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Federal Communications Commission
Washington, D.C. 20554

August 27, 2024

VIA ELECTRONIC MAIL

FOIA Control No. 2024-000748

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¹ See 5 U.S.C. § 552 (a)(3)(A); 47 CFR § 0.461.

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³ 47 CFR § 0.470.

⁴ 47 CFR §§ 0.461(j), 1.115; 47 CFR § 1.7 (documents are considered filed with the Commission upon their receipt at the location designated by the Commission).

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Sincerely,
/s/
Sima Nilsson
Legal Advisor
Media Bureau

cc: FCC FOIA Office

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Attachment C

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1980

"A MICRO-TV SERVICE IN THE UNITED STATES"

Report to

the

Federal Communications Commission

April, 1980

by

Parry D. Teasdale

Note: This report was prepared under contract for the Federal Communications Commission. The views expressed are the author's own, and do not necessarily represent the views of the Commission or of its staff.

A MICRO-TV SERVICE IN THE UNITED STATES

Summary

This report concludes that the authorization of a very low-power - or Micro-TV - service in the United States would benefit those people whose present television service is inadequate. The service is envisioned operating in both the VHF and UHF bands and at transmitter powers of one watt on VHF and ten watts on UHF. The licensing and technical requirements for the Micro-TV service could be considerably relaxed compared to those for full service stations and translators. This approach, outlined in detail in the report, would make it possible for more people to own and operate TV stations, specifically Micro-TV stations, without creating the potential for any increase in harmful interference.

The report traces the historical development of translators and low-power broadcasting systems in the United States. Particular attention is paid to an experimental station set up in Lanesville, N.Y., in the early 1970's. The Lanesville facility was, in many ways, a prototype Micro-TV station. It might serve as a model of the potential Micro-TV holds for producing community programming with extremely low cost equipment.

The report also outlines the approach the Canadian Government has taken toward very low-power TV - a service now authorized in that country. Part of Appendix I of this report is a comprehensive technical analysis of an already existing network of very low-power TV stations in Canada. It was prepared by Switzer Engineering Services for the Canadian Department of Communications. The Switzer documents conclude that Micro-TV is a technical success and that it is extremely inexpensive. The Canadian Government used the Switzer report to draft its minimal licensing requirements for very low power TV. The Switzer study data are referred to frequently in this report.

The final chapter of "A Micro-TV Service in the United States" addresses some of the questions that must be answered if this new service is to be authorized in a manner that will encourage its growth. The program sources available to Micro-TV operators and the methods these stations will find to support themselves are investigated, with special emphasis placed on the possibilities for encoded transmissions.

The report sees Micro-TV as a logical outgrowth of the low-power broadcasting tradition in this country, begun over 30 years ago with the initiation of the first TV booster systems. As part of that tradition, Micro-TV would help to provide better TV service to more viewers throughout the United States.

A MICRO-TV SERVICE IN THE UNITED STATES

Table of Contents

INTRODUCTION

THE UNITED STATES: The Origin and Development of Very Low-Power Broadcasting

Translators	1.
Other Options	5.
Local Origination	9.
Alaska	12.
BOCES Developments	18.
Lanesville TV	23.
Lanesville TV Programming and Finances	38.

VERY LOW-POWER BROADCASTING IN CANADA

CBC Translators	46.
St. Jerome	49.
Northern Access Network	50.
Post Script: Syracuse "Pirates"	60.

A MICRO-TV SERVICE IN THE UNITED STATES

Licenses	63.
Micro-TV Transmitter Power	64.
Spectrum Availability and TV Interference	68.
Antennas and HAAT	73.
Program Feeds	75.
Encoded Signals	76.
Technical Standards	77.
Financing and Programming	80.
Further Regulatory Considerations	85.

