same speed as the earth revolves on its axis, and they therefore maintain a fixed location in relation to the earth's surface. Small jets affixed to each satellite can be triggered from earth to correct a wandering satellite's course.

The "parking space" for satellites above the equator is limited. FCC Chief Engineer William H. Watkins says that there are only 16 so-called "slots" from which a communications satellite can serve the 48 contiguous United States. Only the westernmost five can accommodate service to Alaska. Some of these 16 slots are considered desirable by other countries for their own domestic use.

Watkins said that although there is a limit to the number of satellites which can be put up, shortage of space is not a drastic problem and should not be turned into an international "political football."

Ground facilities called earth stations are used to send and receive satellite signals. Under FCC regulations, U.S. earth stations for international use are half-owned by Comsat and half-owned by common carriers in proportion to their use. FCC rules do not permit even partial ownership of earth stations by private users. A review of earth station ownership, however, is now underway at the commission.

Comsat: Currently faced with a diminishing of power on the international front *(see Comsat box)*, Comsat now confronts the spectre of unlimited competition on the domestic scene. A sharp drop in the value of Comsat stock—down 6.75 points after release of the White House statement and still falling the next week—reflects a blow to public confidence in the corporation. Comsat has invested an estimated $100 million in technology for a domestic satellite.

By placing Comsat on an equal footing with other carriers and private corporations, however, the White House recommendation would absolve Comsat's domestic system from the rules set up by the FCC for its international systems. For example, it would allow Comsat to lease circuits directly to satellite users. Under present FCC rules, circuits may be leased only to other common carriers who release them at a profit.

Current rules on earth station ownership would also be subject to change. William L. Miller, director of domestic services at Comsat, told the *National Journal* that his organization thinks that Comsat should continue to own and operate earth facilities which have the capability to both receive and transmit signals. Comsat is relatively open, he said, to user ownership of receive-only stations.

Despite the White House memorandum, Comsat continues to contend that legislation would be needed for any other entity to enter the field of satellite communications. A Comsat official told the *National Journal* that the corporation will continue to press this position in filings to the FCC.

AT&T: H.I. Romnes, board chairman of AT&T, said Jan. 26 that his corporation welcomed the White House recommendation and plans to apply to the FCC for permission to use satellites to fill out its domestic communications network. On Dec. 18, before the House Science and Astronautics Subcommittee on Space Sciences and Applications, an AT&T vice president testified that the "economics of satellites for domestic uses are not attractive at present" because of a decline in the cost of land communications.

A spokesman for AT&T told the *National Journal* that his corporation foresees no immediate economic benefits from satellite use. He said that the high cost of satellites will offset increased profits from diminishing land-line costs.

In mid-October, AT&T adopted a corporate position on domestic satellites very similar to the White House recommendation. In 1966, AT&T had argued that only Comsat was authorized by law to own a satellite system and that only Comsat and common carriers could own the land stations which receive and transmit satellite signals.

An official in the FCC's common carrier bureau said that AT&T probably stopped supporting Comsat's lone role in satellite communications because of the growth in competition between the two corporations. Although AT&T was a pioneer in satellite communications with its Telstar satellites and currently owns 29 per cent of Comsat, the corporation is committed to cable for the bulk of its domestic common carrier service.

Television network: The three major broadcasting networks have welcomed the White House recommendation, which would allow them to set up their own system for television interconnection. The White House mem-

Study Group

President Nixon's domestic satellite study group was coordinated by Clay T. Whitehead, an electrical engineer, former consultant to the Rand Corp. and the Budget Bureau, now staff assistant to Peter M. Flanigan. Other White House staff working with the group were Flanigan, his administrative assistant Jonathan C. Rose and William E. Kriegsman, another staff assistant.

The following government agencies were represented at group meetings:

Office of Science and Technology
Council of Economic Advisers
Budget Bureau
Office of Telecommunications Management
Federal Communications Commission
Justice Department
National Aeronautics and Space Administration
Commerce Department
Post Office Department
Transportation Department
National Aeronautics and Space Council

Comsat: A Carrier's Carrier

The Communications Satellite Corp. (Comsat) is a corporation *ex machina*, created in 1962 by Act of Congress (PL 87-624) to handle the growth of commercial space-age communications for the United States on the international scene.

Sixty-three per cent of Comsat's 10,000,014 shares are held by public stockholders. The remaining 37 per cent of shares are owned by common carriers. The following are major common carrier stockholders in Comsat and their percentage of interest: American Telephone and Telegraph (AT&T)—29 per cent; General Telephone and Electronics Corp.—3.5 per cent; Radio Corp. of America World Communications Inc.—2.5 per cent; International Telephone and Telegraph World Communications Corp.—1 per cent.

Comsat began to show an operating profit in 1968, but stockholders have yet to receive a dividend.

Since 1964, Comsat has been both major owner and manager of the International Telecommunications Satellite Consortium (Intelsat). Intelsat is a profitmaking organization made up of 70 nations to develop a global communications network.

Present operating arrangements for Intelsat—under which Comsat, with 53 per cent interest in the system, has absolute veto power and as manager handles most construction contracts—have been challenged by other members of the consortium, including the United Kingdom, France and Canada. Comsat officials predict a diminishing ownership of Intelsat by Comsat and a corresponding loss of control over the system.

As a "carrier's carrier," Comsat is subject to strict control by the Federal Communications Commission (FCC), and the corporation has often complained of over-regulation. Comsat has not won widespread popularity at the FCC. A former FCC commissioner characterized Comsat as "uncooperative" in comparison with AT&T, a sentiment echoed by members of the FCC staff.

Comsat's biggest customer and most influential stockholder is AT&T. The common carrier stockholders of Comsat currently elect four members to the corporation's 15-member board of directors. Two of Comsat's present directors are top AT&T officials; one is Harold M. Botkin, an assistant vice president of AT&T, and the other is AT&T Vice President and General Counsel Horace P. Moulton. A third Comsat director is James E. Dingman, a former vice chairman of the board of AT&T. Speaking of AT&T's influence, one Comsat official said, "If they don't give us traffic, we'll go broke."

orandum, however, did refer to possible antitrust problems which might arise should the networks join to own a domestic satellite system.

At present, the networks are retaining the firm of Page Communications Engineers Inc. to study the economics of a satellite system devoted to television use, a spokesman for the Columbia Broadcasting System told the *National Journal*.

A major consideration in the study will be the possibility of inexpensive construction of facilities to receive satellite signals. If each network-affiliated station could afford its own reception device, much of the cost of overland signal transmittal from a central receiver to the stations would be eliminated. If a central receiver were used, common carrier cable and microwave services would still constitute a major network expense.

Current dissatisfaction with their present network arrangements has contributed to the urgency with which the networks are seeking satellite relief. In October, AT&T raised its annual charges for network television interconnection by $20 million. AT&T provides interconnection to the networks for only 14 to 18 hours per day.

The educational network, while receiving interconnection service from AT&T at a reduced rate by congressional decree, is also unsatisfied with the status quo. The special interconnection service afforded to educational television is subject to interruption or pre-emption when AT&T wishes to make use of the circuits for something else.

If the networks operate their own satellite, they are expected to give the educational television network free access to the system.

Outlook: The FCC is now expected to depart from its earlier decision favoring Comsat, an FCC staff worker told the *National Journal*, and adopt a policy conforming substantially to the White House recommendation. A proposed decision is being drafted, he said, by Ruth Reel and Robert D. Greenburg—lawyers in the office of FCC General Counsel Henry Geller.

The final FCC decision will probably not be made along party lines. Among the strongest proponents of competition on the commission are Republican Chairman Dean Burch and Democratic commissioner Nicholas Johnson.

Elizabeth Shriver

FCC notes

• Commission announced proposed rulemaking covering cable television systems with less than 500 subscribers. Comments due on Feb. 2. Jan. 21 (35 Fed Reg 815). *(For story on CATV legislation, see p. 15.)*

In the media

• Consumer Reports: "Making FCC's Mission Impossible." Proposed legislation to regulate challenges to renewal of radio and TV licenses. February 1970. *(For story on FCC licensing policy, see p. 123.)*

Securities and Exchange Commission

SEC notes

• Commission announced it had decided against endorsement of self-regulation of mutual fund fees by the Investment Company Institute, the industry's trade organization. Chairman Hamer H. Budge stated that self-regulation would "be dominated by those who receive such fees and have a vested interest in insulating them from effective control." Jan. 19.

• Division of Corporation Finance issued a guide on preparation of prospectus as relating to public offerings of interests in oil and gas programs. The guide is designed to bring uniformity to the sequence of disclosures and their general content. Jan. 20 (70-13).

• Commission gave notice of proposed technical amendments in annual income and expense reports to clarify data for statistical [illegible] Jan. 20 (35 Fed Reg [illegible]).

(11)

Europeans mount a challenge to Comsat's role

BUSINESS WEEK, FEBRUARY 24, 1973

More troubles for the Communications Satellite Corp. are likely to come from a two-week meeting of the 73 nation members of the International Telecommunications Satellite Consortium (Intelsat) which begins in Washington on Monday.

Comsat dominates the consortium and an important bloc of members—mostly the Europeans—want to see this dominance diluted. They plan to attack from two directions.

- They want to have Comsat replaced as manager of the system and will move to arrange the charter to bring this about.
- They will argue that Comsat's share of ownership in Intelsat should be cut from 50% to 40%, and to do this will try to change the basis on which shares are calculated.

The revolt is partly nationalistic. The other members are irritated by U. S. domination of the organization. There is a more practical reason, too. The dissidents want their own nationals to get more experience in managing and operating the space communications business. The core of expertise built up in running Intelsat could be increasingly important in the future.

The State Dept., negotiating for the U. S., will respond that Intelsat is running well under the present setup, and that management should not be changed without a comprehensive study.

It is the second blow in two weeks for Comsat, following a White House recommendation favoring the creation of competing domestic satellite systems. If this goes through, Comsat will be thrown into a bitter battle with AT&T, which ironically is the biggest Comsat shareholder.

75

INTELSAT

BY JOHN M. HIGHTOWER

WASHINGTON (AP)-THE LARGEST INTERNATIONAL CONFERENCE TO BE HELD IN WASHINGTON WILL OPEN MONDAY FOR AN ATTEMPT TO AGREE FINALLY ON AN INTERNATIONAL TELECOMMUNICATIONS SATELLITE ORGANIZATION.

MOST OF THE COUNTRIES ARE DETERMINED TO REDUCE THE POWER OF THE UNITED STATES IN THE NEW PERMANENT SYSTEM AS COMPARED WITH U.S. DOMINATION OF THE TEMPORARY ORGANIZATION, CREATED IN 1964.

"WE'RE TRYING TO FIT TOGETHER A KING OF JIGSAW PUZZLES WITH SOMETHING IN IT FOR EVERYBODY," ONE OFFICIAL SAID.

AS THE INTERESTS OF OTHER NATIONS ARE RECOGNIZED, THERE WILL INEVITABLY BE A WHITTLING DOWN OF AMERICAN POWER, WASHINGTON AUTHORITIES AGREE, BUT THE NIXON ADMINISTRATION IS DETERMINED TO AVOID ANY LOSS OF EFFICIENCY DURING THE TRANSITION PERIOD.

THE CONFERENCE IS TO EMBRACE MORE THAN 100 NATIONAL DELEGATIONS. OF THE TOTAL 73 WILL COME FROM COUNTRIES WHICH BELONG TO THE GOING SYSTEM AND ABOUT 30 FROM OTHER COUNTRIES WILL ATTEND AS OBSERVERS. THESE INCLUDE THE SOVIET UNION AND SOME EASTERN EUROPEAN COMMUNIST COUNTRIES.

AMBASSADOR ABBOT WASHBURN WILL BE THE CHIEF U.S. NEGOTIATORS.

INTELSAT IS A JOINT INTERNATIONAL VENTURE WHICH PROVIDES WORLDWIDE COMMUNICATIONS TODAY WITH SATELLITES AT AN ALTITUDE OF 22,300 MILES OVER THE ATLANTIC, PACIFIC AND INDIAN OCEANS.

LAST JULY THE SATELLITE COMMUNICATIONS NETWORK--WHICH CAN HANDLE ANY KIND OF MESSAGE OR ELECTRONIC TRAFFIC--SERVED HISTORY'S LARGEST AUDIENCE OF A SINGLE EVENT--MAN'S FIRST LANDING ON THE MOON.

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2/17/70 ?

Major Networks Study Domestic-Satellite Use

By a WALL STREET JOURNAL Staff Reporter

NEW YORK—The three major networks—American Broadcasting Cos.' ABC division, Columbia Broadcasting System Inc. and RCA Corp.'s National Broadcasting Co.—have retained Page Communications Engineers, Washington, to make a cost and feasibility study of a domestic satellite system for television and radio network program distribution.

Page is a subsidiary of Northrop Corp. The requirements for national interconnection of Corp. for Public Broadcasting will be part of the study.

The move confirms earlier reports that the networks had been planning the step and had already held informal talks with Page. Last month, the Nixon Administration indicated that it would favor such a satellite system.

Alan R. Novak

February 5, 1970

Mr. Thomas Whitehead
The White House
1600 Pennsylvania Ave.NW
Washington, D. C. 20006

Dear Tom:

I thought you might be interested in this letter that I have written to the Times on your recent Memorandum. My congratulations for a good job.

Sincerely,

Alan

ALAN R. NOVAK

Dear Sir:

The recent White House Memorandum on Domestic Communication Satellite Policy recommending free competitive entry rather than regulated monopoly as the initial guide to government policy in this area is, in my judgment, a constructive step toward a new national communication policy.

For many years, regulated monopoly has been the rule in the communications industry. More recently, however, the pressure of advancing communications technology, coupled with the tremendous growth in demand for traditional and new services, has forced a search for areas where free market competition, generally assumed to afford the most reliable incentives for innovation, cost reduction, and efficient resource allocation, could be permitted.

As Staff Director of President Johnson's Task Force on Communications Policy, I experienced at first hand the fierce struggle to redefine the boundary lines between regulated monopoly and competition. Despite some internal disagreement, the Task Force recommended that in the area of domestic telecommunications: "Public policy should promote an environment assuring free and competitive opportunity for such [technological] developments without impairing the integrity and viability of the basic telephone network", and in particular, that for the first time, competitive entry be permitted in the provision of private line for-hire services.

Subsequently, the FCC endorsed the competitive principle in the landmark "MCI" case, involving microwave services.

The Task Force did not recommend that the principle of free entry be applied to domestic satellites in the absence of any operational experience, but it did acknowledge the logic of such application:

> " In principle, we see no reason for not seeking a similar outcome for satellite and other new long haul transmission systems when they become operational.

"Given our lack of operational experience with domestic satellite applications, however, it is too soon to state unequivocally the appropriate disposition. Even so, the burden should continue to be on the carriers to demonstrate why entry privileges should be withheld, rather than vice versa...."

To obtain operational experience with domestic satellites, the Task Force recommended: "...a prompt start upon a pilot program designed to provide useful technical, operational and economic data as a basis for more permanent policy decisions."

The Task Force in recommending such a pilot program was not opting for any specific entity or for a "regulated monopoly" approach, but only seeking some operational experience before definitive decisions were made. In addition, since the Task Force also recommended a merger of international communications facilities with Comsat playing a major role and with Comsat vacating the domestic field entirely upon consummation of the merger, the risk of Comsat preempting the domestic satellite field by its primary role in the pilot program seemed acceptable.

In my opinion, and of course I speak only for myself and not for any member of the Task Force, events since the Report was submitted provide ample justification for the Administration's policy decision now without first going through a pilot program.

1. The very passage of time. After five years, and seemingly endless government reviews, we are still two years away from any operational system. The slower development of a pilot program is less attractive with each year.

2. Evolution of government policy. At the time of the Task Force deliberations, the FCC had not yet applied the principle of competitive entry. But now the FCC has done so in the MCI case. And as the Task Force said, there is no reason in principle not to apply the same rule to satellite services.

3. Industry attitudes. A.T.& T. has recently indicated its support for a free entry approach, undercutting the agreement for a monopolistic approach on the ground of "systems integrity."

4. Inaction on international merger. The government does not seem interested in an international merger. Without such a merger and the consequent withdrawal of Comsat from the domestic field, even a carefully designed pilot program would run the risk of giving Comsat a future preemptive position.

For these reasons, among others, I, for one, support the White House Memorandum as an auspicious beginning. But it is no more than that. For endorsing the principle does not assure its effective implementation. It will be no mean chore to chart a course establishing conditions of effective competition.

The most troublesome problem is the possibility that A.T.& T. now free to enter, might ultimately preempt the domestic satellite field. I personally doubt that this will happen, and I do not believe that A.T.& T., the company principally responsible for assuring the American people inexpensive quality communication service should be denied the employment in its network of any communication mode it considers efficacious.

The Administration's approach also leaves unanswered such crucial questions as Comsat's future, the possibility that embracing the principle of free entry now may mean giving up on an international merger which would require A.T.& T. to surrender its underwater cable lines and the difficulty that present adoption of the principle of free entry may create in obtaining from operators of satellite systems special arrangements favoring educational and instructional uses of the service.

Notwithstanding the above, and the host of other issues one could raise, the basic policy enunciated by the White House Memorandum marks an important advance in communications policy, and I would urge its adoption by the FCC.

Sincerely,

Alan R. Novak

ARN/lc

Domsat

February 25, 1970

Dear Alan:

Thank you for your note of February 5th and the copy of the letter you have sent to the New York Times regarding our domestic communications satellite policy. It was a very good letter, and it stimulated me to go back and review the satellite chapter of the Rostow Report. We were not far apart in many respects.

I did not see the letter in the Times, although I may have missed it, but it should have been run as a worthwhile addition to the public record.

I suspect that we will be forced to get into a number of other communications policy matters in the not too distant future and hope that we will have an opportunity to chat about them.

Sincerely,

Clay T. Whitehead
Staff Assistant

Mr. Alan Novak
Room 701
1225 19th Street, N. W.
Washington, D. C. 20036

cc: Mr. Flanigan
Mr. Whitehead
Central Files

CTWhitehead:jm

NH&S

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February 26, 1970

Dr. Clay T. Whitehead
The WhiteHouse
Washington, D.C. 20000

Dear Dr. Whitehead:

I am interested in obtaining a copy of your report on satellites which was noted in the January 3 issue of TV Guide.

Our agency is building a "future file" from which we draw material for presentation use. And, of course, communications and the space program are an important part of our collection.

If your paper has not been released yet, would you please add my name to the waiting list, or refer me to the proper department of the government printing office.

Any quotations used will be properly credited.

Thank you very much.

Sincerely yours,

John L. Jaeckel

JLJ:vw

Please send

3/2/70

New York Times NYT Mar 4 / 70

Communication Policy

To the Editor:

The recent White House Memorandum on Domestic Communication Satellite Policy recommending free competitive entry rather than regulated monopoly as the initial guide to policy is, in my judgment, a constructive step forward.

Regulated monopoly has traditionally been the rule in the communications industry. Recently, however, advancing technology coupled with increased demand has forced a search for areas where free market competition, with its reliable incentives for innovation, cost reduction, and efficient resources allocation, could be permitted.

President Johnson's communications policy task force wrestled with redefining the boundary between regulated monopoly and competition. The task force recommended that: "Public policy should promote an environment assuring free and competitive opportunity for such [technological] developments without impairing the integrity and viability of the basic telephone network," and that for the first time, competitive entry be permitted in private line for-hire services.

Subsequently, the F.C.C. endorsed this principle in the landmark M.C.I. [Microwave Communications, Inc.] case, involving microwave services.

The task force did not recommend free entry for domestic satellites, absent some operational experience, but it did acknowledge the logic of such application:

"In principle, we see no reason for not seeking a similar outcome for satellite and other new long-haul transmission systems when they become operational."

To obtain operational experience, the task force recommended: ". . . a prompt start upon a pilot program . . . as a basis for more permanent policy decisions."

In my opinion, events since the Report justify the Administration's policy decision now.

Government Policy. When the task force deliberated, the F.C.C. had not yet applied the principle of competitive entry, as it now has in the M.C.I. case. And as the task force said, in principle, the same rule applies to satellite services.

Industry Attitudes. A.T.&T. now supports a free entry approach, undercutting the argument for a monopolistic approach because of "systems integrity."

Inaction on International Merger. Without such a merger and Comsat's consequent withdrawal domestically, as the task force recommended, even a carefully designed pilot program would risk Comsat having a pre-emptive position.

I recognize that establishing effective competition will be difficult. For example, A.T.&T., now free to enter, might ultimately pre-empt the field. But I consider this doubtful, and believe that A.T.&T., principally responsible for assuring inexpensive quality communication service, should not be denied any communication mode it considers efficacious.

Other questions remain. But the White House Memorandum advances our policy, and should be adopted. ALAN R. NOVAK

Washington, Feb. 15, 1970

The writer was Staff Director of President Johnson's Task Force on Communications Policy.

Domsat

March 5, 1970

To: Mr. Norton Goodwin

From: Tom Whitehead

Attached is a copy of Tom Whitehead's bio, along with two sets each of the Domestic Satellite Proposal and the Telecommunications Reorganization Proposal, as requested.

Norton Goodwin (lawyer)
824 Connecticut Avenue, N. W.
Washington, D. C. 20006

Chairman of the Subcommittee Three of the Information Retrieval Committee of the American Patent Law Association

Mentioned Paul Zurkowski (??), Executive Director of Information Industry Association.