APPENDIX I - CANADA

A Study of Very Low-Power TV and FM
Transmitters for Remote Communities

Technical Acceptability Brief
(Northern Access Network)

License Applications Form for A Very Low-Power
TV Station

APPENDIX II - LANESVILLE TV

Cost Breakdown of Lanesville TV System

Lanesville TV Broadcast System, c. 1975

Estimated Service Contour of Lanesville TV
Lanesville TV Viewer Survey and Cover Letter
Early Lanesville TV Program and Telephone Logs

APPENDIX III - CORPORATION FOR PUBLIC BROADCASTING

Micro-TV Broadcast Stations

Grade B Contours of Low-Power Transmitters

INTRODUCTION

In 1972, when the very low-power broadcast station known as Lanesville TV went on the air, the United States already had a history of unauthorized low-power television broadcasting stretching back over two decades. Lanesville TV was part of a tradition which arose not out of a desire by low-power broadcasters to flaunt their activities, but rather out of an attempt to meet community needs for which recognized services, and the regulations to govern them, did not yet exist. This tradition of very low-power television broadcasting continues today. It is the intent of this report to outline some of the significant developments that have sustained this tradition and to indicate how important it is for regulations to keep pace with new technologies and the uses to which determined television watchers will put them.

As a principal participant in the Lanesville TV experiment, I spent five years running a very low-power TV station in a rural community in upstate New York. The station had great practical value as a means of delivering TV programming to a tiny settlement in which the reception of full service TV stations was all but impossible. The Lanesville TV experience taught me how easily a TV station could be put together and operated, and how inexpensive that process could be. There were problems to be sure; but for all the pitfalls of very low-power systems, I still retain my enthusiasm for this type of community TV broadcasting. It is both an effective and efficient use of television.

My principal concern is that this report provide the reader with an appreciation of the contributions very low-power TV systems

have made to broadcasting in the United States and Canada. An understanding of very low-power TV history is crucial to the presentation of the second part of this report--a set of specific recommendations for the establishment of a very low-power - or Micro-TV - service in this country.

This report is not exhaustive. My experience with Lanesville TV and my background as a writer and a producer of TV programs have, I believe, allowed me to assemble a general picture of both the origins and the possible future of very low-power TV broadcasting. Although I am not an engineer, I was able to take advantage of several detailed technical studies that addressed the engineering considerations of very low-power systems.

This report was prepared under contract from the Federal Communications Commission's Low-Power Television Inquiry Staff.* As such, it is intended to compliment the comprehensive review of the Commission's approach to low-power television being undertaken by that staff. This report is intended to supplement the record of that proceeding. In addition, my job has been made much easier because I was able to rely on the thorough record assembled by the Commission staff up to the time I was engaged in this research (i.e., during the Fall of 1979).

I also found that the comments in the proceeding submitted by the Corporation for Public Broadcasting (CPB) were particularly helpful in the preparation of this report. CPB recommended that the Commission authorize two types of low-power TV broadcasting

*Notice of Inquiry in B.C. Docket No. 78-253, 68 FCC 2d 1525 (1978)

III

services and accompanied those recommendations with specific engineering and financial data, some of which is reproduced here. I had two conversations with Philip Rubin, Director of Engineering Research at CPB. He supplied me with two documents ("A Quantitative Comparison of the Relative Performance of VHF and UHF Broadcast Systems," 1974, and; "Public Television Service in Rural America," 1979) which, along with his own views, lent valuable support to the criteria I propose for a Micro-TV service.

I have also used another report sponsored by CPB. It was prepared by Anthropos, Inc., on the use of low-power TV in Alaska. The Anthropos study evaluates the effects of the CPB "mini-TV" experiments, begun in the early 1970's, in three remote Alaskan communities. I supplemented this information with what I had learned from Mr. Rubin and from Gordon Oppenheimer of the FCC's Broadcast Bureau, who was directly involved in the authorization of these stations.

I visited Canada where a Micro-TV service is already a reality. The first person I interviewed there was David Brough, who operates a network of one-watt TV stations throughout the northern regions of Canada. I recorded much of our lengthy conversations, took notes, and witnessed several crucial aspects of his technical operation.

My travels also brought me to the Canadian Radio and Telecommunications Commission, one of the two agencies that regulate Canadian broadcasting on the federal level. I met with Michael Helm, whose title is Assistant Director of the Broadcast Programs Directorate. I also spoke with representatives of the Canadian Department of Communications and with an engineer and a program executive of the Canadian Broadcasting Corporation concerning the latter organ-

ization's policy of providing local access to their low-power, re-broadcasting transmitters.

There are three television broadcast systems in the contiguous 48 states authorized to broadcast extensive amounts of locally originated programming over low-power transmitters. These systems have been licensed under waivers of certain parts of the rules and regulations governing full service stations. All three systems are located in the Appalachian region of New York State. I visited two of them and spoke at length on the telephone to the director of the third. One of these systems, in Stamford, New York, was familiar to me from years past, when Lanesville TV was operational. Because of the nature of their near-full-service licenses, these three systems cannot be considered as truly representative of what Micro-TV might offer. They do, however, present a picture of the range of local services that a low-power station or a Micro-TV station might offer.

No new broadcasting service can be considered independently of the technology that spawns it. This is as true of Micro-TV as of any other service. With that in mind, I paid visits and made follow-up calls to several manufacturers of low-power transmitter equipment. I also contacted Paul Evans of the National Translator Association. He provided me with detailed accounts of the evolution of translators from a totally unauthorized to a fully licensed service.

Of all the literature I collected during the research for this report, perhaps the single most enlightening document was one prepared for the Canadian Department of Communications by Switzer Engineering, Limited, of Missisagua, Ontario. It investigated the technical acceptability of David Brough's Micro-TV network, and made

recommendations for regulations necessary to authorize such a service in Canada. The credibility of the Switzer report is enhanced by the Canadian government's acceptance of its recommendations and the authorizations of a Very Low Power (Micro-) TV service just as Switzer had proposed. It is the most comprehensive technical evaluation of Micro-TV currently available. It appears in Appendix 1 of this report.

My other sources are cited in the footnotes. The only exceptions involve Lanesville TV where, for some of the descriptions, I have had to rely on my memory and the recollections of other participants in lieu of records that have been lost or were never kept. I do not believe that the accuracy of the report suffers because of this.

The history of very low-power broadcasting suggests that when people want a service and the equipment exists to provide it, that service will be created regardless of whether or not there are regulations to allow for it. My research has lead me to believe that this could soon be true of the types of Micro-TV broadcasting outlined in this report. Certainly, the equipment needed to set up a Micro-TV station is almost universally available in this country. The question that remains concerns only the extent to which people need or desire such a service.

One need only travel as far away from an urban area as Lanesville, N. Y. (on the fringe of five television markets including the largest-- New York City), to witness how poor TV reception is for many rural viewers. Until now, the people who lived in these television-poor areas had little hope of better reception, let alone the advent of

an increased range of program services. Now, however, creation of a licensed Micro-TV service holds the promise of greater service for those who need it most.

Time is a crucial factor. The FCC should consider the advantage of acting swiftly to design a Micro-TV service that encourages growth but avoids the potential for harmful interference. Such action will not only fill the gaps in the present patterns of television service, it will demonstrate that the Commission and the public have benefited from the lessons of very low-power broadcasting history in the United States.

THE UNITED STATES:

The Origins and Development of Very Low-Power Broadcasting

Translators:

In the United States, television reception is generally regarded as a right, not a privilege. Everyone is entitled to the pursuit of television viewing. One early indication of the extent to which public sentiment was aroused in the exercise of television liberties is the story of television translators. It is also the logical place to begin any investigation of low power TV broadcasting in the U. S.

As television stations proliferated throughout the country in the early and mid-1950's, most cities and their immediate suburbs were provided with a number of stations from which to choose. Some stations were affiliated with networks while others were independent, but all of them met the technical and financial requirements which the FCC had determined would render them capable of delivering the fullest possible service to the public. The tremendous capital investment and large overhead of these commercial stations turned out to mean that they could operate profitably only in cities. In western states, where cities are often far apart and the terrain mountainous, many rural communities were left without any television at all.

It did not take long for some of these communities to realize what they were missing and to seek a technical solution for their electronic isolation. In the Fall of 1948, the community of Astoria, Oregon began to receive its television via a novel idea--a television booster system. Any booster system has three basic elements: a

receiving antenna; an amplifier; and, a transmitting antenna. A booster system was usually set up on a hill or mountainside where the signal from a distant TV station could be received. That signal was fed to the amplifier where it was strengthened and then sent to the transmitting antenna through which it was re-broadcast to the community below, where TV reception had previously been unavailable.

In order to avoid interference between the signal arriving from the TV station and the one being re-broadcast, a method was developed to change--or TRANSLATE--the frequency of the original signal before it was re-broadcast. This frequency shift meant, for instance, that a distant TV station originating on channel 4 might be received in a translator-served community as channel 6 or channel 45 or as any other convenient frequency.