Mentioned that the Information Industry Association is having its second National Sympesium at the Shoreham March 23-25 and they may invite him to be a participant.

Forward

March 2, 1970

Dear Howard:

Knowing of your deep interest in improvement of the Alaska communications system, I know the President will be pleased to see your February 23 letter conveying your endorsement of his recent policy statement on the use of domestic communications satellites. I will be pleased to bring this to the President's attention at the earliest opportunity.

With warm regard,

Sincerely,

Bill

William E. Timmons
Assistant to the President

Honorable Howard W. Pollock
House of Representatives
Washington, D. C. 20515

WET:EF:VO:rks

bcc: Clay Whitehead w/incoming FYI

HOWARD W. POLLOCK
THE CONGRESSMAN FOR ALASKA

COMMITTEES:
INTERIOR AND INSULAR AFFAIRS
MERCHANT MARINE AND FISHERIES
COMMITTEE ON COMMITTEES
NATIONAL CONGRESSIONAL COMMITTEE

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

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FAIRBANKS 99701
(907) 452-2226

February 23, 1970

The President
The White House
Washington, D. C.

Dear Mr. President:

This letter is to convey my endorsement of your recent policy statement addressing the utilization of domestic communications satellites. It has been my continuing concern that the American people have failed to realize a greater return on their investment in space. Admittedly, we are uncertain as to the application of much of the technology developed thus far. But it would appear we have been agonizingly slow in capitalizing on our knowledge and experience, even as it is presently applicable with a minimum of further refinement.

I must cite as one of the most glaring examples, the sophisticated stage of development in communication satellite technology as contrasted to the present lack of adequate communications within the State of Alaska. The primary obstacle clearly has been the failure of the government to define the necessary administrative and institutional structure within which such a system might be pursued. It is now my firm opinion, however, that with the positiveness of the solution you propose, we have taken a monumental stride in extending the dividend of improved communications to all people.

I would emphasize that your statement has a very immediate and significant impact to the Alaskan. The system with which the State is presently handicapped is scheduled for complete modernization coincident with

its transfer from the USAF to a commercial operator later this year. Accordingly, the system planning currently being undertaken by the State may now realistically reflect the incorporation of a communication satellite.

Speaking on behalf of the Alaskan people, I am deeply gratified at your recognition of this problem and the promptness of your decision. I look forward to equally rapid action on the part of the FCC as a final hurdle in our moving forward with an improved system to meet our growing needs.

Cordially,

HOWARD W. POLLOCK
The Congressman for Alaska

HWP:t

HOWARD W. POLLOCK
THE CONGRESSMAN FOR ALASKA

COMMITTEES:
INTERIOR AND INSULAR AFFAIRS
MERCHANT MARINE AND FISHERIES
COMMITTEE ON COMMITTEES
NATIONAL CONGRESSIONAL COMMITTEE

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Cordially,

HOWARD W. POLLOCK
The Congressman for Alaska

HWP:t

TO BE PRINTED: YES ____ NO ____

FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

March 6, 1970

INTER-OFFICE MEMORANDUM

FOR: Special Meeting, March 13, 1970

TO: The Commission

FROM: Chief, Common Carrier Bureau, General Counsel, and Chief Engineer

SUBJECT: Domestic Satellite

RECOMMENDED ACTION: For Discussion.

1. Pursuant to the Commission's instructions, there is attached a new draft Report and Order (Attachment A) in the domestic satellite proceeding (Docket No. 16495), which takes account of the recommendations of the Executive Branch. In essence, this draft provides that:

(a) The Commission will consider applications by any qualified entity to establish domestic satellite systems for common carrier services, for private use, for joint cooperative use, for lease to prospective users, or any combination thereof (paragraph 19).

(b) In considering whether to grant such applications, the Commission must make the requisite public interest finding and will, of course, be guided by the policies and provisions of the Communications Act, other relevant statutes, and pertinent judicial authorities (paragraph 20).

The draft also specifies procedures for filing and contents of applications (paragraphs 29-38), and technical criteria (Appendix D). 1/ It states that applicants "may also submit alternative proposals, reflecting what would be requested if there were different technical constraints and showing how the alternative would better serve the public interest" (paragraph 29).

1/ The technical criteria have been cleared by NASA. There has also been coordination with Canada on the disclosure of the orbital locations for the satellites in its proposed domestic system.

2. The draft Report and Order would keep open the proceedings in Docket No. 16495, and consolidate the attached Notice of Proposed Rule Making (Attachment B). The rule making, which is discussed at paragraphs 23-28 of the Report and Order, looks toward the possibility that the Commission may establish by rule the policies to be followed in the event of technical or economic conflicts between applications. It also requests comments on the appropriate initial role of AT&T in the domestic satellite field, and on the question of access to earth stations. The Executive Branch recommended that any authorization to AT&T should be limited to public message service and that facilities to be used for specialized communications services "should be authorized only after a determination by the Commission on each application, based on public evidentiary hearings, that no cross-subsidization between monopoly public message and specialized services would take place in the development, manufacture, installation, or operation of such facilities." Comments are requested on the question of whether the public interest would be better served by confining AT&T's participation, for an initial period, to the leasing of satellite channels in systems established by others, for the reasons set forth in paragraphs 25-27 of the draft Report and Order (see also, paragraph 4 of the Notice).

Ruth V. Reel
for Bernard Strassburg
Chief, Common Carrier Bureau

Henry Geller
Henry Geller
General Counsel

William H. Watkins
William H. Watkins
Chief Engineer

RVR Attachments (2)

RVReel/RBCrowell/EDDavis/WHMelody:bjt:bml:dk/alt,OGC

EB. WHM

ATTACHMENT A

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Establishment of Domestic	)	Docket No. 16495
Communication-Satellite	)	
Facilities by Non-govern-	)	
mental Entities.	)	

REPORT AND ORDER

Adopted: ; Released:

By the Commission:

I. Preliminary Statement

1. This proceeding was instituted by the Commission on March 2, 1966 (Notice of Inquiry, 31 F.R. 3507; Supplemental Notice of Inquiry, October 20, 1966, 31 F.R. 13763) to explore various legal, technical and policy questions associated with possible authorization of domestic communications satellite facilities to non-governmental entities. The responses are listed infra in Appendix A. A full description of the background of the proceeding, the issues designated by the Commission, and a summary of the responses are set forth in Appendix B. There has also been appropriate liaison with agencies of the Executive Branch, which have studied the matter of domestic satellites, along with a number of other related issues discussed herein.

2. The principal points raised in our Inquiry related, first, to whether there were any legal constraints on our power to authorize the construction and operation of communications satellite facilities for domestic use, and, secondly, to the extent that we had such legal authority, whether it should be exercised, and, if so, in what manner.

3. For the reasons set forth in the attached memorandum of law (Appendix C), we conclude that we may authorize any non-government entity, including the Communications Satellite Corporation, other common carriers, and non-carriers, to construct and operate (either individually or jointly) communications satellite facilities for domestic use. We have also concluded that appropriate authorization of satellite facilities solely for domestic purposes is not inconsistent with the multi-lateral 1964 Executive Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System, to which the United States is a signatory, and its related Special Agreement (TIAS No. 5646).

4. In this connection we note that the Presidential message of August 4, 1967 (H. Rep. Docket No. 157, 90th Cong., 1st Sess.), while specifically stating that any nation desiring to use satellites for domestic communications could ". . . elect to operate a separate satellite for its own domestic use," stressed that (page 6):

> In view of the international nature of satellite communications and our commitments under the INTELSAT Agreement of 1964, we should take no action in the establishment of a domestic system which is incompatible with our support of a global system.

As a very minimum there thus must be coordination with INTELSAT on such matters as use of frequencies, use of particular parking positions in synchronous orbit and prevention of interference. In addition, we should explore with INTELSAT the feasibility and desirability of such matters as joint research and development, use of available facilities for tracking, telemetry and control, joint spares on the ground and in orbit, etc., so as to promote not only domestic operations but also the global system.

5. In short, recognition of the right of nations to establish separate domestic systems is not inconsistent with continued strong support of the global system envisaged through INTELSAT. We conclude further that we should not propose to authorize the establishment of any domestic satellite facilities that did not accord fully with the United States obligations under the Interim Arrangements or under the Definitive Arrangements now being negotiated, or derogate in any manner from continued full United States support of the global system. We feel sure that the course we propose herein would not do so. Rather, it would be in accord with the above cited Presidential statement.

6. The filings before us contain much valuable data and suggestions as to the manner in which our authority should be exercised. Certain basic differences among respondents emerge from the filings. All agree on the desirability of proceeding with a domestic satellite program. The major differences of opinion relate to the kind of system to be authorized and to the purposes for which the system is to be used. A multi-purpose common carrier operation was favored by common carrier parties. 1/ On the other hand, noncommon carrier respondents--principally the television networks, the Ford Foundation, the Department of Health, Education and Welfare, and educational, press and airline interests 2/--urge that specialized systems should be authorized or at least not foreclosed. Proposals for multi-purpose systems have been submitted by American Telephone and Telegraph Company (AT&T) and the Communications Satellite Corporation (ComSat). Proposals for a specialized system for transmission of commercial and noncommercial broadcast programs have been submitted by American Broadcasting Companies, Inc., (ABC) and the Ford Foundation. In addition ComSat and the Ford Foundation suggest that we may not want to make definitive decisions at this time, but might consider the advisability of authorizing a pilot or demonstration system, which could provide operating experience valuable in reaching ultimate policy determinations in the future. Each has submitted a proposal for such a program (see Appendix B). Finally, General Electric Company (GE) has submitted suggestions as to a system specifically engineered to provide record (data, message and video) communications services, which would also have capacity for other uses (see Appendix B, Section K).

1/ Communications Satellite Corporation, American Telephone and Telegraph Company, Western Union Telegraph Company, General Telephone and Electronics Service Corporation, United States Independent Telephone Association, Hawaiian Telephone Company, ITT World Communications, Inc., and Western Union International.

2/ E.g., American Broadcasting Companies, Inc.; Columbia Broadcasting System, Inc.; National Broadcasting Company, Inc.; Aeronautical Radio, Inc. and Air Transport Association; American Newspaper Publishers Association; National Association of Educational Broadcasters; National Education Association; National Education Television and Radio Center.

II. Discussion

7. Type of action to be taken, if any. The threshold question before us is whether satellites offer sufficient promise as a mode of domestic communications to warrant the assignment of frequencies and use of orbital parking positions. Secondly, we must address ourselves to the question of the type of system or systems to be authorized if the threshold question is answered affirmatively.

8. The satellite technology has proven itself in the international field. Three generations of satellites have been launched by INTELSAT. Satellites now in orbit are capable of providing the means of international communications to all countries which have access to earth stations. There is a general consensus that satellites will continue to play an important, if not a major role, in providing future international communication facilities. There is now substantial reason to expect that satellites can also play an important role in the field of domestic communications. First, they are readily adaptable as a means of communication to complement long-haul terrestrial facilities used to provide point-to-point communication. Second, they appear to offer unique promise as an economical means of providing service from one transmission point to many reception points, e.g., for the relay of radio and television programs for entertainment, educational and instructional purposes, and for reaching remote or relatively inaccessible areas. Third, they may also offer special advantages and economies in the provision of new and expanded record communications services of the nature suggested by GE, principally by eliminating distance as a factor, as well as part of the switching involved on terrestrial networks, and through the potential flexibility that might result from the use of the satellite technology. Finally, past experience with new means of providing communication services also leads us to believe that an operating domestic system or systems may be expected to disclose other advantages which cannot now be foreseen.

9. We are also impressed by the fact that we have been urged to proceed with authorization of domestic satellite facilities by such organizations as ComSat, AT&T, the Ford Foundation, GE, the broadcast industry, and other potential user groups, which represent a broad spectrum of diverse interests. Studies in the Executive Branch have resulted in recommendations in favor of authorizing domestic satellite operations. See paragraphs 16-18 below. The technology is available, several potential suppliers of service have expressed interest in investing in a satellite system, and some potential users, anticipating that satellites will provide them with new or improved communications services, have indicated that they are eager to avail themselves of satellite services. Other nations are moving rapidly to exploit the potential benefits of the new technology domestically.

10. We are aware that there are risks and uncertainties associated with a proposed satellite system that do not accompany additions to the existing terrestrial systems. Moreover, technological advances in terrestrial transmission facilities over the years have reduced the costs of point-to-point transmission, and are expected to continue to reduce costs in the future. Thus, it may be that the potential of satellite communications lies more in the development of new or complementary services which could exploit any special advantages inherent in the unique characteristics of the satellite technology.

11. In addition to such presently unknown factors as the extent of demand for domestic satellite services, the particular services that can be provided most effectively and efficiently via this medium, and the costs involved, there is some doubt as to whether domestic satellite operations can be fully and economically accommodated in the only frequency bands presently available for commercial domestic satellite communications services, i.e. the 4 and 6 GHz bands. It seems desirable from the standpoint of economics that earth stations be located as close as possible to population centers in order to avoid dissipating any savings in long terrestrial interconnections. Terrestrial use has substantially saturated the 4 and 6 GHz bands near several population centers throughout the United States and quite generally in the Northeastern states. Moreover, there may be a further problem of sporadic interference from transmitting earth stations in the 6 GHz band to terrestrial microwave systems in that band, and from terrestrial stations in the 4 GHz band to receiving earth stations, via anomalous propagation, such as interfering signals scattered from common volumes, though the extent of any such problem is not yet known. Thus, there may be considerable difficulty in coordinating satellite earth station facilities with terrestrial systems in the 4 and 6 GHz bands without some readjustments by certain stations in the terrestrial networks. While it is anticipated that the next international space conference in 1971 will allocate additional spectrum for communication satellite services, which could facilitate the location of earth stations at desirable sites, the precise nature of such allocations is not now known.

12. The foregoing discussion (paragraphs 10-11) is meant to point up the uncertainties involved in the threshold question whether the public interest is furthered by the authorization of domestic satellite communications services at this time. In our judgment, however, these uncertainties cannot be resolved by another round of written comments or by additional studies. Indeed, a critical consideration in this respect would appear to be what persons, with what plans, are presently willing to come forward to pioneer the development of domestic communications satellite services according to the dictates of their business judgment, technical ingenuity, and any pertinent public interest requirements laid down by the Commission. In short, on the basis set out in paragraph 8, supra, it appears to us that domestic satellite communications do have the potential of making a substantial contribution to the nation's communications system. 3/ That being so, we should proceed with the authorizing process as promptly as possible, consistent with the public interest, since considerable lead time is required for research, design, development, construction and launch of the satellite before any authorized facilities would become operational. The next issue is how best to proceed and whether the public interest would be served by the delineation at this time of the system or systems to be authorized.

13. Type of Domestic Communication-Satellite Facilities to be Authorized--The parties to this proceeding have made various proposals for domestic systems, both permanent and pilot in nature. It has been proposed by the Ford Foundation and ABC that there be a special purpose system devoted primarily to the distribution of television programs. They urge that domestic satellites offer unique advantages for such a system which would involve one of a limited number of transmission points and a large number of reception points. Since the satellite can transmit the same signal to all areas from which it is visible, transmission costs would not be affected by either distance or the number of receiving points. The receive/only stations are relatively inexpensive. Therefore, it is urged that such a specialized system should be in a position to satisfy television needs at substantial savings in program transmission costs compared to the costs of existing services. It is also asserted that the policy commitments with respect to future action would be minimized, and that such a system would demonstrate the economic feasibility of the satellite technology for this purpose.

3/ When this proceeding was instituted in 1966, it appeared that a number of years might elapse before the spectrum allocations for communications satellites services would be re-examined by an international space conference. In view of the imminence of the 1971 space conference, prospective applicants may now prefer to await the outcome instead of proceeding at 4 and 6 GHz. While this factor may also present a pertinent public interest question, we think that it should be resolved in the context of our consideration of concrete applications for the 4 and 6 GHz bands which will contain analyses of potential interference vis-a-vis terrestrial operations and specify the length and cost of the terrestrial interconnections for earth stations.

14. Others, particularly ComSat and the domestic carriers, have recommended a multi-purpose system. It is asserted that a multi-purpose system could not only accommodate television distribution service but also provide experience with respect to various types of communication and make whatever benefits domestic satellite service can offer available to the widest possible range of users. AT&T submitted a comprehensive proposal for an integrated Space-Earth Communications System in two phases to meet anticipated growth in long-distance communications requirements through 1980 (see Appendix B, pages 11-12). ComSat also proposed a phased multi-purpose system, as well as a pilot demonstration program (see Appendix B, pages 12, 20-23).

15. GE has suggested a system which would be in part dedicated to specialized record services, and in part available for multi-purpose use. It urges that the satellite communication technology would provide a means for revitalizing business usage of the nation's record communications system and offers potential for new and expanded data and video services to the public. It further claims that economies would be realized because distance is not a factor in the use of this technology and much of the hierarchy of switching on terrestrial systems could be eliminated. The basic services suggested by GE (see Appendix B, Section K) are: multiple access digital services (record communications in the nature of Telex, TWX, and private wire systems; "Telemail" for business-to-business transaction mail; and remote access computer services for computer-to-computer and computer-to-individual user purposes) and multiple access video services (random assembled video networks for use by business, professional, governmental, educational and social organizations; public video exchange service for persons or groups with insufficient needs to require dedicated facility; and private video exchange service for customers with large usage).

16. On January 23, 1970, the Executive Branch recommended to the Commission that initial government policy in the domestic communications satellite field should be to encourage and facilitate the development of systems to the extent that private enterprise finds them economically and operationally feasible. (For the full text of this memorandum, see Appendix B, pages 33-40.) On the question of eligibility the recommendation stated:

> Subject to appropriate conditions to preclude harmful interference and anticompetitive practices, any financially qualified public or private entity, including Government corporations, should be permitted to establish and operate domestic satellite facilities for its own needs; join with related entities in common-user, cooperative facilities; establish facilities for lease to prospective users; or establish facilities to be used in providing specialized carrier services on a competitive basis. Within the constraints outlined below, common-carriers should be free to establish facilities for either switched public message or specialized services, or both.

It was further recommended that: there should be no arbitrary limitation on the number of classes of potential offerers of satellite services or a priori ranking of potential types of systems (common carrier vs. specialized carrier vs. private; or satellite vs. terrestrial); public interest exclusion of proposals would be warranted only in the event that specific applications pose immediate and irreconcilable conflict in the use of radio and orbital resources; and the potential economic impact of private or common-user satellite systems on terrestrial common carrier or specialized carriers should not be a factor in the authorization of such systems.

17. As guidelines for the authorization of systems, the Executive Branch recommended the following:

(1) Facilities to be established by independent entities for their own private use should be required to demonstrate only the financial and technical qualifications to implement their system proposals. There is no valid public interest requirement in such cases to require a showing of economic viability or optimization, nor should the potential economic impact of such operations on common or specialized carriers be a factor in the authorization of such facilities.

(2) Facilities to be established as part of a common-user cooperative system should be authorized in accord with the same principles as for fully independent facilities. However, to avoid restraints on competition, the opportunity should be made available for all potential users of similar services to participate without discrimination in such cooperatives as a condition of their authorization.

(3) Facilities to be used by specialized carriers (i.e., carriers having no monopoly over switched public message services) should be authorized under essentially the same terms and conditions as private or common-user facilities. Furthermore, such specialized carriers should not be constrained to serve as a "carrier's carrier" nor to share ownership of space or earth station facilities with other carriers. We also urge the Commission to allow competition to limit the rates charged for specialized services via satellite. Specialized carriers should, however, be required to serve similar users at equal rates and on a non-discriminatory basis.

(4) Facilities to be used by common carriers solely for the transmission of switched public message services should be authorized under the same terms and conditions that apply for terrestrial radio facilities. However, facilities to be used by such carriers in the transmission of specialized message services should be authorized only after a determination by the Commission on each application, based on public evidentiary hearings, that no cross-subsidization between monopoly public message and specialized services would take place in the development, manufacture, installation, or operation of such facilities. This should not be interpreted, however, to preclude the legitimate economies of joint-use facilities.

(5) The use of leased facilities (satellite and/or earth stations) should be authorized under the same terms and conditions as owned facilities, with the responsibility for adherence to those conditions resting with the lessee. Rate-regulated carriers should be permitted to include a portion of the lease costs of such facilities in their rate base.

(6) Local communications common carriers should be required to provide leased interconnection services for user access to earth stations at reasonable rates and without discrimination.

(7) Potential harmful interference between satellite systems and terrestrial installations should be resolved by the Commission according to established procedures. Satellite operating entities should have equal status with terrestrial users in interference problems and in access to the radio spectrum. To accommodate new systems or services, the Commission should affirm its authority to modify or rescind, where appropriate, the operating rights of established spectrum users (satellite or terrestrial) where this would not significantly impair the quality of service or impose undue economic burdens; we believe that the Commission should require compensation of the established users to be paid by the new entrant in such situations.

18. The Executive Branch recommendation stressed the importance of acting consistently with United States obligations and commitments to INTELSAT and the International Telecommunications Union, with other foreign policy considerations, and with national security requirements; stating that it is "particularly important that domestic systems not threaten the operational integrity or economic viability of the global services provided through" the INTELSAT system. The Executive Branch saw no reason why ComSat should not be permitted to compete for domestic satellite service on an equal basis. Finally, it was recommended that policies should be adopted on an interim basis (3-5 years), during which period the Commission should "monitor the industry structure, service offering, and rates to determine if natural monopoly or other conditions are developing that suggest more restrictive entry conditions or warrant direct rate regulation for specialized satellite services." At the end of the interim period, a full review of the policy and industry structure should be made.