The Astoria idea caught on quickly. Translators and boosters proved to be an excellent method for extending TV services to communities which would not ordinarily have had them; and the systems were not very expensive. By 1956 there were about 800 translators and boosters in the U. S.¹

Not one of these early systems was licensed by the FCC. They might have been had the Commission established rules for licensing anything other than full service TV stations, but technology and viewer demand were ahead of the Commission's ability to create regulations pertaining to this new service.

In 1955 and 1956, the Commission tried to catch up through a

1. Notice of Inquiry Docket No. 78-253, appendix B, p. 2, cites H. Sieden, "An Economic Analysis of Community Antenna Television Systems and the Television Broadcast Industry," report to the FCC, 1965, as the source of this figure.

series of proposed rulemakings² which culminated in the adoption of regulations limiting translators to the upper 14 channels of the UHF band (Ch. 70-83) and to powers of 10 watts.³ This was a cautious approach aimed at precluding translators from interfering with other broadcast services. But many translator operators, already operating at VHF frequencies (Ch. 2-13) stubbornly refused to be banished to the outer fringes of the dial.

The issue was a thorny one with strong political overtones. The authority of the Commission was being openly challenged by translator operators who refused to change from VHF to UHF frequencies. The FCC had the authority to enforce the new regulations by confiscating the unauthorized VHF translators. But the governors of all the western states, mindful of the consequences of a constituency deprived of its television, rallied to the support of these low-power VHF systems.⁴ At one point the governor of Colorado, in an effort to resolve the controversy in favor of the translator operators, began issuing proclamations that purported to be licenses for the operation of translators in his state.

The translators continued to function while the controversy was sent to the courts⁵ and then back to the Commission. Finally, in July of 1960, the outlines of translator policy as it exists today were laid down.⁶ The acceptance of VHF translators was an essential

2. Dockets Nos. 11331, FCC 55-404 and 11611, FCC 56-44.

3. Docket No. 11611, FCC 55-446.

4. Notice of Inquiry in Docket No. 78-253, appendix B, p. 3.

5. C.J. Community Services, Inc. v. FCC, 100 U. S. App. D.C. 379, 15RR2020.

6. 20RR 1536, July 27, 1960.

part of that decision. But, with the adoption of these broader frequency policies for the translator service, a new problem confronted the commission.

The intent of the early translators had always been to provide service where little or none was already available. The advent of legal VHF translators threatened to change this orientation as full service TV stations realized the potential these systems could have as competitive tools. It was soon realized that translators could enable one station to invade the market of another in a different city without any thought given to their intended use as a method to bring television to sparsely populated regions and the "shadow areas" (spots with poor reception) within the station's own service contour.

The Commission eventually acted to limit VHF TV stations to operating translators only within their Grade B contours⁷ and to restrict other potentially unfair practices translators might offer.⁸ These rules effectively curbed the burgeoning appetite of TV stations for translators. In 1976, according to the TV Factbook, only 16% of the 3551 licensed translators were owned by commercial TV stations.

By far the largest number of translators, 66% in 1976, are owned by public authorities and civic associations. These two types of organizations can be considered together because they have provided translators as a public service and not as a profit-making venture. Even so, these groups often face difficulties finding the money to construct and maintain their facilities. The Commission

7. 23 RR 1565.

8. Lee Co. TV, Inc., FCC 65-483.

has made some effort over the years to make it easier for translator operators to support their systems. The power at which translators may operate has been gradually increased so that larger audiences will be available, and thus, available to pay for, more efficient coverage.⁹ The Commission also made it possible for translators to originate messages, including requests for support, for 30 seconds per hour.¹⁰ The rules governing the types of relays from which translators may obtain their signals have been broadened to include microwave relay links and satellite receive only earth stations (TVRO's).

None of these changes in the rules has made the establishment of commercial translators in rural areas an economically attractive proposition. Translator operators who cannot include the expense of their systems within the budget of a large venture (e.g., TV stations, school districts) must make ends meet by door-to-door solicitation, the use of local tax dollars¹¹ or by pleading for support for thirty seconds per hour on the channels they provide.

Other Options:

In the absence of strong broadcast signals from full service stations or from nearby translators, rural viewers do have several other methods that they can use to receive acceptable television pictures. However, none of these methods appears likely to fulfill

9. FCC 65-334; 13 FCC 2d 305, 13RR 2d 1577.

10. The most recent development in this regard was the Commission's adoption, on March 27, 1980, of rules permitting the origination of fundraising and emergency announcements for thirty seconds per hour on VHF, UHF and FM translators.