19. Here, again, the Commission is unable to determine on the basis of the information presently before us, whether domestic communications satellite opportunities would be more fully and effectively developed through one or more multi-purpose systems, specialized systems, through a combination of both, or through an essentially "open entry" policy. Nor do we feel that we are now in a position to authorize any of the specific proposals in the record. 4/ In connection with the suggestion of some of the parties that a pilot program might produce information and data which would be of assistance in determining the nature of a regular system or systems, we have considered the possibility of authorizing one or more initial systems in accordance with policies and guidelines specified by the Commission. Upon further deliberation, we have decided against such an approach. It is technically

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4/ The proposals before us vary considerably with respect to proposed satellite capacity and design, the number and kind of earth stations, antenna size, areas to be served, types of services to be provided, etc. Moreover, most of these proposals were filed some time ago and may not reflect intervening advances in the state of the art or the requirements of services suggested by others.

21. Coordination with INTELSAT and Other Domestic Satellite Programs--Insofar as relations with INTELSAT are concerned, as noted above, we believe that the establishment of domestic satellite facilities would be fully consistent with our obligation to the single global system. The United States commitment to INTELSAT and the technical constraints on the use of orbital locations in synchronous orbits, as well as limitations on the available frequency spectrum and dangers of mutually harmful interference, establish the necessity for close coordination on these matters. In addition, intelligent planning, the possibility of achieving major economies, and the desirability of continuing to promote the single global system, indicate that the closest possible cooperation should be sought. The areas where coordination is essential include such matters as frequency use, prevention of harmful interference, and orbital space on the geostationary orbit. Before authorizing the use of particular frequencies or the placement of satellites at particular locations, we would bring the matter to INTELSAT for coordination purposes and if the latter has plans which would conflict with the frequencies or orbital spaces proposed, we would work out an accommodation in view of our obligations to the single global system of some 74 nations, including the United States. We would, of course, fulfill any coordination requirements called for by the International Radio Regulations, as well as those established in the Definitive Arrangements for INTELSAT which are now under negotiation. We would also encourage and lend our assistance to the exploration of other areas for possible cooperative effort to determine if joint action or sharing would be appropriate to achieve mutual benefits.

22. To avoid orbital space problems and possible interference, proposals for domestic satellite systems must also take into account the known plans of other countries who may have an interest in the use of the satellite technology for domestic communications purposes. For example, Canada has already selected two orbital locations for its proposed domestic system, which will require protection. 6/ Canada also has indicated an eventual requirement for a third satellite position, details of which are yet to be specified. As in the case of INTELSAT, it may be beneficial to explore areas of mutual cooperation to reduce costs, enhance efficiency and share the results of operating experience. There is also the possibility of a shared use of the space segment of a United States system or systems to serve the domestic requirements of another country or countries, or vice versa.

6/ The orbital locations chosen by Canada are 88 and 109 degrees West Longitude.

III. Proposed Rule Making

23. The Commission is concurrently issuing a notice of proposed rule making on the policies to be followed in the event of technical or economic conflicts between applications and on the appropriate initial role of AT&T in the domestic communications satellite field. Technical conflicts may arise in such areas as proposed orbital locations and frequency usage. Moreover, in the course of coordinating earth stations with terrestrial systems it may prove impossible in some instances to accommodate earth stations at desired sites without some adjustment in the frequencies and routes of terrestrial systems or other measures to avoid interference. Also, arguments of economic incompatibility may be raised, posing questions as to the proper effectuation of the Commission's responsibility under Section 1 of the Communications Act to exercise its regulatory functions in such a manner as to make communications services "available, so far as possible, to all people of the United States * * *."

24. It may be that conflicts will not arise, or will be resolved through negotiation or other procedures in a manner consistent with the public interest, so that the promulgation of rules will be unnecessary. However, in order to facilitate expeditious action on the applications, and to insure the prompt attainment of the benefits discussed in paragraphs 8-9 supra, the Commission clearly should follow such procedures as will "best conduce to the proper dispatch of business and to the ends of justice" (Section 4 (j) of the Communications Act). Rule making may be one such procedure. Applicants are therefore requested to submit comments in their proposals on the question of what policies would be appropriate in these areas. An opportunity will be afforded for the filing of reply comments by applicants and comments by other interested persons after the expiration of the time for filing applications (see paragraph 38 below). Since the rule making will be consolidated with this proceeding, material contained in the comments already on file need not be resubmitted.

25. Comments are also requested on what initial role of AT&T in the domestic communications satellite field would be appropriate. The most important value of domestic satellites at the present time appears to lie in their potential for opening new communications markets and for developing new and differentiated services that reflect the special characteristics of the satellite technology. Realization of this potential will require innovative technological and service planning and development, and may necessitate steps to promote a market environment conducive to new competitive entry. A question has been raised as to whether AT&T might discourage or foreclose entry by others into its special service markets through a policy of inter-service subsidy. The Executive memorandum recommended that facilities to be used by AT&T for specialized communications services "should be authorized only after a determination by the Commission on each application, based on public evidentiary hearings, that no cross-subsidization between monopoly public message and specialized services would take place in the development, manufacture, installation, or operation of such facilities." We are concerned that such a procedure might not prove fully effective to achieve a market environment conducive to innovation, new competitive entry, and the vigorous exploration and development of the special communications service potentials of the satellite technology. 7/

26. Aside from the possibility of market foreclosure through cross-subsidization, there is a question as to whether innovative satellite planning by AT&T would be constrained by its existing terrestrial facilities and services. Any satellite proposal would be supplemental to and compatible with the existing terrestrial network, and would reflect the carrier's necessary and predominate concern over the effects of the satellite technology upon its existing landline investments and markets. 8/ Moreover, AT&T is the dominant domestic carrier and other potential common

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7/ The practical problems and difficulties inherent in the establishment and implementation of regulatory standards by which to ascertain and correct cross-subsidy among AT&T's major interstate service classifications are well known to us. The problem has proven to be most difficult, complex and time-consuming. The evidentiary hearing procedure would necessarily entail the substantive burdens and delays involved in lengthy and cumbersome administrative investigations and hearings.

8/ AT&T has stated that it views satellite transmission as just another form of transmission similar in function to terrestrial microwave systems and coaxial cables, and that there are no communications services which could be offered by satellites which cannot now be offered by terrestrial facilities.

carrier developers of domestic satellite systems cannot approach the problems and possibilities of domestic satellite applications from a reasonably equal competitive opportunity position. Thus, a further question is presented as to whether AT&T's expansion into the satellite field at this initial stage might pose a substantial constraining factor for such potential entrants in deciding whether to develop system proposals, the kinds of systems that will be proposed, and the types of services and markets that can be developed. In addition, AT&T is presently experiencing a rapid growth in demand for its existing services and is in the process of working its way out of some severe service problems. Rapidly developing data communications requirements, continued advances in computer technology and its applications to communications and changing characteristics of many communications demands provide unprecedented opportunities for developing expanded, improved and new communications capabilities. This dynamic market environment has engendered claims that the existing carriers, handicapped by the need to meet the growing demands for existing services, have been unable to respond with the speed and flexibility required to satisfy these new and changing demands. It has also engendered applications by new entities for the opportunity to develop and serve special service communications markets, which the applicants claim have not been fully developed within the capabilities of the terrestrial technology by the existing carriers.

27. In light of all the foregoing, applicants and other interested persons are requested to comment in the rule making on the question of whether the public interest would be served by confining AT&T's participation in the domestic satellite field, for an initial period, to the leasing of satellite channels in systems established by others. We stress that this proposed policy would be limited to the initial stage of domestic satellite development. After the initial systems have been established and afforded a reasonable opportunity to demonstrate their ability to open or expand communications markets, the Commission would re-examine any interim policy as to AT&T in light of the circumstances then pertaining.

28. It is contemplated that a new carrier entrant will be capable of dealing directly with customers for its services. In other words, the "authorized user" policy, which has applied in the field of international communication and under which the satellite carrier is permitted to sell its services directly to users only in special cases, will not be applied to domestic service. This, in turn, raises the question as to the means by which a customer for service of a new carrier will obtain access from his location to the earth station of the carrier. From a technical and operational standpoint, there are a variety of methods by which such access can be provided. For example, the customer may arrange to provide connecting channels which he himself has constructed and owns or has leased under appropriate tariffs from existing carriers. Or it may be preferable for the new carrier to undertake provision of the access facilities by its own construction or by purchase or lease from a terrestrial carrier. Or arrangements for a joint through service may be entered into between the new carrier and the terrestrial carrier. Other types of interconnecting arrangements may also be feasible. Which arrangement will best suit a particular operation in terms of total efficiency and economy can only be determined in light of all of the circumstances of a proposed service offering. These are matters which we expect to be fully addressed by proposed system applicants in connection with their applications and, as necessary, in their responses to the Notice of Proposed Rule Making. We will also welcome the views and comments of existing carriers whose full cooperation is clearly needed for effective implementation of this policy. It is our expectation that existing carriers will not thwart or hinder the development of new and expanded common carrier services envisaged by this policy by the imposition of arbitrary restrictions on interconnection or through route arrangements or so-called exchange of facilities among carriers--established and new--or other means of accomplishing the desired objective of providing service directly to the customer. We will also expect that established carriers will review the compatibility of the terms and conditions of their existing tariffs with any new common carrier services which may be proposed by prospective carrier interests and which are determined by the Commission to serve the public interest, and make any necessary or desirable revisions therein. With respect to non-carrier systems, applicants may propose access to earth stations through their own facilities or through interconnettion with terrestrial carrier networks. It is expected that the same policies and practices applicable to interconnection of privately owned terrestrial systems with common carrier facilities will also apply to the interconnection of non-carrier satellite systems with terrestrial carrier systems, unless public interest considerations call for some different treatment.

IV. Procedure for Filing and Contents of Applications

29. Pending the adoption of forms and fees and the promulgation of rules governing technical standards for domestic communication-satellite facilities, applications should be filed in accordance with the procedure and technical criteria set forth below and in the attached Appendix D. Applicants making proposals under the technical criteria specified herein may also submit alternative proposals, reflecting what would be requested if there were different technical constraints and showing how the alternative would better serve the public interest.

30. It is expected that applicants will file a complete and comprehensive proposal for the entire system, describing in detail all pertinent technical and operational aspects of the proposed system, including, among other things: the technical characteristics, capacity, weight and quantity of satellites; the proposed orbital configuration, frequencies to be used, 9/ and launch vehicle; the arrangements for tracking, telemetry and control; the technical characteristics, quantity, types and location of earth stations; the coordination with terrestrial facilities to avoid potential interference, the facilities for terrestrial interconnection and local distribution including the nature of any interface with terrestrial facilities that are or will be owned and operated by others and the nature of any agreements with interconnecting carriers; the factors of system quality, reliability, redundancy and maintenance; the types of services to be provided and the areas and entities to be served; the construction plan

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9/ The only frequencies available for non-Government communication-satellite services are the 3700-4200 MHz band (satellite-to-earth) and the 5925-6425 MHz band (earth-to-satellite) on a shared basis with terrestrial common carrier fixed microwave stations. Pending any additional allocations for communication-satellite services that may result from the 1971 international space conference, all applicants shall request frequencies in these bands whether or not common carrier operations are proposed.

including timing of construction, estimated investment costs by year and estimated annual operating costs for the proposed system; the estimated volumes and types of uses to be provided; proposed charges for any operations on a common carrier or lease channel basis; the nature of the agreement by participants in any proposal for joint ownership and use of facilities on a cooperative basis including the arrangements for cost-sharing and for the exercise of managerial and licensee responsibilities; the legal, technical and financial qualifications of the applicant to implement the proposal; and the estimated time schedule. Where pertinent, applicants should also address the factors discussed in paragraph 34 below. In the course of processing applications, the Commission may, of course, request additional information. Applications will not be considered as accepted for filing until the Commission issues a public notice to that effect. In giving public notice of the first proposal accepted for filing, the Commission will specify a time period for the filing of applications by applicants who desire to have their proposals considered in conjunction with the first proposal, and the time period for the filing of comments on the rule making by other interested persons. In this way, we will have before us the complex of applications and comments we believe necessary for a determination as to policies.

31. We recognize that in an undertaking of this nature applicants may not be in a position to apply now for all of the facilities ultimately contemplated, or to specify some of the design and operational details of the facilities requested for initial operation, and may desire to modify their initial specific proposals in light of subsequent developments. Obviously, considerable flexibility must be afforded. Following any grant, the Commission may from time to time request further information. We also expect to be kept promptly apprised of all pertinent developments in the implementation of the authorizations and any significant modifications in the initial proposals. However, in order that the Commission may be in a position to take definitive action, applicants should, to the extent practicable, make specific application now for construction permits for all facilities requested for the commencement of operations, and describe as fully as possible the nature of any present plans for additional facilities (including at least an outline of the applicant's long range plan for the complete system).

32. A separate application for construction permit will be necessary for each space station and each earth station, including receive/only stations, 10/ transportable stations and any separate stations used for tracking, telemetry and command. Application should also be made in the appropriate service for any terrestrial interconnection and local distribution facilities to be owned and operated by the applicant. Common carrier applicants should request certification pursuant to Section 214 of the Communications Act. Information pertinent to the entire proposal need be submitted only once, and may be incorporated by reference in the individual applications for construction permits and/or Section 214 certification. Applications for space and earth stations need not be filed on any prescribed form, but should be complete in all pertinent details and contain the information described in the attached Appendix D. Applications for interconnecting terrestrial facilities should be made on the form prescribed for the service in which the applicant is eligible.

10/ We think that receive/only stations must be licensed by the Commission if they are to be protected from interference, and also to assure the quality of service intended for end use by the public. Our authority to do so stems from the fact that facilities would be an integral link in interstate radio communication. See Sections 2 (a), 3 (b), and 301 of the Communications Act. Cf. Section 103 (e) of the Communications Satellite Act; United States v. Southwestern Cable Company, 392 U.S. 157.

33. The comprehensive proposal for the entire system may be submitted in narrative form, with attached exhibits. In addition to the general system technical information specified in paragraph of Appendix D, the comprehensive proposal should include full and detailed information as to the following:

(a) Name and post office address of the applicant.

(b) Description of overall system facilities and operation, including the arrangements for access to the system between the premises of the users and the earth stations.

(c) Services to be offered and the estimated demand for such services.

(d) For proposed common carrier operations, the prospective customers or customer classifications, the proposed charges, and the basis on which such charges are constructed.

(e) Estimated total system construction and annual operating costs (both for the commencement of operations and, to the extent practicable, for facilities to be added at some later stage), including:

Research and development
Satellites
Launching
Earth stations
- Major transmit/receive
- Minor transmit/receive
- Receive/only
- Transportable
- Tracking, telemetry, and control

(Estimated cost totals for each type of earth station may be calculated on the basis of the estimated average cost of a station of that type. The estimated average cost should be subdivided into components such as equipment, building, land, power, etc. Specific construction cost estimates for each earth station should be submitted with the application for the particular facility.)

Terrestrial interconnection and local distribution facilities to be owned by the applicant, or obtained by purchase or lease from a terrestrial carrier or through some other type of interconnection arrangement.

Other costs (legal, engineering, management, general overhead, and miscellaneous costs)

Annual depreciation, maintenance, and operating costs, indicating the basis on which such costs are calculated.

(f) Financial qualifications of the applicant to construct and operate the proposed system.

(g) Technical qualifications of the applicant to construct and operate the proposed system.

(h) Legal qualifications of the applicant, including direct and indirect ownership data, interests in other communications media, and other business interests. (Applicants whose legal qualifications are already a matter of record before the Commission may incorporate such information by reference. New applicants are referred to FCC Forms 301 and 401 for the type of information generally considered to be pertinent.)

(i) Public interest considerations in support of a grant.

34. All applicants should further address question (a) below, and questions (b), (c), and (d) where pertinent.

(a) Whether the system will be capable of providing service to Hawaii and Alaska. We believe that national unity will be served if domestic systems have the capability of serving these two States. Hawaii is presently receiving communications satellite service via the facilities of INTELSAT, though not the type of broadcast program distribution service that has been proposed in this proceeding, and we have authorized an earth station in Alaska. Our belief that domestic systems should be capable of serving Hawaii and Alaska does not reflect any view with respect to the continued use of INTELSAT facilities. But unless the capability is built into the domestic facilities at the outset, the possibility of providing any service to these States by means of these facilities will be precluded.

(b) Where the proposed services include television program transmission, the terms and conditions under which used the satellite system will be made available for a noncommercial educational network. We note that parties to this proceeding, such as ComSat and the ABC network, have proposed to provide satellite channels without charge for the interconnection of public and instructional broadcasting. We believe this to be in the public interest. Applicants proposing television program transmission service should also address the possibility of realizing a "peoples' dividend" to provide some funds for programming by noncommercial educational stations, as suggested by the Ford Foundation.

(c) Where the applicant is engaged in the business of providing a common carrier public message service, 11/ the proposal should provide full and detailed information concerning the manner in which the satellite operations will be integrated with terrestrial operations technically and economically, including:

(i) The manner and extent to which the facilities of the satellite system will be used at the carrier's option to augment terrestrial facilities for message, private line, and other existing or proposed services;

(ii) The extent, if any, to which satellite facilities will be used for services offered directly to the public, the nature of such services, the proposed charges, and the basis on which such charges are constructed.

(iii) The carrier's market and cost studies that demonstrate that expansion of the integrated system by use of the satellite technology is more economical than expansion by using other available technologies;

11/ Pending a final determination on our proposed interim policy relating to AT&T, it is not precluded from submitting an application. In that event, the application should address the questions set forth in this subparagraph (c).

(iv) The estimated revenue requirements that will apply to the satellite system during each of the first three years of operation;

(v) If the satellite facilities are to be used for services other than common carrier public message service, a demonstration that the public message service will not subsidize the other services.

(d) Applications proposing a special purpose system for joint use by several entities under a cooperative arrangement should furnish a copy of a written agreement by the participants, which sets forth:

(i) The entity to be licensed who will have full operational control over the facilities except to the extent that earth stations may be licensed to other participants;

(ii) The identity of all participants;

(iii) The manner in which contributions to capital and operating expenses will be equitably prorated among all participants (except to the extent that the considerations discussed in subparagraph (b) herein may be applicable);

(iv) The terms on which potential new users with the same or similar service requirements will be afforded an opportunity to participate in the cooperative arrangement and to have access to the facilities of the system;

It is anticipated that any such cooperative arrangements would be on a non-profit, cost-sharing basis without charge to participants (except to the extent that the considerations discussed in subparagraph (b) herein may be applicable). In the event that it is proposed to make any of the system capacity available for use by non-participants, the application should set forth full and detailed information concerning the type of proposed users and services and the terms, conditions and charges for such use.

35. Applicants may experience considerable difficulty in finding sufficient locations for earth stations which will not have at least one or more potential cases of harmful interference. This is especially true since the procedure for coordination as discussed in Appendix D makes the assumption that each earth station and each radio relay station within the coordination distance contours utilizes the entire pertinent frequency band or bands. Also, an earth station may be planned to point at more than one satellite location. Since the 4 and 6 GHz bands are coequally shared between the communication-satellite service and the fixed common carrier service, the above assumption is made to allow for flexibility and growth in both services. Applicants should therefore endeavor to find suitable locations for earth stations that present the least amount of potential interference problems. After such locations have been chosen, applicant should specify all cases, if any, of potentially harmful interference that may exist with a description of the steps taken thus far, if any, to alleviate the problems. Readjustments to certain stations in the terrestrial network may be a solution in some cases. (See also paragraph 23.)

36. Transportable earth stations will be considered for authorization only at specified fixed locations chosen by the applicant after a similar coordination procedure as for regular fixed earth stations has been followed. Since transportable earth stations may be used at a given location for a relatively short period of time, or on a one-time basis, the applicant should consider coordinating on discrete frequencies under particular operating conditions, i.e. antenna azimuth and elevation angle. Locations for the use of transportable earth stations will be protected from potentially harmful interference only during the time the station is actually located at the site with reasonable expectation of being used in the near future. Subsequent use of the same location after a lapse of time will require further frequency coordination to take account of any intervening changes in the terrestrial network, and a new authorization by the Commission. Applicants proposing use of transportable earth stations should indicate the general geographic area within which it is proposed to use each such earth station and coordinate at least one location within that area in the application for construction permit.

37. There may be instances where it is anticipated that the applicant might desire to make occasional use of a receiving earth station for transmission (e.g. by "plugging in" a transportable transmitter). Applicants may wish to consider this possibility in the coordination procedure for the receiving earth station site. In light of the circumstance that full-time transmission is not contemplated, applicants should assume that only one channel, rather than the entire frequency band, will be utilized for transmission.

38. Applications should be submitted to the Federal Communications Commission, Washington, D.C. 20554. Information should be current as of the date of filing, and the applicant should notify the Commission regarding any material change in the facts as they appear in the proposal. An original and 14 copies of the comprehensive proposal and of the individual applications for space and earth stations should be submitted. Applications for interconnecting terrestrial facilities should be submitted in accordance with the requirements governing the service in which application is made with respect to filing fees. The applications for space and earth stations should be accompanied by the following fees:

Space station	$100
Earth station	
Transmit/receive	$100
Receive/only	$ 50
Tracking, telemetry and command	$ 50
Transportable	$ 25
Authorization for use at a new location	$ 10

CONCLUSION

39. In view of all of the foregoing, we find and conclude that the national public interest will be served by the consideration of applications for domestic communications satellite systems in accordance with the views expressed above. In order that the Commission may be in a position upon consideration of such applications to take such further action and establish such policies as may be necessary in the public interest and in the effectuation of its statutory responsibilities, we will keep open this proceeding and consolidate the concurrently issued notice of proposed rule making in Docket No. .

ORDER

40. IT IS ORDERED, pursuant to Sections 1, 2, 3, 4 (i) and (j), 214, 301, 303, 307-309 and 403 of the Communications Act of 1934 and Sections 102 (d) and 201 (c) of the Communications Satellite Act of 1962, That applications for domestic communications satellite systems will be entertained by the Commission and SHALL BE SUBMITTED in accordance with the guidelines specified herein and in the attached Appendix D.

41. IT IS FURTHER ORDERED, That the proposed rule making in Docket No. is consolidated with this proceeding.

FEDERAL COMMUNICATIONS COMMISSION

Ben F. Waple
Secretary

APPENDICES

APPENDIX A

PARTIES & FILINGS ON DOMESTIC SATELLITES

Docket No. 16495

A. INITIAL FILING PARTIES

		8/1/66	12/16/66	4/3/67	9/18/67
1.	ABC Television Affiliates Association				X
2.	Ad Hoc Committee on Adult Education			X	
3.	Aeronautical Radio, Inc. & Air Transport Assoc.		X	X(B)	X
4.	American Broadcasting Companies, Inc.	X(T)	X	X	X
5.	American Library Association			X	
6.	American Newspaper Publishers Assoc.		X	X(B)	X
7.	American Petroleum Institute	X			
8.	American Telephone & Telegraph Company	X(B)	X(T)	X	X
9.	American Trucking Associations, Inc.	X			
10.	California, State of			X	
11.	Carnegie Commission on Educational Television	X			
12.	CBS Television Network Affiliates Association				X
13.	Columbia Broadcasting System, Inc.	X(B)	X		X
14.	Communications Satellite Corporation	X(B)(T)	X(B)(T)	X	
15.	Dow Jones, Inc.	X		X	
16.	Ford Foundation	X(B)(T)	X(B)(T)	X(B)	X(T)
17.	General Electric			X	
18.	General Telephone & Electronics Service Corp.	X(B)	X(B)	X	X
19.	Hawaiian Telephone Company	X(B)	X		X
20.	Health, Education & Welfare, (U.S. Dept. of)	X			
21.	ITT World Communications, Inc.	X	X	X	
22.	JFD Electronics Corporation	X			
23.	Joint Council of Education Telecommunications		X		
24.	Lloyd P. Morris		X		
25.	National Association of Broadcasters		X	X	
26.	National Association of Educational Broadcasters	X	X	X	
27.	National Association of Manufacturers	X(B)			
28.	National Broadcasting Company, Inc.	X	X	X	X
29.	National Education Association		X	X	
30.	National Education Television & Radio Center		X		
31.	National Science Foundation and National Foundation on Arts & Humanities		X		
32.	United States Independent Telephone Assoc.		X		
33.	Western Union International	X	X	X	
34.	Western Union Telegraph Company	X(B)	X(B)	X	X

Symbols: X -- Statement or Comments
(B) -- Legal Brief
(T) -- Technical Study

B. FILINGS ON THE GE PROPOSAL

35. On February 19, 1969, General Electric Company sought leave to supplement its original filings with additional comments on a new proposal. The parties who filed comments on this GE proposal on or before April 14, 1969, are as follows:

1. Aerospace Industries Association of America, Inc.
2. American Broadcasting Companies, Inc.
3. American Telephone & Telegraph Company
4. Communications Satellite Corporation
5. Con Sumers, Inc. and TVC of California, Inc.
6. GT&E Service Corporation
7. ITT World Communications, Inc.
8. Microwave Communications, Inc.
9. National Association of Manufacturers
10. National Broadcasting Company, Inc.
11. Western Union International
12. Western Union Telegraph Company

In addition, comments on the GE proposal were filed by the Postmaster General on May 15, 1969.

APPENDIX B

Background and Summary of Comments of the Parties

A. History of the Proceeding

1. The history of this proceeding dates from an application filed with this Commission on September 21, 1965, in which the American Broadcasting Companies, Inc. (ABC), requested ". . . a satellite authorization in the Auxiliary Radio Broadcast Service for television broadcast distribution purposes." An opposition to the application was filed by the Communications Satellite Corporation (ComSat), to which ABC replied. The application was tendered under Part 74 of the Commission's Rules and Regulations and requested waiver of Parts 2, 21 and 74, as might be necessary. ABC proposed use of the frequency bands 3700-4200 and 5925-6425 MHz, for transmitting network programs from earth stations in New York and California, via satellite, to ABC-owned and affiliated stations throughout the United States, including Alaska, Hawaii, Puerto Rico and the Virgin Islands. ABC also proposed to provide facilities for the interconnecting of non-commercial educational television stations in those areas.

2. The application proposed new use of space communication techniques and presented novel questions of law and policy which would have to be resolved before any Commission action on the application could be taken. Accordingly, on March 2, 1966, the Commission returned the ABC application, without prejudice to appropriate refiling in light of the outcome of a public inquiry which was simultaneously instituted.

3. Because the application by ABC raised novel problems, the Commission believed that the public interest would be served by obtaining the views and comments of interested parties on a series of questions as a means of determining what further actions were warranted by the Commission. Therefore, the Commission adopted a Notice of Inquiry on March 2, 1966, in which it cited its statutory responsibility to study new uses for radio and generally encourage the larger and more effective use of radio in the public interest (Section 303 (g) of the Communications Act of 1934, as amended).

4. The March 2, 1966, Notice of Inquiry (31 F.R. 3507) invited comments on the following specific questions:

a. Whether, as a matter of law, the Commission may promulgate policies and regulations, looking toward the authorization of non-governmental entities to construct and operate communications satellite facilities for the purpose of meeting their private or specialized domestic communications requirements. This proceeding is not concerned with the question of whether communications common carriers may be authorized to construct and operate communication-satellite facilities for domestic purposes. (Parties submitting comments in this matter should do so in separate legal briefs);

b. The effect or impact of any such authorization upon the policies and goals set forth by the Communications Satellite Act and upon the obligations of the United States Government as a signatory to the Executive Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System;

c. Whether, as a matter of policy, it would be in the public interest to grant such authorization considering:

(1) The amount of frequency spectrum now available for the communication satellite service under the Commission's Rules;

(2) The extent to which terrestrial facilities are or may be available to provide the services contemplated;

(3) The potential economic effects on common carriers; and

(4) The potential benefits (e.g., improved quality and reduced cost of service) which might result from the grant of such authorizations;

d. Is it technically feasible to accommodate the space service contemplated in light of the requirement:

(1) That the power flux density produced at the earth's surface in the band 3700-4200 Mc/s by emissions from a space station employing wide-deviation frequency (or phase) modulation not exceed -149 dbW/m^2 in any 4 kc/s band for all angles of arrival nor a total of -130 dbW/m^2 for all angles of arrival;

(2) That the power flux density produced at the earth's surface in the band 3700-4200 Mc/s by emissions from a space station employing other than wide-deviation frequency (or phase) modulation not exceed -152 dbW/m^2 in any 4 kc/s band for all angles of arrival;

(3) That earth stations receiving signals from space stations in the band 3700-4200 Mc/s be so located with respect to the existing common carrier microwave complex in that band that they are not subjected to harmful interference from such terrestrial microwave systems;

(4) That transmitting earth stations in the band 5925-6425 Mc/s:

(a) Not exceed a mean effective radiated power of 45 dbW in any 4 kc/s band in the horizontal plane; and

(b) Not cause harmful interference to the existing common carrier microwave complex in the same band.

e. Other relevant matters to which the respondents wish to address themselves.

B. Filing of Initial Comments (August 1966)

5. On or before August 1, 1966, comments were filed by 19 parties. (See list of all parties filing in this proceeding in Appendix A) Several parties argued that this Commission has authority under existing legislation including the Communications Act of 1934, as amended, and the Communications Satellite Act of 1962, to authorize entities other than communications common carriers to establish and operate communication satellite services to meet their private or specialized needs. This position was supported by ABC; the American Telephone & Telegraph Company (AT&T); the Columbia Broadcasting System (CBS); Dow Jones & Company, Inc.; the Ford Foundation; ITT World Communications, Inc. (ITT Worldcom); the National Association of Educational Broadcasters(NAEB); the National Association of Manufacturers (NAM); and the National Broadcasting Company (NBC). Opposition to this view, based upon an interpretation of the two named Acts, was contained in comments of ComSat; GT&E; the Hawaiian Telephone Company; and Western Union Telegraph Co.

6. ABC and NBC challenged the adequacy of the facilities of existing carriers to meet present and foreseeable television network program distribution requirements -- a challenge disputed by AT&T. ABC proposed that it be authorized, individually or in conjunction with other commercial or non-commercial educational network organizations, to construct and operate (by joint venture or otherwise) communications satellite facilities for the purpose of transmitting network programs (commercial and educational) to affiliated and associated stations within the United States and its insular possessions. ABC is prepared to join with other entities to create a non-profit organization to construct and operate such facilities.

7. Several communications common carriers challenged the economic and technical viability and feasibility of privately owned systems, and presented a variety of policy considerations in support of their conclusion that private ownership and operation of domestic communication satellite facilities are not technically or economically feasible. On the basis of historical, economic, technical and policy considerations, AT&T, ComSat, Hawaiian, ITT Worldcom and Western Union Telegraph urged the Commission to find it in the public interest that domestic communication satellite service should be provided by a multipurpose,common carrier owned satellite system. ComSat, urging that the Commission was limited by the 1962 Act to authorizing the space segment of a domestic system to ComSat alone and the earth stations to ComSat and qualified carriers, attached its technical plan for meeting various domestic requirements. AT&T stated that it was engaged in studying possible domestic uses of satellites and in formulating plans where their use appeared to be advantageous. Western Union took the position

that joint undertakings by the carriers are possible and perhaps desirable, but urged that present authorizations should run to a particular carrier in those instances where that carrier is seeking to establish a system to meet its own needs.

8. A number of parties urged the Commission not to reach any decision at this time which would preclude consideration in the near future or eventual establishment of privately owned or specialized domestic communication satellite facilities. Several of the parties stressed the necessity of leaving a choice available to potential users as to how they may arrange to meet their domestic telecommunication needs. JFD Electronics Corporation (JFD) in its comments asked the Commission to expand the proceeding to investigate and provide for the possibility of a satellite-originated television broadcasting service in the upper part of the UHF band (channels 70-83). JFD contended that there is no Congressional intent in the Communications Satellite Act of 1962 to grant ComSat a monopoly over domestic satellite systems.

9. The Carnegie Commission on Educational Television (Carnegie) advised the Commission that it was studying educational television in every aspect and that it presently was studying alternative methods of program distribution, including possible use of satellites, and that discussions were in progress with the National Aeronautics and Space Administration concerning a communications satellite system designed for non-commercial television. The statement was filed to call this Commission's attention to the studies in progress, and to encourage this Commission to retain flexibility on the issues relating to educational television until the final Carnegie report would be published in late 1966 or early 1967.

10. The U.S. Department of Health, Education and Welfare (HEW) filed comments encouraging the Commission to consider authorization for non-governmental, non-common carrier entities to construct and operate communication satellite facilities. HEW perceived four major advantages from multiple authorizations: (1) provide the greatest versatility in meeting the broad range of public needs; (2) allow individual entities to make specialized arrangements where necessary; (3) allow for reaching smaller professional or public groups where significant educational gains can be made; and (4) permit the broadest possible continuing experimentation necessary for the quality and variety of programming necessary for (3). HEW noted that not all needs for which private systems could be used involved mass audiences.

The Ford Foundation Proposal

11. In addition to answering the questions posed by the Notice of Inquiry, the Ford Foundation submitted a model of a private satellite system to provide television transmission for both commercial and non-commercial programming. The proposal calls for creation of a Broadcasters' Non-profit Service Corporation (BNS), authorized by the Commission to establish communication satellite facilities for transmission of commercial and non-commercial television and radio programming. The corporation would be a joint effort of the commercial and non-commercial institutions engaged in broadcasting. BNS would provide free interconnection for educational stations via satellite and would generate from its commercial users substantial funds (estimated to approximate $30 million a year at first and perhaps twice that much within 10 years) for non-commercial programming, both national and regional. BNS could operate, according to Ford, either as a specialized common carrier or as a cooperative controlled by its commercial, non-commercial and instructional users.

12. In a letter submitting its comments, the Ford Foundation urged that "non-commercial television has unlimited potential, for human welfare and for the quality of American life" and that "nothing is more needed - for television itself as well as for the country - than a first-rate national non-commercial service." Pointing out that it has been in the past the largest single source of funds for non-commercial broadcasting, the Ford Foundation stated that this contribution - though large for it - has been much too small for the needs of non-commercial broadcasting. While the financial needs of educational television are widely recognized, the sources of needed funds for programming have been elusive. The Foundation continued:

> * * *We all want educational television to be properly funded. We do not want the Government to "pay the piper and call the tune." We are looking for an answer. And that is what makes the possibilities of satellites so extraordinarily important. Non-commercial television has two great needs: first, to become a true national network, at a cost it can afford - and second to have the money for programming, at a wholly new level of excellence. Properly used a television satellite can meet both needs. By its natural economic advantage over long landlines, it can effectively eliminate long-distance charges as a determining element in network choices - commercial and non-commercial alike. And if in the case of commercial networks a major share of

these savings is passed on to the non-commercial programmers, then both problems are on the road to solution, and everyone is better off than he was before. This is not magic, or slight-of-hand. It is a peoples' dividend, earned by the American nation from its enormous investment in space.

13. It was proposed that the programming fund would consist of two-thirds of the difference in cost to commercial broadcasting between program transmission by BNS and toll line payments to terrestrial carriers, with allowance for continued use of some terrestrial facilities. The Ford Foundation filing contains tables setting forth estimated costs of installation and operation for both an initial BNS-1 system (providing six commercial channels and five non-commercial channels in each of four time zones) and a more expansive BNS-2 system, larger by twenty channels. The Foundation did not contend that BNS would provide all of the funds needed for non-commercial programming or that its particular models were the only way to proceed. Rather than seeking immediate licensing action, the Foundation urged that its proposal be put forth for public comment and that the Commission take no action in the meantime to foreclose this possibility.

C. Issuance of Supplemental Notice of Inquiry

14. Reviewing the comments filed August 1, 1966, and cognizant of the needs of all interested parties for the potential use of satellites to provide domestic communication services, the Commission considered it necessary in the public interest to expand the initial scope of this proceeding and to invite comment on the Ford Foundation proposal. In addition, it was found that responses to the initial Notice of Inquiry were not fully responsive to the technical questions set forth in the initial Notice. Accordingly, on October 20, 1966, the Commission adopted a Supplemental Notice of Inquiry setting forth the following matters for consideration by interested parties (31 F.R. 13763):

a. The Commission desires to have, to the extent they are available, descriptions, from existing carriers responding to this inquiry, as well as other entities intending to seek authority to provide common carrier services, general or specialized, of their plans for using communication satellite facilities to meet domestic needs; and

b. Whether, as a matter of law, there is any restriction on the Commission's power to authorize any communications common carrier or carriers to construct and operate communications services;

c. Assuming legal authority, under what circumstances should the Commission issue such authorizations, and to whom (one carrier, more than one carrier, two or more carriers jointly) having due regard for, among other things:

(1) The comparative advantages of communication satellites and other communication media in meeting domestic communications needs;

(2) The effects on charges for, and quality and adequacy of, present and future public communications services;

(3) The anticipated volume of domestic communications needs through 1980, and the portion thereof that can and should be satisfied through the use of communication satellite facilities in view of expected technological developments in all media;

(4) The comparative advantages and disadvantages of meeting domestic needs (i) through the facilities of the global system; or (ii) through a separate system or systems;

(5) The effect or impact of any such authorizations upon the policies and goals set forth by the Communications Satellite Act and upon the obligations of the United States Government as a signatory to the Executive Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System.

d. Whether the type of entity and service contemplated by the Ford Foundation proposal may be licensed under present statutes, and, if not, the type of legislation that would be required.

(1) For the most part, comments filed thus far have not been fully responsive to the technical questions raised in the first Notice of Inquiry as to the adequacy of existing allocations to the communications satellite service or as to the electromagnetic interference to and from both present and projected operations of the global commercial communication satellite system and the

domestic fixed public services sharing the same frequency bands. The latter question is complicated further by the fact that the plenary assembly of the CCIR (Oslo, June 1966), has recommended changes in the technical criteria applicable to the power flux density delivered at the earth's surface from space stations. Therefore, pending resolution of the legal status of the Oslo criteria vis-a-vis those criteria now in the international Radio Regulations, interested parties, in responding to the questions raised in our prior notice and herein (which include the technical questions explicitlyset out in our prior notice) should direct their responses to both the present and Oslo criteria.

Additionally, to permit an evaluation of the impact from proposed systems, parties should indicate as fully as they now can the planned positioning of space stations on the equator for the system under consideration if equatorial stationary satellites are involved.

D. Filing of Supplemental Comments (December 1966)

15. By December 16, 1966, the Commission had received supplemental comments from 21 parties, 9 of which had not filed previously in this proceeding. Almost all non-carrier entities argued that, as a matter of law, the Commission has power under existing law to authorize entities other than carriers to establish a domestic satellite system. Arinc & ATA, ANPA, the Ford Foundation, NAEB and the three networks urged the Commission not to preclude the authorization of private systems. ComSat, GT&E, Hawaiian, the United States Independent Telephone Association (USITA) and Western Union contended that non-carrier entities could not be authorized under existing law; and AT&T, ComSat, GT&E, Hawaiian and USITA urged that private systems should not, in any event, be authorized as a matter of policy. With respect to the Ford Foundation's BNS proposal, AT&T, ComSat, Hawaiian, USITA, CBS and NBC urged that additional legislation was required.1/ The Ford Foundation and NAEB commented that clarifying legislation might be desirable, but was not essential.

1/ In addition, AT&T challenged the Ford Foundations' estimates of construction and operating costs and questioned whether there would be any savings for non-commercial programming.

16. The joint Council on Educational Telecommunications submitted comments supporting favorable consideration by the Commission of some immediate action, such as proposed by Ford, to strengthen and foster development of communication facilities and services dedicated to educational purposes. Lloyd P. Morris, a private citizen filing individually, commented that a major effort must be made at the earliest possible time to improve and accelerate development of local facilities for program production and broadcasting for educational purposes. The National Educational Association and the National Educational Television and Radio Center (NET) supported the Ford proposal and encouraged study of, and immediate effort to resolve problems related to, the structure, activities and financial condition of program production and broadcast facilities of educational organizations and institutions.

17. The National Science Foundation and the National Foundation on the Arts and the Humanities submitted comments supporting consideration of the potential of satellites in educational, cultural and scientific activities and their encouragement and dissemination. They urged that, as a matter of policy, non-governmental entities other than carriers should be allowed to establish domestic communication facilities to meet private needs, particularly where such needs relate to educational, cultural and scientific activities.

Proposals for Domestic Systems

18. Four parties--ABC, AT&T, ComSat and the Ford Foundation--submitted proposals for domestic satellite systems. In brief, the proposed systems were as follows:

(1) The ABC Proposal

19. The ABC proposal, prepared by Hughes Aircraft Company, contemplates a special purpose 24 channel capacity satellite (with one spare in orbit and one in reserve) to provide 3 network signals and one ETV signal in each of 6 time zones (Eastern, Central, Mountain/Pacific, Alaska, Hawaii, and Puerto Rico/Virgin Islands). Each of the three networks would operate earth stations in the vicinity of New York and Los Angeles, which would be capable of transmitting one network signal to each of the six time zones and one ETV signal to the satellite. Receive terminals would be located in each of the television market areas served by one or more networks, each equipped occasionally to transmit one channel to the satellite for special events. There would also be 10 mobile

terminals for remote special events originations. The system would operate in the 4 and 6 GHz bands. It is estimated that the initial capital cost would be approximately $80 million, with annual expense in the neighborhood of $17 million, representing annual savings on program transmission costs to the networks of about $11 million. ABC asserts that the networks could voluntarily agree to donate a portion of their savings for ETV program production costs, but could not be required to do so. However, it is willing to make satellite transmission available to non-commercial stations without cost to them.