11. The State of Montana permits the establishment of translator tax districts that can assess residents up to \$16 per year for the operation of translators.

the majority of currently unmet needs for TV service. What follows is a brief discussion of several presently available viewing options and an indication of the limitations of each.

The first possibility is for individuals to invest in their own, sophisticated home antenna and amplifier receiving system. Depending upon where a home is located, this option may be prohibitively expensive and may not yield satisfactory results in any case.

Cable TV, with one, strategically located set of antennas and distribution of the TV signals over co-axial cable, would seem the obvious alternative. However, cable TV systems are not profitable without a certain number of subscribers per mile of co-axial cable. They may also require a far larger capital investment than translators. In many rural communities, cable is either not economically feasible to begin with, or, as is often the case, the cable serves only the immediate boundaries of one local village. The truly rural viewer, outside these small population centers, is still left with unequal and inadequate TV service.

For the affluent rural viewer in the right location, satellite TV may be the answer. A 4.5 meter diameter, dish-shaped receiving antenna and a sophisticated package of demodulating devices can provide viewers who have an unobstructed view of the southern sky with a choice of program services now using the RCA Satcom I satellite. For the determined viewer with considerable technical expertise, the cost of such a system could be less than \$1000 in do-it-yourself form.¹² For the less adept, Neiman Marcus, the luxury

12. This figure comes from an article entitled, "Build This: Low Cost Satellite TV Earth Station," by Robert B. Cooper, published in the February, 1980 edition of "Radio Electronics."

department store, offers a complete installation for about \$36,000.

One disadvantage of this type of reception is the absence of any programming of local or regional relevance. Faced with the choice, it is not hard to imagine that the rural viewer with little or no acceptable reception would gladly overlook this shortcoming in favor of superior quality reception and the variety of programming services carried on the satellite. The inescapable conclusion, however, is that any form of personal ownership of present TVRO's is beyond the means of the vast majority of rural viewers.

Another possible, though limited, option is the use of pre-recorded TV programs, either on videocassette or, in the future, on video disc. The current cost of these systems precludes their widespread use in rural homes. They have proven effective when collections of tapes and viewing machines are placed in local libraries. The public can view the tapes during library hours and at special presentations.¹³ Yet no matter how popular these programs have proved to be, they cannot make a major contribution to the delivery of TV services to the rural U. S.

It seems clear that for all the present methods of TV diffusion--full service stations, translators, cable TV, satellites, and videocassettes and discs--there is still a segment of the population disenfranchised from their television rights.

13. One of the more successful of these systems is run by the Mid-Hudson Library System in Poughkeepsie, N. Y. The Mid-Hudson System sends collections of video tapes and video playback machines to rural and urban libraries throughout a five county area of New York State.

It is difficult to specify exactly how large an audience in this country remains underserved. One indication may be found in the Comments to the Commission in this proceeding by the National Translator Association. The comments cite a study, released in 1974 by the Denver Research Institute, that reported:

As of 1973, 1.2 million households did not receive adequate television services on even one television channel, about twice that number received only one channel of adequate service, and a full 80% of rural households received three or fewer channels.¹⁴

In a more recent study, but one which was concerned only with public television service, the Public Service Satellite Consortium found that of seventy-two communities surveyed in Wyoming and Montana, fifty-four did not receive public television signals.¹⁵

One of the difficulties in assessing where the gaps in TV service exist is that most of the poorly served communities are small and relatively isolated. They do not have the resources necessary to remedy their own predicament, nor do they possess the economic and political leverage they would need to draw outside attention to their plight.

The number of translators in operation today¹⁶ serves as a further indication that full service TV stations alone cannot meet the needs of all the viewing public. The intent of the ensuing sections of this report is to show that translators, too, are not

14. Comments of the National Translator Association in Docket No. 78-253, p. 26, cite these figures as coming from Broadband Communications in Rural Areas: National Cost Estimate and Case Studies, Denver Research Institute, 1974.

15. "Public Television Service in Rural America," by the Public Service Satellite Consortium for the Corporation for Public Broadcasting, January, 1979.

16. The "1977 TV Factbook" lists 3187 licensed translators.

now a wholly adequate means of delivering television signals to everyone in this country who wants them.