(2) The AT&T Proposal

20. AT&T submitted a comprehensive proposal for an integrated Space-Earth Communications System to meet anticipated growth in long distance communications requirements through 1980. This system would operate initially in Phase I in the 4 and 6 GHz region of the spectrum to facilitate an early establishment, but would in large part shift to 18 and 30 GHz in 1972 in order to obtain the exclusive frequency allocation (estimated to approximate 2800 MHz in the 18 GHz and 30 GHz regions, respectively) believed necessary to full development of a domestic system. The initial system, proposed for operation in 1969, would consist of two geostationary (synchronous) satellites, each with a capacity for 9600 voice circuits or twelve television channels.2/ There would be two receive-transmit earth stations located in the vicinity (within 10 or 12 miles) of New York City and Los Angeles (with a third satellite and Chicago vicinity earth station to be added in 1970 or 1971) and 73 receive-only earth stations and terrestrial links to meet the TV and ETV needs of 1969.3/

21. Beginning in 1972 AT&T anticipated use of a new generation of satellites with vastly increased capacity and new capability, in the 4, 18 and 30 GHz region of the spectrum, using pulse code modulation (pcm) for voice, and pcm and fm for television transmission. There would be four satellites (two in 1972, a third in 1975, and a fourth in 1976; the latter two replacing the three from the initial Phase I), each with capacity for 12 television channels and 30,000 voice circuits. There

2/ AT&T also states that the initial system could have some 3200 two-way voice circuits, 8 full time television channels, and 12 occasional use television channels.

3/ The AT&T proposal does not contemplate satellite distribution service to the northeastern sector of the United States, where it asserts that economic and interference considerations call for terrestrial facilities only.

would also be 26 new earth stations in major metropolitan centers, to be used in conjunction with the 73 receive-only stations from Phase I. When fully employed the Phase II system would have capacity for 83,000 equivalent voice circuits, 27 television channels and 61 protection and/or occasional television channels. There would be provision for switching capability in the satellites, and for telephone split circuits (one-way by satellite and return by terrestrial facilities, to alleviate the time delay problem). Although in Phase II all earth station operations would be discontinued in the 6 GHz band, the 4 GHz band would continue to be used for television distribution outside of the Northeastern portion of the United States. 4/

22. AT&T estimated that the initial system in 1969 would require an investment of approximately $104 million, with an additional $339 million by 1980. It state that continuing to meet these requirements through terrestrial facilities alone would require an estimated investment of $183 million in 1969 and $538 million by 1980.5/ AT&T takes the position that any savings should be reflected in the rates charged the general public for common carrier services. It asserts that support of non-commercial television should come from general tax revenues.

4/ Protection against rain attenuation would be provided by space diversity; i.e., each earth complex would consist of two earth stations separated by at least 10 miles and linked by a high-capacity terrestrial system. During sun transit, receiving stations would be interconnected to stations outside the transit area using terrestrial protection facilities. With respect to use of the 17.7-19.3 and 19.4-19.7 GHz bands for transmission of telephone signals (or point-to-point television as distinguished from television distribution channels) from satellite to earth, AT&T estimates that these bands would be divided into one set of 15 channels, spaced 128 MHz and another set of 14 channels, also spaced 128 MHz but located between the first set. The two sets of channels would be used on adjacent antenna beams to reduce interference.

5/ AT&T estimated that the cross-over point where satellite transmission is economic in comparison to terrestrial facilities is approximately 1,300 miles for non-TV traffic.

(3) The ComSat Proposal

23. ComSat also proposed a phased system, to commence in 1969 at 4 and 6 GHz, and later to move into the higher frequencies after a period (perhaps five years) of technical research and experimentation in those frequencies. The initial implementation would involve one satellite (12 TV channel capacity), a large antenna facility on each coast and approximately 58 smaller antenna facilities including a few that are mobile. The Phase I system would gradually grow to 4 satellites, 6 large antenna facilities and approximately 173 smaller antenna facilities. In the early period, ComSat would include demonstrations and experiments to determine how satellite services can be most effectively and efficiently provided and to permit potential users to obtain knowledge as to practicable service arrangements which will meet their communications needs. In 1973, the system would be augmented by a few more large antennas, approximately 60 smaller antennas, and 20 antennas capable of transmitting in the bands above 10 GHz, if feasible. The third phase, in 1978, would include 4 satellites of substantially increased capacity and considerable utilization of transmitting and receiving facilities in the frequency bands above 10 GHz.

24. Although estimating that relative annual cost per channel would decline in the later models, with technological advances, ComSat did not set forth precise figures as to estimated costs for the various models. Like AT&T, it contends that the multi-purpose approach would effect economies over the specialized approach and asserts that "if domestic TV transmission were to be accommodated separately in the early days, general communications would suffer and the largest of all of the immediate 'peoples dividends' from the national space program would be severely prejudiced." According to ComSat, the "large block of the TV requirements supplies the necessary economic base for initiating the multi-service system."

(4) The Ford Foundation Proposal

25. The Ford Foundation, in a comprehensive filing comprising three lengthy volumes,[6/] proposed two "much improved" systems, BNS-3 and BNS-4, which by comparison with BNS-1 and BNS-2 are "more reliable, more efficient and more economical in their use of the frequency spectrum."

6/ Volume I is addressed to policy and financial issues, Volume II to legal issues, and Volume III to the technical characteristics and costs of BNS-3 and BNS-4, interference problems and adequacy of spectrum space. Included in the Foundation's comments are studies by: Joseph A. Pechman, Brookings Institute, on possible sources of tax revenues for non-commercial broadcasting; Professor Wilbur Schramm, Stanford University, on

(continued on next page)

By moving to larger satellites lifted by larger launch vehicles (an Atlas-Uprated Agena or a Titan 3B-Agena), the Ford Foundation's designer was able to propose satellites of greater power and sophistication, each of them carrying 24 channels that can be beamed sharply and powerfully at selected time zones of the United States. The system would include service (omitted from BNS-1 and BNS-2) to Alaska, Hawaii, Puerto Rico and the Virgin Islands. The BNS-3 system would have two satellites, and BNS-4 would have three; either system would have 233 earth terminals of which 10 would be mobile.

26. The Ford Foundation estimates that BNS-3 would have an initial capital cost of $101.3 million and an annual cost of $22.8 million. BNS-4 is estimated to have an initial capital cost of $115.8 million, and an annual cost of $31.8 million. The Ford Foundation states that these cost estimates include all commercial, non-commercial and instructional requirements, and necessary microwave and cable links. The present cost of program transmission by terrestrial common carrier facilities is $65 million, expected to increase in the 1970's. The Ford Foundation estimates that by 1970, BNS-3 could replace $55 million (plus $5 to $10 million for a fourth network), leaving potential savings of $31.2 - $36.2 million. These figures represent potential savings, not revenues - which the Ford Foundation anticipates will be larger because the economies of satellite transmission will generate business.

27. The Ford Foundation states that BNS-3 and BNS-4, like their predecessors, are still only models open to criticism and subject to improvement. It mentions the possibility of a joint use of facilities, citing TAT IV (AT&T et al., 37 F.C.C. 1151) and stating:

> The alternatives are not either a number of special purpose systems or a single multi-purpose system owned by a common carrier. There are other modes of

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6/ continued: instructional television; International Business Machines Corp., on potential interference; cost studies by Hughes Aircraft Corp. and Philco-Ford Corp.; and a study entitled "Communications Rates and Integrated Communications Systems" by Dr. Leland Johnson, indicating how lower costs of satellite transmission would be reflected in rates if there were a common carrier system. Dr. Johnson concludes that the savings are likely to be absorbed and passed on to users, if at all, in amounts too small to be noticed. The Ford Foundation filing also includes a review of non-commercial and instructional television in other countries.

organization. If there are substantial cost advantages in joint use of some part of the facilities of a television satellite system - on the ground or in space - for telephone and date transmission, there is no reason why that should not be done. Joint use of facilities will undoubtedly require foresight in planning and designing the satellite system to insure flexibility; it will also require ingenuity in developing joint uses or forming joint ownership arrangements. We believe, however, that national economic tradition, the heavy national investment in space, the bright promise of satellite technology and the compelling needs of non-commercial and instructional television obligate us to look beyond traditional responses, as the Commission has done before.

(5) The Ford Foundation Demonstration Program.

28. The Ford Foundation noted that a number of questions had been raised concerning the feasibility of the Ford Foundation's proposal and ComSat's technical plan and indicated its understanding that serious thought was then being given by others to the possibility of launching a test satellite. The Ford Foundation took the position that a pilot demonstration program should be conducted by the National Aeronautics and Space Administration (NASA) as program manager, although in cooperation with other federal agencies (including HEW, FCC, DTM, DOD, and the National Bureau of Standards of the Department of Commerce) and all interested private parties including the carriers, the commercial networks, commercial and non-commercial stations, ComSat, the satellite system manufacturers, and the private foundations concerned with public and instructional broadcasting. The Ford Foundation proposed further that, in any event, a pilot demonstration program should not be commenced before April 1968, in order to permit the making of necessary national policy decisions on the issues involved in use of satellites for domestic purposes.

29. The Ford Foundation urged that existing programs and existing spacecraft should be used wherever possible, and modified as required, both for testing and pilot operations. Pointing out that NASA is already engaged in a testing program with its Application Technology Satellite Series (ATS) and is therefore in a position to make a swifter beginning, the Ford Foundation asserts that these satellites could be could be used for interference testing and for early pilot operations of non-commercial and instructional television through satellites. It also claims that interference measurements can begin without satellite through mobile vans and aircraft equipped to make measurements around existing terrestrial facilities and a transportable prototype earth

terminal sited near such facilities. If interference measurements and pilot operations cannot ride "piggy back" on an existing program then, the Ford Foundation states, it may be necessary to undertake design of a new satellite, with a 6 - 8 TV channel capability, to transmit signals in two beams, one to the eastern half of the United States and the other to the western half.

30. Whether the "piggy back" approach is used or a new satellite design proves necessary, the Ford Foundation states that the following ground equipment would be useful for conducting pilot operations:

2 network terminals with transmit/receive capability
6 affiliate terminals with transmit/receive capability
2 mobile terminals with transmit capability
18 mobile terminals with receive capability
20 remote schoolhouse terminals with receive capability

The Ford Foundation contemplates that the first three types of terminals would be primarily used by commercial and non-commercial television networks in the production and distribution of programs, and in testing various network configurations. One of the network affiliated terminals would be used on a time-shared basis to originate instructional programs. The 18 mobile receiving terminals would be used for instructional television purposes to demonstrate satellite program distribution to non-commercial stations and to classrooms for instructional use. The 20 schoolhouse terminals would be so placed as to evaluate a wide-area operational direct-to-school transmission system. 7/

31. The network terminals would be located in New York and Los Angeles, and the affiliate terminals would be used by the networks to feed established regional networks. Each terminal would simultaneously

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7/ According to the Ford Foundation, all 20 schoolhouse terminals would be placed at schools in a single geographical region. They would remain there for periods of a year or more, in order to integrate the programs they provide into the school curricula. Access to the available channel or channels could be time shared between state educational entities transmitting programs only to schools in their respective states and a regional body organized to test the feasibility of cooperation on a wider scale.

serve all networks, including non-commercial stations. The two mobile transmitting terminals would be used by networks at points of remote program origination, relaying these programs via the satellite. An instructional television demonstration and evaluation program would occupy one or two satellite channels and would require 18 mobile receiving terminals and the 20 schoolhouse terminals. Each mobile terminal would be a complete, self-sufficient television demonstration system consisting of an antenna, a dual-channel receiver, a video distribution system, and approximately 50 color television monitors to be placed in classrooms and auditoriums. Travelling with the terminals would be an operations team consisting of two technicians to install, operate, and maintain the equipment and several trained demonstrators to work with teachers and administrators.

32. The Foundation recognizes that a program of this nature is outside the scope of NASA's presently planned activities and that generous financial support by Congress would be vital. While not prepared to operate or manage anything in this field, Ford would consider how it might contribute to:

> Training personnel in non-commercial networking operations through the satellite.
>
> Training teachers and educational administrators in the more effective use of instructional television.
>
> Making available programs for both non-commercial and instructional television.

E. The Carnegie Commission Report

33. In January 1967, Carnegie issued the report to which it had referred in earlier comments filed in this proceeding. Carnegie presented a finding that "a well-financed and well-directed educational television system, substantially larger and far more pervasive and effective than that which now exists in the United States, must be brought into being if the full needs of the American public are to be served. This is the central conclusion of the Commission and all its recommendations are designed accordingly." (Carnegie Report, Bantam, pg. 3.). Specifically, Carnegie said:

> (1) We recommend concerted efforts at the federal, state, and local levels to improve the facilities

and to provide for the adequate support of the individual educational television stations and to increase their number.

(2) We recommend that Congress act promptly to authorize and to establish a federally chartered, non-profit, non-governmental corporation, to be known as the "Corporation for Public Television." The Corporation should be empowered to receive and disburse governmental and private funds in order to extend and improve Public Television programming. The Commission considers the creation of the Corporation fundamental to its proposal and would be most reluctant to recommend the other parts of its plan unless the corporate entity is brought into being.

(3) We recommend that the Corporation support at least two national production centers, and that it be free to contract with independent producers to prepare Public Television programs for educational television stations.

(4) We recommend that the Corporation support, by appropriate grants and contracts, the production of Public Television programs by local stations for more-than-local use.

(5) We recommend that the Corporation on appropriate occasions help support local programming by local stations.

(6) We recommend that the Corporation provide the educational television system as expeditiously as possible with facilities for live interconnection by conventional means, and that it be enabled to benefit from advances in technology as domestic communications satellites are brought into being. The Commission further recommends that Congress act to permit the granting of preferential rates for educational television for the use of interconnection facilities, or to permit their free use, to the extent that this may not be possible under existing law.

(7) We recommend that the Corporation encourage and support research and development leading to the improvement of programming and program production.

(8) We recommend that the Corporation support technical experimentation designed to improve the present television technology.

(9) We recommend that the Corporation undertake to provide means by which technical, artistic, and specialized personnel may be recruited and trained.

(10) We recommend that Congress provide the federal funds required by the Corporation through a manufacturer's excise tax on television sets (beginning at 2 percent and rising to a ceiling of 5 percent). The revenues should be made available to the Corporation through a trust fund.

(11) We recommend new legislation to enable the Department of Health, Education, and Welfare to provide adequate facilities for stations now in existence, to assist in increasing the number of stations to achieve nation-wide coverage, to help support the basic operations of all stations, and to enlarge the support of instructional television programming.

(12) We recommend that federal, state, local, and private educational agencies sponsor extensive and innovative studies intended to develop better insights into the use of television in formal and informal education.

Carnegie did not submit any immediate or developed proposal for implementation of an operating satellite system.

F. The President's Message of February 28, 1967, and the Public Broadcasting Act of 1967

34. The President's 1967 message to Congress on Education and Health in America indicated the Administration's desire to have Congress adopt, at its current session, legislation which would establish a program for implementation of the Carnegie Commission's Report. In recommending

the establishment of a Corporation for Public Television, the President stated (113 Cong. Rec., daily ed. S. 2679):

> "One of the Corporation's first tasks should be to study the practicability and the economic advantages of using communication satellites to establish an educational television and radio network. To assist the Corporation, I am directing the Administrator of the National Aeronautics and Space Administration and the Secretary of Health, Education and Welfare to conduct experiments on the requirements for such a system, and for instructional television, in cooperation with other interested agencies of the Government and the private sector."

Legislation on the matter was promptly introduced in the Senate by Senator Warren G. Magnuson and has since been enacted, Public Broadcasting Act of 1967 (Public Law 90-129, 76 Stat. 65). The Public Broadcasting Act of 1967 provides in Section 396 (h) that:

> Nothing in the Communications Act of 1934, as amended, or in any other provision of law shall be construed to prevent United States communications common carriers from rendering free or reduced rate communications interconnection services for non-commercial educational television or radio services, subject to such rules and regulations as the Federal Communications Commission may prescribe.

The Public Broadcasting Corporation has been established.

G. Filing of Reply Comments (April 1967)

ComSat proposes Pilot Demonstration Program

35. On or before April 3, 1967, the Commission received reply comments from 19 parties, four of which were filing in this proceeding for the first time. With one exception, ComSat, there were no notable changes in the positions of the parties which has filed comments or supplemental comments. ComSat presented a new proposal for a pilot demonstration program, which the Corporation considers consistent with the President's message of February 28, 1967, to provide a pilot experience in non-commercial as well as commercial television and in general domestic communication by satellite at the earliest possible time. Specifically, ComSat proposes: (1) to participate in experiments, conducted under government auspices, concerning the

practicality and economic advantage of using communications satellites to inter-connect educational television and radio stations; (2) to develop under the auspices of the Commission and in conjunction with other appropriate entities, including governmental entities and common carriers, a program to demonstrate communication satellite operations for a variety of services, including commercial and non-commercial broadcasting, voice and record transmissions; and (3) to expedite the program, under which ComSat would provide the necessary capital, subject to Commission approval, without prejudice to the question of ultimate ownership, construct a minimum number of earth stations, and procure appropriate satellite launches to provide one television channel free in each of two time zones for educational television networking, with additional capacity for experiments and demonstrations to prove and exhibit potential advantages of satellite services for non-commercial television and radio as well as for other services. Capacity in the model would also be available for commercial television transmission and transcontinental common carrier service, to provide a financial foundation for the model. The demonstration facilities would be so designed that they would be absorbed eventually in a long term complex for the furnishing of commercial service after the termination of their use for demonstration purposes.

36. ComSat proposed that the Commission adopt a statement of interim policy approving the principles of a pilot demonstration program set out in such filing; call a conference of appropriate interested persons and entities (interested carriers, educational and commercial broadcasters, HEW, NASA, DTM, NET, the Ford Foundation, etc.) to plan such a program; and subsequently, on the Commission's own motion or on application by a party, take action to establish a pilot demonstration model system. ComSat noted that all technical proposals made by the parties contemplated certain common minimum requirements needed in the long-run for a single multi-purpose system or for one or more dedicated systems. Its model system would be designed to permit eventual absorption in a long-term complex for commercial service. It described the initial objective of the program as making non-commercial television and general communications by satellite available throughout the Pacific and Rocky Mountains time zones, with direct access from New York. Commercial television and general communications services would be accommodated at commercial rates, and one television channel in each time zone would be made available without charge for educational broadcasting. Capacity would be provided for experiments, particular demonstrations, and long-distance services. ComSat urged that steps now be taken to assure that needed facilities will be available for experiments, demonstrations, and the described services.

37. On July 26, 1967, ComSat elaborated on its proposal in a response to a letter from the Commission. The ComSat pilot program, contemplated to be completed during the two years 1970-1971, would use two satellites, each with a five year life, in synchronous orbit between 70° and 120° W. Longitude, tentatively 97° and 103° W. Longitude. Their coverage would include parts of Canada and Mexico as well as the Mainland United States. Radiation outside the United States would not (according to ComSat) cause harmful interference with terrestrial radio facilities. The satellites each would have a capacity of twelve color television channels, or 21,600 voice channels when used with 85 foot antennas,or 9600 voice channels when used with 42 foot antennas. Television, voice, data, telegraph, etc., could be simultaneously transmitted. Normally, each satellite would be used for both full-time and occasional service, but if one failed, the other could handle all full-time service needs. The satellite would transmit at 3700-4200 MHz and receive in the 5925-6475 MHz band.

38. ComSat proposes a send/receive earth station near New York City and another near Los Angeles, each with two 85 foot antennas, each antenna being capable of using the full capacity of one satellite. It proposes two send/receive earth stations, each with a 42 foot antenna, one in the northwest and one in the southeast, which can transmit and receive multi-point message channels and color television. The proposal also calls for thirty receive only stations, with 25 to 32 foot antennas, in the Pacific and Rocky Mountains time zones. These zones are considered by ComSat as best suited for demonstrating the distribution capabilities of satellites, because of large distances, sparse population, and limited available terrestrial facilities.

39. This system configuration is based on ComSat's estimate of current demand, as derived from its talks with certain major users; it states, however, that no facility would be constructed without reasonable assurance of economic use. Total investment is estimated at $57,700,000, of which $37,220,000 would be recovered over the five year period 1970-74. (ComSat anticipates, however, that the pilot program will have before then justified a follow-on program for wide area coverage.) Total revenue requirements, then, including an annual operating cost of $4,070,000 and 12 percent return on investment after taxes, start at $24,485,000 in 1970 and decline to $17,312,000 in 1974 (with a declining investment). The requirements over the entire 5 years are $104,428,000.

40. ComSat recognizes that all costs could not be recovered in the five year period, on the assumption that this would require non-competitive pricing. However, it proposes a multi-service system, with each service charge being related to its costs so far as possible.

There would, however, be capacity associated with two non-commercial television channels offered without charge. To the extent that costs are not recovered in the two year pilot program ComSat proposes that they be recovered in later years.

41. ComSat is willing to finance, own, and operate the earth stations itself, or to share in a divided ownership with appropriate carriers. Satellite ownership and operation would be in conformity with international obligations under the definitive INTELSAT arrangements now being negotiated.

H. Supplemental comments on ComSat's pilot proposal (September 1967)

42. Since ComSat's proposed pilot demonstration program was presented for the first time during the final round of comments submitted on or before April 3, 1967, no other parties to the proceeding were provided an opportunity to study and respond to the proposal or to offer counterproposals. On August 14, 1967, the Ford Foundation filed with the Commission a petition for leave to file further comments on the ComSat proposal submitted March 31, 1967, and elaborated in July 1967. The Commission, desiring to assure full consideration and discussion of the relevant issues in the ComSat proposal, issued an order on August 29, 1967, inviting further comments from all interested parties on the ComSat proposal. Deadline for filing of such comments was set for September 18, 1967.

43. Twelve parties filed comments in response to the Commission's order. AT&T, Hawaiian Telephone Co., and GT&E favored early implementation of ComSat's pilot program. AT&T urged further that the earth stations be owned by the common carriers utilizing them to provide service to the public. Hawaiian maintained that users of the satellite system should be limited to the terrestrial carriers in all ordinary circumstances. ANPA, CBS, and Western Union Telegraph also supported ComSat's proposal, but cautioned against permitting ComSat to obtain a de facto position of dominance so as to prejudge a considered decision on the various issues pending before the Commission in this proceeding.

44. While agreeing on the desirability of a test program, NBC, ARINC and ATA questioned the advisability of an immediate acceptance of ComSat's proposal. ARINC and ATA felt that authorization would give ComSat a substantial "foot in the door" toward ultimate ownership of the system and questioned: (1) whether ComSat is legally qualified to provide domestic service, and (2) whether ComSat's capital resources are not precommitted exclusively to the global system. NBC urged that

a conference of interested government and industry parties precede any authorization, in order to give the Commission a more complete and considered basis than is now available on which to authorize a test program.

45. ABC and the Ford Foundation opposed the ComSat proposal. Both saw authorization as giving ComSat the inside track toward ultimate ownership and supported instead a test program conducted by a more disinterested entity such as NASA. Ford contended further that acceptance of the ComSat proposal would be an untimely prejudgment of the issues now being considered by the President's Task Force on Communications Policy (see infra, Section J), viz, whether a domestic satellite system should be generalized or specialized, and whether there should be more than one system. Ford also maintained that the ComSat proposal makes insufficient provision for the possibilities of satellite communications in the field of public television, both as a provider of free interconnection and as a source of protected program funds.

46. Ford further claimed in its September 1967 filing that there are other technical tests, less expensive and less time-consuming than the ComSat program, that can usefully be undertaken before a full-scale program costing tens of millions of dollars is warranted. Appended to this filing are two studies conducted by Stanford Research Institute (SRI) and Hammet & Edison (Hammet) setting forth a number of tests which they consider useful. Among other things Hammet states that it appears feasible to distribute television programming by satellite in the bands now allocated to the Television Auxiliary Broadcast Service without disrupting present use of these frequencies, and that the use of these bands would reduce congestion in the common carrier bands and result in considerably more efficient use of the spectrum than that now planned in the 4 and 6 GHz bands.

47. ABC Television Affiliates and CBS Television Network Affiliates, both filing for the first time in this proceeding, urged that broadcast stations should be allowed, individually or in groups, to own the ground receiving equipment necessary to provide television interconnection service to them by satellite.

I. ComSat Reply

48. On September 20, 1967, ComSat filed a response to the comments on its proposed pilot program, with a covering letter addressed to the Ford comments. ComSat observed that Ford's concern with funding public television leads it to underemphasize domestic communications in general, which the ComSat proposal would meet through a multi-purpose

system, and so give each experience in economic use of satellite and earth service facilities. Though ComSat notes it has provided for preferential rates to non-commercial broadcasting, it says it is not willing to make the networks a "captive treasury" for public television.

J. Other Pertinent Background

49. The President's message of August 14, 1967, transmitting recommendations relative to world communications, states, inter alia, with respect to domestic communications satellite systems (H.R. Doc. No. 157, 90th Cong., 1st Sess., page 6):

> The space segment of a communications satellite system is international by its very nature.
>
> -- A synchronous satellite occupies a permanent orbital position in the international domain of outer space.
>
> -- All satellites radiate electro-magnetic energy potentially capable of interference with other communications systems.
>
> -- All satellites use the internationally regulated frequency spectrum.

In view of the international nature of satellite communications and our commitments under the INTELSAT agreement of 1964, we should take no action in the establishment of a domestic system which is incompatible with our support of a global system.

This does not mean that the United States - or any nation - will give up vital sovereignty over domestic communications. The flow of satellite communications - both domestic and international - is to and from ground stations owned by the individual nation or its representative. Each country will have to determine for itself whether it wants to use communications satellites for domestic purposes. It must be prepared to bear the expense of such satellite use, just as it will derive any revenues.

It is the space segment - not the ground station - that is of legitimate international concern. How should a nation utilize satellites for domestic communications purposes?

There are several possible choices:

-- A nation can lease circuits from an international INTELSAT satellite.
-- It could elect to operate a separate satellite for its own domestic use.
-- It could join with neighboring countries to operate a separate satellite.

50. The President further announced the appointment of a Task Force on Communication Policy to study and report on the following questions within one year (id. at pgs. 8-9):

-- Are we making the best use of the electro-magnetic frequency spectrum?
-- How soon will a domestic satellite system be economically feasible?
-- Should a domestic satellite system be general purpose or specialized, and should there be more than one system?
-- How will these and other developments affect ComSat and the international communication carriers?

51. The Inter-Governmental Agreement and Special Agreement of 1964 (T.I.A.S. No. 5646) establishing interim arrangements for the global commercial communications satellite system (INTELSAT) do not treat the matter of domestic satellite systems. Article IX of the Agreement provides for the negotiation of definitive arrangements for INTELSAT in 1969. The United States proposal for such definitive arrangements contains a provision for the establishment of separate satellites by a member of INTELSAT to meet its domestic needs. The proposal states, however, that "clearly the space segment of even a domestic satellite system is a matter of legitimate international concern, and no action should be taken in the establishment of a domestic system which is incompatible with the global INTELSAT system." The proposal further states that in order that legitimate international concerns would be fully protected, the Governing Body of INTELSAT would have to decide prior to the establishment of a domestic satellite system that:

a. The establishment of such facilities would be consistent with INTELSAT's proposed use of the frequency spectrum and orbital space, and

b. The proposed mechanism and techniques for control of these satellites were adequate, and the radiation emitted from the satellites would not cause harmful interference.

In February and March, 1969, an international conference was held in Washington, D.C., to begin negotiations on definitive arrangements, and was reconvened to continue such negotiations in February, 1970.

K. The GE Proposal

52. On February 19, 1969, General Electric Company (GE) sought leave to supplement its original filings with additional comments setting forth its present view of new and expanded communications services that might appropriately be provided via satellite. In the interest of a full record that might be of assistance in arriving at policy determinations, the Commission accepted the filing and accorded parties to the proceeding an opportunity for comment. GE states that in view of uncertainties as to the structuring of a domestic satellite system, it cannot in the exercise of a prudent business judgment undertake commitments of an investment or operational nature in the system it is proposing. Rather, it is making the conclusions drawn from its studies and research available in an effort to assist the Commission and stands ready to provide further technical and other data.

53. The GE proposal rests on its conclusion that "introduction of satellite communication technology into our domestic communications system can provide the means for a revitalization of the business usage of the record communications system in the United States," that it "offers a unique opportunity for the achievement of a repeatedly recognized basic legislative and administrative policy objective, i.e., the development of a balanced national communications system including not only the excellent voice switched network system provided by the Bell System but also a viable and effective truly competitive record communications alternative." While stating that consideration should be given to authorizing the proposed system to existing communications common carriers, GE suggests that a possibility equally worthy of a serious consideration would be authorization of an entirely new common carrier entity for the purposes it describes--"one not deterred by existing capital or other commitments in the present common carrier system."

54. GE's proposed system and services concentrate on areas of data and other record message point-to-point transmission that would not require the availability of complex switching arrangements. The basic array of proposed services is subdivided as follows:

(1) Multiple Access Digital Services (MADS)

a.) Record Services

b.) Remote Access Computer Services (RACS)

(2) Multiple Access Video Services (MAVS)

55. With respect to MADS-Record Services, GE states that record communications of the nature of Telex, TWX and Private Wire Systems could be provided much more economically via satellite, by eliminating most of the present hierarchy of switching on the terrestrial network, and thus would become available to a far greater number of users. It also contemplates a service designated as "Telemail" for business-to-business "transaction" mail (allegedly about 17% of all mail), which would ultimately be provided at rates comparable to postal service, but with instant delivery.

56. In the area of Remote Access Computer Services (RACS), GE states that a key service of the proposed system would be the provision of communications needed for computer-to-computer and computer-to-individual user purposes. This would involve not only communications for time-sharing computer facilities, but also provide communications capabilities for many other types of computer uses that do not involve time-sharing. GE also

asserts that the availability of nationwide "metropolitan area" access to time-sharing centers, regardless of physical location, should increase the practicability of nationwide data banks or library services provided from very large storage facilities in one location.

57. The proposed Multiple Access Video Services (MAVS) contemplates random assembled video networks for use by business, professional, government, educational and social organizations. A primary objective of the MAVS service would be to provide mobile ground stations for transmission, reception, or both. It is asserted that this would facilitate meetings, conferences, seminars and other face-to-face confrontations and save the time now spent on travel. The service provided could be simplex, half-duplex, or full-duplex video with duplex audio. GE foresees two additional video services: (1) a Public Video Exchange (PVX) to meet the requirements of any person or group that are insufficient to require a dedicated facility, in which case the subscriber would be required to go to the public studio; and (2) a Private Video Exchange for customers with large usage (e.g., the central office and a remote production facility of a large corporation, a central university and its extension facilities, state governments and their regional or county centers, etc.) in which case the ground facility would be located at the subscribers premises.

58. GE further states that the demands for data and video services would not utilize the full satellite capacity, and that extra transponders would be available for use by common carriers (such as telephone carriers) and private network users (e.g., broadcast networks, airline entities, etc.). It states that control of this portion of the satellite facilities would be with the user of these transponders, who would provide the related ground facilities.

59. The GE filing sets forth in some detail the estimated market potential and rates for the various proposed services, the basic technical and operational mode of the proposed system, technical characteristics of the satellite and other equipment, general system parameters, and the estimated cost structure. Rather than attempting to summarize GE's discussion and charts here, we refer interested persons to the GE filing itself. We do note, however, that GE contemplates use of frequencies in the 4 and 6 GHz bands; digital transmission; the use of one computerized "Routing Center," as director of system traffic for all ground facilities, which would perform the channel assignment, billing, TT&C, and system diagnostic maintenance functions; the standard use of 30-foot antennas in the proposed 175 earth stations; and the use of CATV cable and/or microwave links, as well as local telephone loops, to provide local inter-connection with the satellite system facilities.

60. The estimated system costs for full implementation by 1980 are calculated to amount to approximately $321 million. This includes initial and continuing research and development costs of both satellite and earth facilities, and procurement of five satellites (assumed five year life) and boosters. The largest single item of investment would be earth facilities, including 175 earth stations, one routing center and other administrative facilities. Personnel requirement estimates range from 1300 people at the time of initial satellite launch to approximately 4,700 for full operational capability in 1980.

61. GE argues against authorization of a pilot or interim system, claiming that the uncertainty would prejudice its ability effectively and aggressively to advance new markets. It asserts that sound business judgments would require a reasonable degree of certainty concerning continuation of the system that would only be associated with a more permanent system. GE states that the justification for a pilot would depend primarily on an assumption that there are major technical uncertainties, which is contrary to the established technical feasibility of synchronous satellites for the pruposes it advances.

62. Comments on the GE proposal were filed by twelve parties on or before April 14, 1969. In general, non-carrier parties either commented favorably or took no position on the GE proposal, but requested prompt action by the Commission to encourage rapid development of some form of domestic satellite program. ABC states that the GE proposal does not exclude an additional, separate broadcaster system and urges expeditious authorization of such a system. While NBC believes a separate broadcaster system to be best, it would also support another system that could better serve the needs of program transmission users. It further urges that a demonstration program, utilizing existing types of equipment such as ATS or Intelsat I and II satellites and transportable earth terminals, should commence as soon as possible. The NAM considers the GE proposal to be an "excellent contribution." Aerospace Industries claims that the needs of aerospace companies are not now being met promptly and efficiently, and that an expansion of existing facilities is urgently needed. It asserts that any of the domestic satellite proposals in this Docket would be a welcome addition. Con Sumers, Inc. and TVC of California, Inc., commenting for the first time in this proceeding, state that domestic satellite facilities could be used for other video services (in addition to those proposed by GE) which would require encoding and decoding to ensure that the communication goes only to subscribers, e.g., subscription television and subscription services to the medical profession and small businessmen. It further claims that the prescription of uniform standards for transmission and reception equipment is essential if this potential is to be realized.

63. Common carrier parties were divided in their views on the GE proposal. ComSat adhered to the position that its pilot proposal is best and must include the network television market to be viable. However, ComSat states that if there should be customer demand for the types of services proposed by GE, these requirements could be accommodated in the pilot plan or at some later date. ITT Worldcom commends the GE proposal, but states that the services should be provided on a common carrier basis, by existing carriers, and that decisions as to ownership would be premature prior to formal applications containing adequate data. MCI approves of the GE proposal for new entry and expresses its continuing interest. WUI shares GE's concern that a domestic satellite system be utilized to its fullest potential, and urges that this would be best accomplished by a single multi-purpose system, owned by existing carriers--including ComSat and international carriers who would use a domestic system between gateway centers and satellite earth stations or cable terminals.

64. WU, GT&E and AT&T were critical of the GE proposal. All three assert that the proposed services are being, or could be, provided by terrestrial carriers and that the alleged cost advantages of satellite are unsupported. In the latter connection, they claim that GE's estimated costs are understated and fail to take account of local distribution and terminal costs. It is further urged that GE overemphasizes elimination of terrestrial switching steps, since terrestrial systems utilize direct routes where there is adequate volume and use switching to save costs between low-volume points and for alternate routing. AT&T claims that the GE traffic projections and estimated revenues are unrealistic and overly optomistic, in part because a preponderance of traffic would be short-haul and much would never leave the area served by a single earth station. AT&T further states that GE does not provide for restoration of facilities over alternative paths; if an earth station failed, the only alternative would be terrestrial facilities to another earth station and in the event of outage at the routing center, the whole system would be out. AT&T concludes that the GE proposal in its present form is too inadequate and incomplete to provide a basis for affirmative action. GT&E states that the concepts advanced are interesting and worthy of discussion, but that this proceeding is not an appropriate context.

65. More generally as a matter of policy, WU urges that the proposal for a new record carrier is not sound. It further states that a pilot is desirable to test economic factors, because the uncertainties are not technical, but economic. AT&T argues that the GE proposal rests on an erroneous assumption of a national policy in favor of competition in the common carrier field. It asserts that separate systems for voice and record would be "technically unsound, economically wrong and contrary to the interest of communications users in general."

66. On May 15, 1969, the Postmaster General filed comments on the "telemail" aspect of the GE proposal and its relationship to potential electronic transmission of domestic communications presently carried in the United States mail. It is stated that conceivably, upon ultimate refinement of the concept, all letter mail, or approximately 56.8% of all mail pieces, could be supplanted by a telemail system and that such a diversion would represent approximately 55% of revenues realized from domestic mail. The Postmaster General requested the Commission to consider the potential impact its decision might have upon the Postal System, and to fashion its decision so that the Post Office Department would not be precluded from acquiring its own electronic communication system at some future date or be restricted to dealing with a sole licensee.

67. Recommendations of the Executive Branch--Finally, on January 23, 1970, the White House submitted to the Commission a memorandum setting forth the Administration's comments and recommendations on the matter of domestic satellite communications. The text of this memorandum is as follows:

THE WHITE HOUSE

WASHINGTON

January 23, 1970

MEMORANDUM FOR

Honorable Dean Burch
Chairman
Federal Communications Commission

Federal policy on domestic satellite communications has been long delayed. The Administration is concerned that the delay not be prolonged and that the policies adopted reflect all important dimensions of the public interest, including the international aspects of geostationary orbital and radio resources. Based on our review of relevant technical, economic, and public interest considerations, the Administration offers the following comments and recommendations to the Commission.

Public Policy Objectives

In telecommunications, the government's responsibility to safeguard and promote the public interest involves primarily the encouragement of reliable communications services for public, business, and government use at reasonable rates and the assurance of a healthy environment for continuing innovations in services and technology. This general goal must, of course, be made more specific for particular policy issues. In our review of the domestic satellite issue, we have concentrated on the following objectives:

-- assuring full and timely benefit to the public of the economic and service potential of satellite technology.

-- insuring maximum learning about the possibilities for satellite services.

-- minimizing unnecessary regulatory and administrative impediments to technological and market development by the private sector.

-- encouraging more vigorous innovation and flexibility within the communications industry to meet a constantly changing spectrum of public and private communications requirements at reasonable rates.

-- discouraging anticompetitive practices -- such as discriminatory pricing or interconnection practices and cross-subsidization between public monopoly and private service offerings -- that inhibit the growth of a healthy structure in communications and related industries.

-- assuring that national security and emergency preparedness needs are met.

The Technical Framework

The establishment and operation of domestic satellite communications facilities is technically feasible within the present state of the art, and readily foreseeable technological advances will further enhance this capability. Technical considerations place no serious constraints on policies governing the ownership or mode of operation (specialized or multi-purpose) of domestic satellite communications facilities. These technical considerations, though of great importance in the detailed engineering, operations, and economics of specific systems, can be dealt with effectively under any reasonably foreseeable ownership arrangements.

The issue of radio resource scarcity for satellite communications has been overstated to a significant degree. While the communications capacity of this resource is finite, the ability to accommodate additional radio services is greatly expandable through administrative, technological, and operational innovation. Both earth station and satellite design standards can be varied to assure adequate orbital capacity for both immediate requirements and likely near-term growth. Long-term growth can be accommodated through further refinement or additional frequency allocations, whichever is most economic.

Since some of the orbital locations and associated spectrum usage of interest for United States domestic satellites might also be potentially useful to other western hemisphere nations, a question of United States monopolization could conceivably arise. However, even 10 to 12 United States domestic satellites (a high estimate of likely early system development) would represent only a small fraction of the number which could be accommodated for western hemisphere use with the current state of the art. Therefore, orbital capacity is not expected to be a problem at this time. As demand for satellite communication expands, it may become necessary to evolve additional international coordinating mechanisms; but this would likely involve the establishment of appropriate technical standards rather than the rationing of orbital positions. This is expected to be a subject for discussion at the 1971 World Administrative Radio Conference.

The Economic Framework

The most immediate potential for domestic satellite communications seems to lie in long distance specialized transmission services -- such as one-way distribution of radio and television programs or two-way exchange of high-speed data or other wideband signals among thinly dispersed users. Common carriers have informed us that satellites do not appear economic at present for the routine transmission of public message traffic.

For the foreseeable future, satellite communications systems will require large initial investments, careful technical and economic planning, and complex technical management capabilities. The extensive, reliable, and low-cost terrestrial communications network already established in the United States makes domestic satellite systems competitive only where their unique capabilities offer significant advantages over terrestrial transmission. We, therefore, expect the initial number of potential offerers of domestic satellite services to be small.

In the absence of clear economies of scale and overriding public interest considerations to the contrary, the American economy has relied on competitive private enterprise rather than regulated monopoly to assure technical and market innovation, long-run

optimum use of resources, and industry flexibility. These are all conditions this Nation has found to encourage higher-quality, lower-cost services responsive to consumer demand.

At this stage of domestic satellite planning, it is not possible to identify major economies of scale. Rather, it appears that a diversity of multiple satellite systems as well as multiple earth stations will be required to provide a full range of domestic services.

Further, we find no public interest grounds for establishing a monopoly in domestic satellite communications. The general public is not a direct user of such services. The provision of specialized transmission services and the carriage of bulk message traffic are quite different in character from the provision of switched public message (telephone) service upon which much of our monopoly theory of telecommunications regulation is based. There is no reason to expect that competition here would do other than to encourage new or lower-cost services, the benefits of which would indirectly accrue to the public. Competition in the offering of satellite services appears to hold forth greater benefit to the economy and the public than would a single chosen instrument.

Detailed regulation of service rates and commercial rates of return are similarly predicated on natural monopoly conditions that should not exist with domestic satellite communications in the immediate future. Not only is competitive entry possible, but terrestrial communications pricing would act as an upper limit on prices chargeable for most satellite services. In these circumstances, competitive pressure, rather than regulatory constraints, should be permitted to limit rates for specialized services via domestic satellites.

The historical development of telecommunications policy, regulation, and industry structure has resulted in a blurred distinction between public and private interests. A confusing patchwork of cross-subsidization between public message and specialized service offerings has become the norm rather than the exception. Therefore, it is possible that satellite services could, through cost-reducing innovation and competition, cause some existing services now surviving on a cross-subsidized basis to become uneconomic. Even if the benefits of such cross-subsidization accrue to the public users

rather than to private service offerings, however, there seems to be no merit in protecting suppliers of such services from fair competition. The primary impact of such competition should be the provision of those services through lower-cost alternatives. Should such competition result in curtailment of some public services that are necessary as a matter of public policy, however, a direct public subsidy would in most cases be less costly to the public than forced cross-subsidization and restraint of competition.

Recommendation

Government policy should encourage and facilitate the development of commercial domestic satellite communications systems to the extent that private enterprise finds them economically and operationally feasible. We find no reason to call for the immediate establishment of a domestic satellite system as a matter of public policy. Government should not seek to promote uneconomic systems or to dictate ownership arrangements; nor should coordinated planning or operation of such facilities be required except as essential to avoid harmful radio interference.

Subject to appropriate conditions to preclude harmful interference and anticompetitive practices, any financially qualified public or private entity, including Government corporations, should be permitted to establish and operate domestic satellite facilities for its own needs; join with related entities in common-user, cooperative facilities; establish facilities for lease to prospective users; or establish facilities to be used in providing specialized carrier services on a competitive basis. Within the constraints outlined below, common-carriers should be free to establish facilities for either switched public message or specialized services, or both.