Local Origination:

The region known as Appalachia extends from Mississippi and Alabama north to an area of New York State known as the Southern Tier. It is a region of rugged terrain and generally depressed economic conditions. Neither of these two conditions invites the best of television services.

The Catskill Mountains lie at the eastern end of New York's Southern Tier. Long after public TV stations had ringed the perimeter of the mountains,¹⁷ reception of those stations was difficult or impossible. Most of the 50,000-70,000 people in the mountainous regions of Delaware, Schoharie and Greene Counties were unable to watch non-commercial television.

In June of 1966, Dr. Frank Cyr submitted a series of applications for translators to the FCC on behalf of the local Board of Cooperative Educational Services (BOCES) which functioned in those counties. The translators were designed to bring public television into the region. What made his applications unique was that in order to supply both the local schools and the general population with the widest range of non-commercial programming, Dr. Cyr had asked that that Commission allow translators to be the source of locally originated programs, well beyond the scope of the short announcements already permitted. He proposed a sort of hybrid system that would

17. The full service PBS-affiliate stations whose signals reach parts of the Catskills region are: WNET, New York City; WMHT, Schenectady, N. Y.; WCNY, Syracuse, N. Y.; WSKG, Binghamton, N. Y.; WVIA, Scranton, PA.

function primarily in the re-broadcast mode of translators, but which would, on occasion, produce and broadcast its own programs in the same manner as any full service station. Furthermore, where ordinary translators were permitted only to act as conduits, passing TV signals on to the viewers at the same time and in the same order as they were received, Dr. Cyr proposed to pick and choose his programs from among those offered by three different public TV stations. He proposed to record some of these programs and replay them at later dates or times.

These applications were to be part of a BOCES project called the Rural Supplementary Educational Center which was to house the origination facilities. The application for a waiver of the Commission translator origination rules stated that this system was intended, "to make available educational programming on a regular basis to an area which has not had such programming since the inception of educational television many years ago, and which has no reasonable prospect of the availability of such programming in the absence of the approval of this proposal."¹⁸ The obvious merit of the proposed service, along with the assurance by Dr. Cyr that the locally originated programs would meet FCC technical standards, prompted the Commission to approve the waiver of all applicable rules and to authorize the first originating translator system in August, 1966.¹⁹

This BOCES system, and the two that followed it, must be viewed as special cases in any discussion of the very low-power broadcasting.

18. Applications BPTTV-1461-8 and BPTTV-2886-9, exhibit 1, p. 1.

19. 4FCC 2d 995.

As originally proposed, the Stamford BOCES station was a hybrid of two different types of broadcast systems. In most technical respects, it was a full service station. But, it employed only translators to deliver its signal. The size of the audience it proposed to serve and the budget for equipment originally allotted to the system were far larger than any this report envisions for very low-power TV stations. Nonetheless, an analysis of the BOCES systems is helpful because of their community programming experiences and, to a lesser extent, because of their use of certain types of low-power transmitters. They remain, however, quite different in design and practice from the very low-power originating TV stations in Lanesville and Canada, described later in this report.

The authorization of the first BOCES station was only one step in the evolution of low-power and very low-power broadcasting in the United States. Perhaps the next significant event in this process was a technical development that, on the surface, had little to do with translators. In the Spring of 1970, the Sony Corporation began selling two new types of video tape recorders (VTRs). The first was actually a variation on earlier models, available since 1968, which used one-half inch wide tape on open reels. But, the "AV" series, introduced in 1970 was the first VTR to be manufactured according to a new, industry-wide standard--EIAJ, Type I. The standardization of half inch VTRS coupled with their extremely low cost (about \$1,500 for a camera and VTR), portability and ease of operation, led to an explosive expansion in the number of individuals and organizations using television equipment.

The other VTR Sony introduced that year was the first video

cassette recorder which used 3/4-inch wide tape. The great promise of video cassettes was that, like audio cassettes, they were threaded by the equipment without the need for a trained operator. The 3/4-inch cassette offered a higher quality picture than the half-inch machines, but neither VTR could produce a signal capable of meeting FCC broadcast standards. Nevertheless, both VTRs were available with miniature television modulators which transformed their video and audio outputs into a standard TV channel. Anyone with a modulator-equipped VTR could watch tapes on a normal TV set. Non-technical viewers usually found this method of playback quite acceptable.