The number or classes of potential offerers of satellite services should not be limited arbitrarily. Nor should there be any a priori ranking of potential types of systems (common-carrier vs. specialized carrier vs. private; or satellite vs. terrestrial). Only in the event that specific applications pose immediate and irreconcilable conflict in the use of radio and orbital resources would an a priori public interest exclusion of proposals be warranted. In particular, the potential economic impact of private or common-user satellite systems on terrestrial common carriers or specialized carriers should not be a factor in the authorization of such systems.

All prospective entrants should be afforded equal opportunity to establish and operate domestic satellite communications facilities by adoption of the following guidelines:

(1) Facilities to be established by independent entities for their own private use should be required to demonstrate only the financial and technical qualifications to implement their system proposals. There is no valid public interest requirement in such cases to require a showing of economic viability or optimization, nor should the potential economic impact of such operations on common or specialized carriers be a factor in the authorization of such facilities.

(2) Facilities to be established as part of a common-user cooperative system should be authorized in accord with the same principles as for fully independent facilities. However, to avoid restraints on competition, the opportunity should be made available for all potential users of similar services to participate without discrimination in such cooperatives as a condition of their authorization.

(3) Facilities to be used by specialized carriers (i.e., carriers having no monopoly over switched public message services) should be authorized under essentially the same terms and conditions as private or common-user facilities. Furthermore, such specialized carriers should not be constrained to serve as a "carrier's carrier" nor to share ownership of space or earth station facilities with other carriers. We also urge the Commission to allow competition to limit the rates charged for specialized services via satellite. Specialized carriers should, however, be required to serve similar users at equal rates and on a non-discriminatory basis.

(4) Facilities to be used by common carriers solely for the transmission of switched public message services should be authorized under the same terms and conditions that apply for terrestrial radio facilities. However, facilities to be used by such carriers in the transmission of specialized message services should be authorized only after a determination by the Commission on each

application, based on public evidentiary hearings, that no cross-subsidization between monopoly public message and specialized services would take place in the development, manufacture, installation, or operation of such facilities. This should not be interpreted, however, to preclude the legitimate economies of joint-use facilities.

(5) The use of leased facilities (satellite and/or earth stations) should be authorized under the same terms and conditions as owned facilities, with the responsibility for adherence to these conditions resting with the lessee. Rate-regulated carriers should be permitted to include a portion of the lease costs of such facilities in their rate base.

(6) Local communications common carriers should be required to provide leased interconnection services for user access to earth stations at reasonable rates and without discrimination.

(7) Potential harmful interference between satellite systems and terrestrial installations should be resolved by the Commission according to established procedures. Satellite operating entities should have equal status with terrestrial users in interference problems and in access to the radio spectrum. To accommodate new systems or services, the Commission should affirm its authority to modify or rescind, where appropriate, the operating rights of established spectrum users (satellite or terrestrial) where this would not significantly impair the quality of service or impose undue economic burdens; we believe the Commission should require compensation of the established users to be paid by the new entrant in such situations.

(8) The Commission may wish to establish a minimum acceptable earth station diameter, such as 30 feet, in order to accommodate an adequate number of initial United States domestic satellites in the 4 and 6 GHz spectrum allocations without excessive use of orbital resources. Although it is very unlikely that the number of satellites proposed during the initial filing period will approach the limit such a standard would impose, the standard should in that event be raised. Conversely, if applications were well below this number, and a reasonable case were made on economic and operational grounds, the standard could be relaxed

in specific cases. To the extent possible within the state of the art, the satellite antenna radiation pattern should encompass only the specific land areas to be served.

In a time of rapid technological, economic, and social change, we would be ill-advised to adopt a definitive policy without the flexibility for future review or to adopt an overly restrictive policy simply because of our inability to predict future developments. We therefore recommend that the above policies be adopted on an interim basis, such as three to five years, to permit vigorous exploration and development of satellite service possibilities. During this period, the Commission should monitor the industry structure, service offerings, and rates to determine if natural monopoly or other conditions are developing that suggest more restrictive entry conditions or warrant direct rate regulation for specialized satellite services. At the end of the interim period, a full review of the policy and industry structure should be made.

It is most important that the establishment and operation of domestic satellite communications facilities be consistent with our obligations and commitments to INTELSAT and the International Telecommunications Union, with other foreign policy considerations, and with national security communications requirements. With respect to INTELSAT, it is particularly important that domestic systems not threaten the operational integrity or economic viability of the global services provided through that system. It is also important that provision be made for use of domestic satellite services by national security and emergency preparedness agencies when appropriate. We are satisfied that domestic satellite communications facilities authorized in accordance with the preceding recommendations will meet all these conditions. We further see no reason why the Communications Satellite Corporation, established by Congress as the chosen instrument for United States participation in INTELSAT, should not be permitted to compete for domestic satellite service on an equal basis under the above guidelines.

Peter M. Flanigan
Assistant to the President

APPENDIX C

MEMORANDUM ON LEGAL ISSUES

1. With respect to the question of whether the Commission has legal power to authorize any non-governmental entity (common carrier or non-carrier) to establish and operate domestic communication satellite facilities, the parties commenting in this proceeding have taken several positions. Some, like ABC and the Ford Foundation, urge that the Commission has broad authority under the Communications Act of 1934 and the Communications Satellite Act of 1962 to authorize either type of entity to establish such facilities. AT&T and ITT assert that the Commission has such broad power as a matter of law but urge that a non-carrier system should not be authorized, at least at this juncture, as a matter of policy. Other common carriers allege that legal capacity to authorize a non-common carrier domestic system is lacking and that such a system should not, in any event, be authorized as a matter of policy. ComSat, in particular, argues that under the 1962 Act it alone may be authorized to own domestic satellites and to utilize earth stations which may be owned by it and other carriers. On the other hand, ARINC and ATA question whether ComSat is legally qualified to provide domestic service in view of its involvement in INTELSAT.

2. After full consideration of the various briefs submitted in support of these positions, the Commission is of the view that the Communications Act of 1934 and the 1962 Act clearly empower the Commission to authorize domestic communications satellite facilities to be owned by any entity, either common carrier--including ComSat--or non-carrier, as the national public interest requires.

3. The 1934 Act, which directs the Commission to provide "a rapid, efficient, Nation-wide and world-wide wire and radio communication service" (47 U.S.C. 151), applies to "all interstate and foreign communication by wire or radio and all interstate and foreign transmission of energy by radio, which originates and/or is received within the United States" and to "the licensing and regulating of all radio stations" (47 U.S.C. 152(a)). A license from the Commission is required for all radio stations except government-owned stations (47 U.S.C. 301, 303, 305, 307, 308 and 309). By definition, "radio station" is "a station equipped to engage in radio communication or radio transmission of energy" (47 U.S.C. 153(k)). "Communication by radio" is defined to include "all instrumentalities, facilities, apparatus, and services" incidental to "the transmission by radio of writing, signs, signals, pictures, and sounds of all kinds" (47 U.S.C. 153 (b)), and "transmission of energy by radio" similarly includes both such transmission and "all instrumentalities, facilities, and services incidental to such transmission" (47 U.S.C. 153 (d)). These all-inclusive definitions clearly include non-government satellite and earth station facilities used for interstate communication or transmission of energy by radio, which originates and is received within the United States.

4. The Commission's jurisdiction under the plain language of the 1934 statute to license and regulate domestic satellite facilities is not affected by the circumstance that the radio transmission involves stations located in space and a new technology not explicitly mentioned in that Act. California Interstate Telephone Co. v. Federal Communications Commission, 328 F. 2d 556 (C.A.D.C.). Section 303 (g) directs the Commission to "study new uses for radio, provide for experimental uses of frequencies, and generally encourage the larger and more effective use of radio in the public interest" (47 U.S.C. 303 (g)). The policy underlying this section was stated during the Congressional hearings on the 1934 Act. "Our supremacy in radio cannot be maintained except by active encouragement and development of its use. Its possibilities are almost untouched today * * *. Who knows what future developments may bring?" Hearings on H.R. 8310 before the House Committee on Interstate and Foreign Commerce, 73rd Cong., 2d Sess., p. 21. Section 303 (g) "makes clear that Congress placed an affirmative duty on the Commission to experiment with and develop the most desirable deployment and utilization of the nation's communications facilities" (Connecticut Committee Aganist Pay-TV v. Federal Communications Commission, 301 F. 2d 835, 837 (C.A.D.C.), cert. den. 371 U.S. 816.

5. The 1934 Act has been uniformly construed as granting broad powers to the Commission which do not depend on a specific reference to the particular service, technology or practice in the statute. In National Broadcasting Company v. United States, 319 U.S. 190, 217, 219, the Supreme Court stated with respect to the Commission's comprehensive power over newly developing instrumentalities of radio communication:

> The avowed aim of the Communications Act of 1934 was to secure the maximum benefits of radio to all the people of the United States. To that end Congress endowed the Communications Commission with comprehensive powers to promote and realize the vast potentialities of radio.
>
> * * * True enough, the Act does not explicitly say that the Commission shall have power to deal with network practices found inimical to the public interest. But Congress was acting in a field of regulation which was both new and dynamic. * * * In the context of the developing problems to which it was directed, the Act gave the Commission not niggardly but expansive powers.

The statutory public interest standard "leaves wide discretion and calls for imaginative interpretation." Federal Communications Commission v. RCA Communications, Inc., 346 U.S. 86, 90. See also United States v. Storer Broadcasting Co., 351 U.S. 192, 203 (the Commission's "authority covers new and rapidly developing fields"); Federal Communications Commission v. Pottsville Broadcasting Co., 309 U.S. 134, 138 (underlying the 1934 Act "is recognition of the rapidly fluctuating factors charateristic

of the evolution of broadcasting and of the corresponding requirement that the administrative process possess sufficient flexibility to adjust itself to these factors"). See also, United States v. Southwestern Cable Company, 392 U.S. 157.

6. In administering the 1934 Act the Commission has exercised this "wide discretion" and "comprehensive power" to authorize both common carrier and private communications systems according to its judgment as to the requirements of the public interest. See, e.g., Allocation of Frequencies in the Bands above 890 Mc/s, 27 F.C.C. 359, 29 F.C.C. 825.[1/] The Commission has also found that the public interest may be served by the joint common carrier ownership of cable facilities (American Telephone and Telegraph Co. et. al., 37 F.C.C. 1151, 1157) and by shared use of private systems on a non-profit, cooperative basis (Amendment of the Commission's Rules to Permit Expanded Cooperative Sharing of Operational Fixed Stations, 4 F.C.C. 2d 404). In the latter connection the Commission said (4 F.C.C. 2d at 417):

> The touchstone for the regulation of the use of radio is the public interest and we think that, under that standard, we have ample authority to permit cooperative use of radio stations if we find, as we have, that the public interest would be served and the larger and more effective use of radio would be encouraged.

The Commission also claimed (ibid.) "ample authority to prescribe any special method of regulating the cooperative use of private systems that would best serve the public interest. See Philadelphia Television Broadcasting Co. v. F.C.C., 123 U.S. App. D.C. 298, 359 F. 2d 282."

7. The same licensing flexibility applies to the authorization of non-government domestic communications satellite facilities by the Commission. We are not persuaded by ComSat's argument that the 1962 Act superseded or restricted the Commission's powers under the 1934 Act in the domestic field by requiring that any domestic system be authorized

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1/ Since the "Communications Act must be read as a whole" (United States v. Storer Broadcasting Co., 351 U.S. 192, 203), the Commission has, of course, been mindful that the authorization of private systems not result in such substantially adverse economic effects upon common carriers as to impair their ability to provide adequate service to the general public. By the same token, the Commission "cannot let its decisions in the radio carrier field interfere with its responsibilities in the television broadcasting field. In both fields, it must 'make available, so far as possible, to all people of the United States,' adequate and efficient service." Carter Mountain Transmission Corp. v. Federal Communications Commission, 321 F. 2d 359 (C.A.D.C.), cert. den. 375 U.S. 951.

to ComSat alone (and/or other carriers in the case of earth stations). The Commission's clear jurisdiction over commercial domestic satellite facilities under the 1934 Act was not withdrawn by the 1962 Act, which legislated in the field of international satellite communications. The declared purpose of the 1962 Act was to establish a global satellite communications system "in conjunction and in cooperation with other countries" (Section 102 (a)) and to provide for "United States participation in the global system * * * in the form of a private corporation, subject to appropriate regulations" (Section 102 (c)). H.R. Rep. No. 1636, 87th Cong., 2d Sess., p. 7. The attention of Congress centered on the early establishment of an international system to enable the United States to move ahead of the Soviet Union and assert a position of leadership at the Extraordinary Administrative Radio Conference of the International Telecommunications Union called in 1963 to allocate frequencies for communications satellite systems. See, e.g., H.R. Rep. 178, 89th Cong., 1st Sess., p. 22; H.R. Rep. No. 1636, 87th Cong., 2d Sess., p. 8; 108 Cong. Rec. 11825, 15026, 15124, 16416, 16569, 16574 (1962). Moreover, in 1962 the technology consisted of random orbit satellites (like Telstar), orbiting the globe and better suited to international than to domestic use. Synchronous satellites, which make domestic service more economically attractive, were not contemplated in the immediate future. The international thrust of the 1962 Act is also reflected in the bill's referral to the foreign policy committees, in the functions accorded to the President (to be executed by the State Department) in Section 201 (a), and in the concern with "world peace and understanding" (Section 102 (a), "services to economically less developed countries and areas" (Section 102 (b), "foreign participation" (Section 201 (a)(5), 102 (a), 305 (a)(1), "communication to a particular foreign point" (Section 201 (c)(3)), and "business negotiations * * * with any international or foreign entity" (Section 402).

8. In asserting that the 1962 Act also superseded the Commission's powers under the 1934 Act in the domestic field, ComSat relies on the last sentence in Section 401 which states: "Whenever the application of the provisions of this Act shall be inconsistent with the application of the provisions of the Communications Act, the provisions of this Act shall govern." But this statement was made in the context of making ComSat a common carrier fully subject to the provisions of Title II and Title III of the 1934 Act. It is more reasonably construed as applying to conflicts between the two Acts insofar as the global international system is concerned, than as effecting a substantive extension of the provisions of the 1962 Act to the domestic field. Indeed, many of the provisions of the 1962 Act make sense only in the international field and are anomalous in a domestic context. See, e.g., Sections 201 (a)(4) and (5), Section 201 (c)(3), Section 305 (a)(1), and Section 402.

9. "Repeals by implication are not favored" (Federal Trade Commission v. A.P.W. Paper Co., 328 U.S. 193, 202), and it would be unreasonable to assume that Congress, in enacting provisions tailored to an international system established "in conjunction and in cooperation with other countries," would have supplanted the 1934 Act in the domestic field -- traditionally only of sovereign concern -- without mentioning that it was doing so. The 1962 Act does not contain any express requirement that domestic satellite service shall be provided in accordance with the provisions governing the global system or any statement withdrawing the Commission's powers under the 1934 Act to authorize an additional non-government domestic system. On the contrary Section 102 (d) states:

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

The denial of intent to preclude domestic use of the global system clearly implies that the 1962 Act might otherwise be construed as prohibiting such use. It makes little sense to argue, as ComSat does based on the use of the phrase "national interest" rather than "public interest," that Congress adopted a scheme whereby the ComSat system was generally given a monopoly both internationally and domestically in the face of the fact that Congress found it necessary to provide explicitly against the possibility that the ComSat system might not be regarded as available for domestic use. Nor is it reasonable to assume that Congress thereby intended to foreclose competition within the domestic field. In short, this permissive language cannot be equated with a mandatory requirement for use of the global system, and militates strongly against such a requirement.

10. The legislative history of the 1962 Act shows that Congress contemplated that an additional system might be authorized to an entity other than ComSat. Language almost identical to Section 102 (d) appears in the "implementation of policy" provisions (Section 201, where Congress provided that the President shall:

> (a)(6) take all necessary steps to insure the availability and appropriate utilization of the communications satellite system for general governmental purposes except where a separate communications satellite system is required to meet unique governmental needs, or is otherwise required in the national interest. . . .

When the bill which became the 1962 Act was reported to the Senate, Section 201(a)(6) did not contain the underscored words. Senator Church, a member of the Foreign Relations Committee considering the bill, was concerned with this omission and the fact that the operative language of the bill did not conform with the declaration of policy. To the Committee report on the bill he appended his separate views on this point, stating (S. Rept. No. 1873, 87th Cong., 2d Sess., pp. 14-15):

> The wisdom of this last clause "or if otherwise required in the national interest" is perfectly apparent. We cannot now foretell how well the corporate instrumentality established by this act will serve the needs of our people. If it should develop that the rates charged are too high, or the service is too limited, so that the system is failing to extend to the American people the maximum benefits of the new technology, or if the Government's use of the system for, Voice of America broadcasts to certain other parts of the world proves excessively expensive for our taxpayers, then certainly this enabling legislation should not preclude the establishment of alternative systems, whether under private or public management. And just as certainly is that gateway meant to be kept open, in case we should ever need to use it, by the language to be found in the bill's "Declaration of Policy and Purposes" to which I have referred.

On the floor, in speaking in support of his amendment to conform these two provisions of the Act, Senator Church repeated these same views verbatim and his amendment was agreed to.

11. The legislative history also refutes ComSat's contention that new legislation would be required for Commission authorization of any additional system different from that prescribed in the 1962 Act. The Senate rejected an attempt by the House to reserve to Congress the right to provide for additional satellite systems. When the legislation was first passed by the House (H.R. 11040, as passed by the House on May 3, 1962), Section 102(d) provided:

> The Congress reserves to itself the right to provide for additional communications satellite systems if required to meet unique governmental needs or if otherwise required in the national interest.

However, the Senate refused to accept the House language and substituted the current version of Section 102(d), to which the House acceded. Since Congress was repeatedly told throughout the 1962 hearings that the Commission had jurisdiction to authorize non-government communication satellite facilities by virtue of the 1934 Act, 2/ the defeat of the House language shows that Congress considered and rejected the position that further legislation is a prerequisite to Commission authorization of different domestic facilities.

2/ The Commission's chairman and other commissioners repeatedly told House and Senate Committees that the Commission had power under the 1934 Act to authorize non-government communications satellite facilities for commercial use. See, e.g., Hearings on Communications Satellites before the House Committee on Interstate and Foreign Commerce, 87th Cong., 1st Sess., pt. 1, pp. 6, 86; Hearings on Communications Satellites before the House Committee on Science and Astronautics, 87th Cong., 1st Sess., pt. 1, pp. 498-499; Hearings on Space Satellite Communications before the Subcommittee on Monopoly of the Senate Select Committee on Small Business, 87th Cong., 1st Sess., pp. 652, 662, (672), 471. Representatives of the Justice Department took the same view as to the Commission's jurisdiction under the 1934 Act. See, e.g., Hearings on Communications Satellites before the House Committee on Interstate and Foreign Commerce, 87th Cong., 1st Sess., pt. 1, p. 153; Hearings on S. 2650 and S. 2814 before the Senate Committee on Aeronautical and Space Sciences, 87th Cong., 2d Sess., pp. 405, 407, 408. The following exchange took place between Senator Kefauver and then Assistant Attorney General Katzenbach (Hearings on Antitrust Problems of the Space Communications System before the Subcommittee on Antitrust and Monopoly of the Senate Committee on the Judiciary, 87th Cong., 2d Sess., pt. 1, pp. 55-56):

> "Senator Kefauver: [speaking of ComSat] Why couldn't some of these channels be held open for the television companies* * *for all of these other hundreds of users that would not come under FCC jurisdiction?
>
> Mr. Katzenbach: They would all come under FCC jurisdiction, sir, because as soon as you are using these facilities, as soon as you are using the radio spectrum, you are under FCC jurisdiction.
>
> Senator Kefauver: But you are forcing them to make a deal with one of the communications carriers, and what if they don't want to make a deal with a communications carrier?

(continued)

12. That the 1962 Act was not intended to withdraw the Commission's licensing flexibility as to domestic systems under the 1934 Act is further indicated by the post-legislative comments of Senator Pastore, floor manager of the 1962 bill, in hearings before the Senate Commerce Committee on August 17, 1966. In questioning representatives of the Ford Foundation and ComSat on the meaning of Section 102 (d), Senator Pastore stated that it was his understanding then and at the time of the drafting and enactment of the 1962 Act that ComSat was established for the purpose of taking and holding a position of leadership for the United States in the international communications satellite field, but that the law and policy as to domestic systems were left wide open. Senator Pastore stated, inter alia, that it was his "understanding now, as it was then, that this is not a field that belongs exclusively under the Act to ComSat or to anyone else," and that:

> "I think we all agree that ComSat could do it. It is a decision of the F.C.C., which way they want to go. They have a perfect right to apply for this under the law. It doesn't preclude anybody--Ford, ITT, anybody else. I think it is an open field."

See Hearings before the Subcommittee on Communications of the Senate, Committee on Commerce, 89th Cong., 2d Sess. (Serial 89-78), pages 103-4, 116, 128-130.

13. ComSat's related challenge to NASA's authority to launch commercial domestic communications satellites for any entity other than ComSat without additional legislation, also appears lacking in merit. The same argument was advanced in connection with NASA's launch of satellites for Canada's proposed domestic system, and was rejected by all of the Governmental entities concerned with this question. NASA has not disclaimed authority to launch domestic satellites for entities other than ComSat, and we find no valid basis for concluding that it would lack authority to launch satellites for any entity duly authorized by the Commission to engage in commercial domestic communications satellite operations.