Alaska:

A year after the introduction of these new VTRs, the Corporation for Public Broadcasting (CPB) and the Alaskan Educational Broadcasting Commission conducted a series of experiments with one watt and ten watt transmitters in two, remote Alaskan villages. These experiments were the first step in a program which has now provided Alaska with over 70 ten watt broadcast stations.

The CPB Alaskan experiments indicated that low-power broadcasting on the order of ten watts would be technically feasible in Alaska. As a result, the Commission granted the first of three experimental "mini-TV" licences to the school board of Unalaska in October of 1973.²⁰ Unalaska's 10W mini-TV station, like two others in Ft. Yukon and St. Paul, was specifically designed to provide that island community of approximately 500 people with public television programming. All three communities were too far from full service

20. Report No. 11887, October 25, 1973.

to make cable TV or standard translators possible. All the programming on these mini-TV stations was recorded at full service stations and sent to the mini-TV facilities on 3/4 inch cassettes. The Unalaska station also produced some programs of its own on a half inch Sony portable VTR.

According to a study of all three systems conducted by Anthropos, Inc., of Anchorage, Alaska,

The results of our evaluation indicated that this undertaking met or exceeded the expectations of all the parties involved...There is no question at all of the community commitment to keep mini-TV alive and functioning indefinitely into the future.²¹

In Unalaska, a fishing village in the eastern Alutian Islands, the mini-TV system was, and still is, run by the local school system. Of the three original stations, this one was the most active in producing local programs. The Anthropos study attributes this, in part, to the use of students from the high school media class in the preparation of a weekly news broadcast.²²

The St. Paul and Ft. Yukon licenses were granted to the municipal governments of those communities. Anthropos reported that while these stations were as popular with local residents as the one in Unalaska, each had only a single station manager who was responsible for the operation of the station as well as any local programming. Because of this, local productions were not a significant part of the activities of either station.

21. "Evaluation of the Impact of Mini-TV Stations Upon Three Remote Communities in Alaska," C.P.B. Study 411, December, 1974.

22. Ibid., pp. 19-20.

In assessing this situation, the study stated:

Typically, what might be accomplished in local programming cannot be done well without guidance and technical assistance. An example is the frequently expressed desire to use television to advance cross-cultural education, Native language instruction, and understanding the indigenous culture. Although some communities can undertake such programming without assistance, it is difficult or impossible for most to begin, let alone sustain, such projects.²³

The stations were originally receiving 25 hours a week of PBS programming. These shows were dubbed onto 3/4 inch cassette at KYUK, the PBS affiliate in Bethel, Alaska. The Alaskan Educational Broadcasting Commission administered the distribution of tapes as they were passed from station to station (a method commonly referred to as "bicycling"), and supplied technical support.

Within a short time, however, all three stations had found ways to obtain cassettes of commercial TV programs. According to Anthropolos:

With the exception of PBS children's programs, commercial television of the "light entertainment" sort is the most generally favored. Of PBS materials, the children's programs received universal praise, and not infrequently was comment made that these programs would in themselves justify the mini-TV operation. Although there were naturally differences of opinion in each community, there was regularly more favor expressed toward documentaries, travel shows, and news-related programs than toward others. Typically least favored were materials highly sophisticated or erudite in nature.²⁴

Anthropolos was enthusiastic about the technical aspects

23. Ibid., p. 29.

24. Ibid., p. 12.

of the systems, saying that they were, "an unqualified success, in that the three stations operated regularly with almost no down time due to equipment malfunction."²⁵ In a related matter, the study reported,

Although there has been some turnover in staff, there was no indication that broadcasting or the overall operation of the station suffered. Given the simplicity of the hardware, training stand-by operators proved no difficulty.²⁶

The geographical isolation of Alaskan communities had always acted as a barrier to the delivery of traditional television services. Since the original mini-TV experiments, that same isolation has been an important factor in encouraging the development of this new service by providing ideal protection from TV interference. It has enabled the Commission to treat Alaska as a special case where the relaxation of rules does not mean poorer service, but rather the existence of service where none was possible before.