2/ continued

> Mr. Katzenback: Then they have to get into the business themselves, sir. And I suppose that if that is a practical way of doing it, then that is what should be done. But these are responsibilities, as to who is to be licensed for what purposes, which are given to the Federal Communications Commission."

14. And, finally, in light of Section 102 (d) and Senator Pastore's comments (paragraph 12 above), we see no merit to the contention that ComSat may be legally disqualified from entering the domestic field because of its involvement in INTELSAT. Since Congress did not intend to preclude use of the global system for domestic communication services, it follows a fortiori that such service may be provided by the United States participant in the global system. The possible advantages or disadvantages accruing from ComSat's relationship with INTELSAT are considerations to be weighed as a matter of policy, but we find no legal bar.

15. Accordingly, we conclude that the Commission possesses the requisite legal power under the Communications Act of 1934 and the 1962 Act to authorize any entity, either common carrier or non-common carrier or some combination of both, to own and operate satellite facilities and earth stations to provide domestic satellite communications services, or to determine that such services should be provided, in whole or in part, through the facilities of INTELSAT. The Commission may authorize domestic communications satellite facilities upon finding that such facilities would serve the "public convenience, interest, or necessity" under the 1934 Act and are "required in the national interest" under the 1962 Act.

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Technical Annex

Domestic Communication Satellite Systems

TECHNICAL ANNEX

Domestic Communication Satellite Systems

The Federal Communications Commission herewith establishes the technical guidelines applicable to the submission of applications for domestic communication satellite proposals including the minimum information necessary for Commission consideration. Applications should be complete and should set forth all pertinent details of the proposal whether or not specific information is requested herein. Technical definitions in Part 25 of the Commission's Rules are applicable to initial filings for domestic communication satellite systems. The following additional definitions are also applicable.

I. Definitions

A. Orbit The path described by the center of mass of a satellite or other object in space, relative to a specified frame of reference.

B. Orbital plane The plane containing the radius vector and the velocity vector of a satellite, the system of reference being that specified for defining the orbital elements.

C. Angle of inclination of an orbit The acute angle between the orbital plane and the equatorial plane.

D. Geosynchronous satellite A satellite for which the mean sidereal period of revolution about the earth is equal to the sidereal period of rotation of the earth about its own axis.

E. Geosynchronous satellite orbit The orbit of a geosynchronous satellite.

F. Geostationary Satellite A geosynchronous satellite having an equatorial and circular orbit such that the satellite appears to remain fixed in relation to the earth.

G. Orbital longitude The mean geographical longitude of the projection of the satellite's position on the surface of the earth.

H. Receive Earth Station An earth station intended to be used only for the reception of satellite signals.

I. Transportable Earth Station An earth station capable of being transported from one point to another, but intended only to be used at specified fixed points.

J. Angle of arrival The angle at a point on the surface of the earth between the line of energy travel of the radio signal from the satellite and the horizontal plane at that point.

K. Elevation angle The angle between the horizontal plane and the central axis of the main lobe of the antenna.

L. Coordination distance contour The closed curve drawn on a scaled map around an earth station location which defines the maximum distance from the earth station location at any given azimuth within which harmful interference might be expected.

II. Frequencies

A. The following frequency bands are available for use by domestic communication satellite systems on a shared basis with terrestrial radio services and with other communication satellite services.

Satellite to Earth	Earth to Satellite
3700-4200 MHz[1]	5925-6425 MHz[2]

B. The following frequencies or bands of frequencies are available for space telecommand functions. Precise frequencies and associated bandwidths of emission will be assigned on a case-by-case basis.
148.25 MHz--maximum occupied bandwidth not to exceed 30 kHz.
450.0 MHz--maximum occupied bandwidth not to exceed 0.5 MHz.
1427.0 - 1429.0 MHz

C. The following frequency bands are available for telemetering from and tracking of domestic communication satellite space stations. Precise frequencies and associated bandwidths of emission will be assigned on a case-by-case basis.

1/ This band may also be used for the transmission of tracking and telemetry signals associated with space stations operating in the same band.

2/ This band may also be used for the transmission of telecommand signals associated with earth stations operating in the same band.

136-137 MHz[1]
137-138 MHz[1]
400.05-401 MHz[2]
401-402 MHz
1525-1540 MHz

III. Frequency Coordination Between Satellite Earth Stations and Terrestrial Radio Relay Stations

For the purpose of this Part, it will be assumed that the terrestrial receiving station is a line-of-sight radio relay station designed according to C.C.I.R. recommendations; that the earth station forms a part of a communication satellite system; that any terrestrial station and earth station within 100 km of each other must be coordinated regardless of whether or not a coordination distance of less than 100 km is calculated; that both systems occupy continuously all frequencies allocated to the particular service band to which they are assigned.

A. Coordination distance contours

1. Applicant shall ascertain in advance of filing if the location of the proposed earth station is such that the coordination distance contours, drawn in accordance with Part 25.251 and 25.203 of the Commission's Rules, assuming geostationary satellites are employed, overlap the boundary of another country. If any part of a coordination distance contour overlaps the boundary of another country the applicant shall submit with its application a map or maps drawn to scale showing the transmitting and receiving coordination distance contours with detailed information used to plot such contours. In this case the coordination distance contours could be used by the Commission for coordination with the administration(s) concerned.

1/ This band is basically a space research band and is not intended for regular use by operational domestic communication satellite systems once the desired spacecraft orbit is established.

2/ This band is available for the transmission of tracking signals only for those space stations employing this band for the transmission of telemetry signals. (See footnote 315A in Part 2, FCC Rules and Regulations.)

2. The coordination distance contours are required in any event for domestic coordination (a) within which the earth station transmitter might cause harmful interference to stations in the Domestic Public Radio Service sharing the same frequency bands; and (b) within which stations in this service might cause harmful interference to reception at the earth stations. A map or maps drawn to scale shall be provided in the earth station application showing the transmitting and the receiving coordination distance contours with detailed information used to plot such contours.

B. Interference considerations

1. After the coordination distance contours have been determined, the applicant shall make a complete and detailed analysis for potential interference caused to terrestrial station receivers within the coordination distance contour by the earth station transmitter, and for potential interference caused to reception at the earth station receiver by terrestrial station transmitters within the coordination distance contour. All pertinent data relating to the actual frequency interference study shall be included in the application. The presentation of this showing should be organized in such a manner that a reconstruction of the calculations by the Commission from the basic data using the method described in the application can be accomplished without undue difficulty.

2. Recognized methods for predicting interference should be used and explained. Applicant may wish to refer to Part 25.251 of the Rules, latest pertinent C.C.I.R. material including Report 388 Vol. IV, Report 244-1 Vol. II (Oslo 1966) and the decisions of the C.C.I.R. XIIth Plenary Assembly, New Delhi, 1970 and other recognized sources for guidance in the interference analysis.

3. Interference calculations should be made for each terrestrial station within the coordination distance contours including those proposed stations for which an application has been accepted for filing by the Commission. Ducting via sidelobes should be considered. All pertinent data (locations, call signs, antenna azimuth, etc.) and calculations used in the interference study should be included in the showing for each terrestrial station considered.

4. The probability of radio interference resulting from scatter propagation should be considered. This propagation sometimes provides signal levels capable of causing interference by means of scatter from precipitation and/or other dielectric discontinuities in the earths atmosphere. The propagation path for this mode of propagation may lie off of the great circle path.

IV. Technical Constraints

A. Orbital location considerations

1. An orbit which is approximately geostationary shall be employed.

2. Applicant shall consider and submit details regarding the selection of the orbital longitude(s) for its proposed system. In such showing, applicant shall discuss and where appropriate determine the probability of interference between its proposed satellite system and other satellite systems which are either established or proposed systems. The effect of the applicant's proposed system on the overall utilization and management of the available orbital space should be considered and discussed in general and in specifics as to the minimum separation of satellites, use of frequencies, orthogonal feeds, polarization, station keeping, inclination, or other suitable standards that may be required in the future. Broad guidelines such as a 5 degree minimum separation between satellites and excursions in both longitude and latitude of $\pm$ 0.5 degrees should be observed until more definitive standards can be determined.

3. Satellites shall be capable of reasonable shifts in orbital longitude.

B. Antenna Directivity (Earth Station)

1. The transmitting antenna directivity in the plane of the geostationary orbit shall, as a minimum, be comparable to that of a parabolic antenna with a diameter of 9 meters operating at 6 GHz, and have a side lobe suppression of at least 25 dB.

2. The receiving antenna directivity in the plane of the geostationary orbit shall, as a minimum, be comparable to that of a parabolic antenna with a diameter of 9 meters operating at 4 GHz, and have a side lobe suppression of at least 25 dB, unless a waiver has been granted.

C. Minimum angle of antenna elevation.

Within the band 5925-6425 MHz, earth station antennas shall not normally be authorized for transmission at elevation angles less than 5^{o}, measured from the horizontal plane to the central axis of the main lobe. However, upon a showing that the transmission path will be seaward and away from land masses or upon special showing of need for lower angles by the applicant, the Commission will consider authorizing transmission at angles between 3^{o} and 5^{o} in the pertinent directions. In certain instances it may be necessary to specify minimum angles greater than 5^{o} because of interference considerations.

D. Power limits.

1. Within the band 5925-6425 MHz the mean equivalent isotropically radiated power transmitted in any direction in the horizontal plane by a communication-satellite earth station shall not exceed +45 dBW in any 4 kHz band.

E. Power flux density limit

1. Within the 3700-4200 MHz frequency band, the maximum power flux density 1/ at the earth's surface produced by a domestic communication satellite space station for all conditions and methods of modulation, shall not exceed $(-152 + \theta/15$ dBW/m^2 in any 4 kHz, band, where θ is the angle of arrival of the wave in degrees above the horizontal.

2. The design of earth stations should meet the requirements imposed by many communication satellite systems sharing the same frequency spectrum and should make judicious use of techniques such as directivity and cross polarization to minimize interference.2/

F. Cessation of emissions

Space stations shall be fitted with appropriate devices to ensure immediate cessation by telecommand of radio emissions.

G. Station Identification.

1. The transmission of station identification is not required for domestic satellite earth stations nor for stations the sole function of which is to transmit telecommand signals to satellite space stations.

2. The transmission of station identification is not required for domestic satellite space stations.

V. Applications

The technical information for a proposed domestic satellite radio system need not be filed on any prescribed from but should be complete in all pertinent details. Each proposal shall contain a complete study for the proposed domestic satellite system accompained by separate applications for each satellite and for each earth station. The following information should be contained in the system study or in the separate applications, whichever is appropriate.

Certain technical information may not be available at the time the application is filed. This fact should be noted in the application with the best estimate as to when this information will become available.

1/ Free space values are commonly used in the calculations.

2/ Document IV/1008, New Delhi 1970, contains a CCIR recommendation on the maximum amount of interference that should be permitted in any telephone channel of a communication satellite system employing frequency modulation.

A. The Domestic Satellite System: General Information.

1. Radio frequency plan.

2. Earth station sites. Sites for earth stations shall be selected, to the extent practicable, in areas where the surrounding terrain and existing frequency usage are such as to minimize the probability of harmful interference between the sharing services.

3. Number of earth stations including estimated construction schedule.

   a. transmit and receive
   b. receive only

4. Number of satellites including estimated construction schedule.

   a. operational
   b. spares
      (1) in orbit
      (2) on ground

5. Proposed satellite system geographical coverage including maps showing flux density contours on the surface of the earth.

6. Interference calculations for the proposed satellite(s) and earth station(s)

   a. to other satellite systems
   b. from other satellite systems
   c. from terrestrial systems
   d. to terrestrial systems

7. Location(s) of satellite(s)

8. Systems reliability and redundancy

   a. in satellite
   b. in earth station
   c. solar noise outages
   d. eclipse conditions
   e. other

9. Launch vehicle

10. Arrangements for tracking, telemetry, and control

11. The technical standards to be met for the quality of each type of service proposed.

B. Satellites

1. Orbital longitude

2. Frequencies

a. initial transmit
b. initial receive

3. Emission designator for each frequency channel

4. Number of communication transponders in each satellite with associated necessary bandwidth and center frequency for each.

5. Antennas

a. Configuration, including types and sizes

(1) Beamwidth, in degrees between half power points (described in detail if not symmetrical).
(2) Sidelobe radiation pattern.
(3) Isotropic gain (in dB, taken at 4 GHz) of the antenna in the direction of maximum radiation.

b. Geographical coverage of each antenna beam.
c. Calculations for the receiving antenna Gain to Receiving System Noise Temperature Ratio (G/T).

(1) Specify G-which is the antenna gain measured at 6 GHz at the input of the pre-amplifier expressed in dB relative to an isotropic radiator.

(2) Specify T-which is the receiving system noise temperature referred to the input of the pre-amplifier, expressed in dB relative to 1^{o} Kelvin.

d. Pointing accuracy and method of maintaining antenna orientation.

e. Transponders associated with each antenna.

f. Polarizations for each frequency.

6. Calculations of the equivalent isotropically radiated power (e.i.r.p.) for each transponder.

7. Station keeping functions.

a. Accuracy with which orbital parameters will be maintained.

1. Orbital inclination
2. Antenna axis attitude
3. Longitudinal drift

b. Provision for pointing antenna toward the earth.
c. Estimated lifetime of station keeping fuel

8. Primary mode of operation of each transponder (FDM-FM, Voice; FM Monochrome or color TV; PCM. etc.)

9. Emission limitations. The degree to which spurious emissions are attenuated below the mean power output of the transponder under actual electrical conditions of proposed operation.

a. On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth.

b. On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth.

c. On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth.

10. Estimated useful lifetime in orbit with the factors upon which this estimated lifetime is based.

11. Method of stabilization or attitude constancy if antennas are body-mounted or fixed.

12. Electrical energy system description, including provision, if any, for operation during eclipse conditions.

13. Estimated capacity under proposed system operating conditions.

a. Number of TV channels
b. Number of telephony channels
c. Other

14. Physical characteristics

a. Satellite weight on pad and in orbit
b. Dimensions
c. Apogee motor
   (1) weight of motor
   (2) weight of propellant

C. Earth Stations

1. Location

a. City, county, state
b. Geographical coordinates of antenna

2. Frequencies

   a. Initial transmit
   b. Initial receive

3. Emission designator for each frequency

4. General Description

   a. Site plan
   b. General layout
   c. Control building
   d. Accesibility
   e. Other

5. Power service

   a. Commercial source
   b. Backup source

6. Functional block diagram of station

7. List of major equipment

8. Communication capacity under proposed system operating conditions.

   a. Number of TV channels
   b. Number of telephony channels
   c. Other

9. Transmitters

   a. Type and manufacturer
   b. Frequency range
   c. Frequency stability
   d. Necessary bandwidth
   e. Power output at antenna feed
   f. Emission limitations - the degree to which spurious emissions are attenuated below the mean power output of the transmitter under actual electrical conditions of proposed operation.

      (1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth.

      (2) On any frequency removed from the assigned frequency by more than 100 percent up to an including 250 percent of the authorized bandwidth.

      (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth.

g. Instruction books when available, description of the oscillator circuits and any devices installed for the purpose of frequency stabilization. When circuits or devices are employed for limiting modulation or suppression of spurious radiation, a description of these should be included. The description should be sufficiently complete to develop all factors that may effect a determination as to how effectively the proposed transmitter can be expected to function.

10. Antennas

a. Types and manufacturer
b. Size
c. Gains
d. Beamwidths, in degrees between half power points (described in detail if not symmetrical).
e. Sidelobe patterns. The first few sidelobes should be calculated and submitted.
f. Height above ground level
g. Height above mean sea level
h. Polarizations
i. Tracking mode
j. Calculations for the receiving antenna Gain to Receiving System Noise Temperature Ratio (G/T).

1. Specify G-which is the antenna gain measured at 4 GHz at the input of the first R.F. amplifier of the receiving system, expressed in dB relative to an isotropic radiator.
2. Specify T-which is the receiving system noise temperature referred to the input of the first R.F. amplifier of the receiving system, expressed in dB relative to 1^{o} Kelvin.

k. Nominal operating range of azimuths of center of main lobe of radiation and corresponding elevation angles.
l. Equivalent isotropically radiated power (e.i.r.p.)

1. Main beam
2. Horizontal plane (per any 4 kHz of bandwidth)

ATTACHMENT B

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Establishment of Domestic	)	Docket Nos. 16495 and
Communication-Satellite	)	
Facilities by Non-governmental	)	
Entities.	)	

NOTICE OF PROPOSED RULE MAKING

Adopted: ; Released:

By the Commission:

1. Notice is hereby given of proposed rule making in the above-entitled matter.

2. On March 2, 1966, the Commission instituted an inquiry in Docket No. 16495 to explore various questions associated with the possible authorization of domestic communications satellite facilities to non-governmental entities. Notice of Inquiry, 31 Fed. Reg. 3507; Supplemental Notice of Inquiry, October 20, 1966, 31 Fed. Reg. 13763. In its Report and Order in Docket No. 16495 adopted on , 1970 (FCC 70-), the Commission decided to entertain applications for the authorization of domestic systems. In order to facilitate expeditious action on the applications and prompt attainment of the potential benefits of the satellite technology in the domestic field, the Commission further decided to keep open the proceedings in Docket No. 16495 and to incorporate a notice of proposed rule making on the policies to be followed in the event of technical or economic conflicts between applications (Report and Order, paragraphs 23-24). The Commission also raised a question as to whether the public interest would be served by limiting AT&T's participation in the domestic satellite field, for an initial period, to the leasing of channels in systems established by others (Report and Order, paragraphs 25-27).

3. We discussed in general terms some of the possible areas of conflict, stating (paragraph 23 of the Report and Order):

> Technical conflicts may arise in such areas as proposed orbital locations and frequency usage. Moreover, in the course of coordinating earth stations with terrestrial systems it may prove impossible in some instances to accommodate earth stations at desired sites without some adjustment in the frequencies and routes of terrestrial systems or other measures to avoid interference. Also, arguments of economic incompatibility may be raised, posing questions as to the proper effectuation of the Commission's responsibility under Section 1 of the Communications Act to exercise its regulatory functions in such a manner as to make communications services "available, so far as possible, to all people of the United States * * *."

It is not practicable to specify now, in advance of the submission of applications, the precise aspects that may require policy determinations by rule. Some potential conflicts may be evident to applicants in the course of preparing applications. Others may not become apparent until all of the initial applications have been filed. The purpose of this Notice is to set forth the subject matter and issue to which parties are to focus--namely, the technical or economic conflicts, if any, which exist or may arise between applicants in this area, and what policies are called for in light of any claimed conflicts. In this way, the Commission will be in a position to adopt rules, reflecting its policy determinations, to resolve any such conflicts, if it appears that this procedure would be the one best conducing "to the proper dispatch of business and to the ends of justice" (Section 4 (j) of the Communications Act).

4. Comments are also requested on what initial role of AT&T in the domestic satellite field would be appropriate in order to achieve a market environment conducive to innovation and the vigorous exploration and development of the special communications service potentials of the satellite technology. The discussion of this matter at paragraphs 25-27 of the Report and Order may be summarized briefly as follows: A question has been raised as to whether AT&T might discourage or foreclose entry by others into its special service markets through a policy of inter-service subsidy. The memorandum of the Executive Branch recommended that facilities to be used by AT&T for specialized communications services "should be authorized only after a determination by the Commission on each application, based on public evidentiary hearings, that no cross-subsidization between monopoly public message

and specialized services would take place in the development, manufacture, installation, or operation of such facilities." In commenting on the question of whether the public interest would be better served by confining AT&T's participation, for an initial period, to the leasing of satellite channels in systems established by others, applicants and other interested persons should, among other things, address the factors of whether innovative planning by AT&T would be inhibited by its existing terrestrial facilities and services, and whether the expansion of the dominant terrestrial carrier into the satellite field at this time would pose a substantial constraining factor for other potential common carrier entrants in deciding whether to develop system proposals, the kinds of systems that will be proposed, and the types of services and markets that can be developed. It is contemplated that any policy adopted in this area would be limited to the initial stage of domestic satellite development. After the initial systems have been established and afforded a reasonable opportunity to demonstrate their ability to open or expand communications markets, the Commission would re-examine any interim policy relating to AT&T in light of the circumstances then pertaining. Comments should also address the proposed policies relating to access to earth stations (paragraph 28 of the Report and Order).

5. Applicants for domestic communications satellite systems are requested to submit comments on the foregoing matters in conjunction with their applications. As stated in the Report and Order (paragraph 30), the Commission will give public notice of a cut-off time for the filing of applications to be considered initially. When such cut-off date is established, the Commission will by further order specify a time for the filing of reply comments by applicants and comments by other interested persons. After consideration of such comments and reply comments, the Commission may request additional comments directed to particular issues.

6. Authority for the proposed rule making instituted herein is contained in Sections 1, 2, 3, 4 (i) and (j), 214, 301, 303, 307-309 and 403 of the Communications Act of 1934 and Section 102 (d) of the Communications Satellite Act of 1962.

7. In reaching its decision in this matter, the Commission may take into account any other relevant information before it, in addition to the comments invited by this Notice. In accordance with the provisions of Section 1.419 of the Commission's Rules and Regulations, an original and 14 copies of all comments, replies, pleadings, briefs, or other documents filed in this proceeding shall be furnished to the Commission.

FEDERAL COMMUNICATIONS COMMISSION

Ben F. Waple
Secretary