The Anthropos study reports that the greatest single source of dissatisfaction with the first three Alaskan mini-TV stations grew out of the frequent delay in the arrival of the program tapes. Inclement weather was most often responsible for these delays. When these stations were started, there was no practical alternative to the physical delivery of the tapes. But the overall success of the first stations prompted other communities to apply for mini-TV licenses. The Commission granted thirteen new licenses to native

25. Ibid., p. 1.

26. Ibid., p. 9.

Eskimo villages in 1974.²⁷ In a subsequent action, the Commission also granted min-TV licenses to the work settlements along the Alaskan oil pipeline which was then under construction. Unlike the original intent of the experimental 10W stations, the pipeline stations planned from the beginning to carry programming from commercial channels.

The demonstratable popularity of the mini-TV stations led to the appropriation of \$1,500,000 by the Alaskan legislature for a project designed to overcome the difficulties of bicycling tapes from one station to the next. Twenty-five mini-TV station applications were filed in 1976 as part of the Alaska Satellite Demonstration Project. The state money has financed a whole system in which programming is first recorded on cassette at Anchorage TV stations. When these cassettes are played back, they are beamed up to the RCA Satcom II satellite. The satellite relays the signal to each of the 25 villages where it is broadcast over mini-TV stations. This method eliminates the problems associated with the physical shipment of tapes.

The seven most recent Alaskan mini-TV licenses were granted by the Commission in January, 1980.²⁸ The licenses were granted over the strenuous objections of cable TV companies located in the same communities for which the mini-TV stations were proposed. In its decision, the Commission stated,

27. This decision and the names of the villages involved were taken from a mention of them in a later decision: File Nos. BPTTV-790103 IA, et. al.

28. Memorandum Opinion and Order on File Nos. BPTTV-790103 IA, et. al.

...Alaska's unique terrain, its remoteness and isolation justify special treatment regarding its television situation. To a large degree, the entire state of Alaska is remote, many of its communities being hundreds of miles apart and beyond the service contours of regular television broadcast stations. Notwithstanding this remoteness, the Commission believes that Alaskans are entitled to the same off-the-air programming routinely enjoyed by other Americans.²⁹

This was not the first time the Commission had decided that a "unique terrain" required a special solution to the problems of delivering TV services. A 1972 decision involving waivers for a translator network had led the Commission to regard the state of Nevada in the same general way:

Nevada, with its vast unsettled areas, its rugged terrain and, save for Reno and Las Vegas, its lack of major centers of population, constitutes a unique situation demanding innovative solutions.
(emphasis added)³⁰

Knowing that both Alaska and Nevada are unique for much the same reasons, it is not hard to imagine that many locations throughout the United States (including Utah, Wyoming, Montana, and large parts of many other states) also fit this general category of uniqueness. The Commission's reasoning that low-power TV stations are justified in Alaska due to that state's terrain and population distribution would seem to warrant the authorization of some form of low-power, or very low-power, TV stations in other parts of this country as well. If that is true, then the conclusions drawn by the Corporation for Public Broadcasting concerning the initial

29. Ibid., p. 4.

30. 38FCC 2d 559 (1972).

Alaskan mini-TV stations take on added significance.

What the C.P.B. learned in Alaska was that, "It was not necessary to build massive facilities with heavy capital investments in order to serve small communities."³¹ Furthermore, C.P.B. stated that although outside financial assistance was needed to initiate their mini-TV stations, "the community was able to handle the maintenance and operation (of the station)."³²

BOCES Developments:

Advances in technology also held out the opportunity for the BOCES translator system, initiated by Dr. Cyr, to expand the scope of its operations. From the beginning Dr. Cyr's concept had been to mix off-the-air cultural and educational programming with shows locally produced by the Rural Supplementary Education Center, the BOCES project responsible for the translator system. In 1966, the major obstacle to local production was the expensive and cumbersome equipment required to do it. The Rural Supplementary Educational Center (RSEC) had covered some local events in its early days, but such productions were infrequent.

By 1974, however, the cost of video equipment had declined to such an extent that the RSEC was able to equip a studio in the immense former resort hotel which served as the center's headquarters. A small staff was assembled and productions, taped on 3/4 inch cassette VTRs, were initiated.

A year later, another similar translator system also began broadcasting local programs, although on a much more extensive scale

31. Comments by the Corporation for Public Broadcasting in Docket No. 78-253, p. 5.

32. Ibid.

than that of the RSEC. This second system was operated by the BOCES in Chautaugua County, N. Y. Chautaugua County lies at the western end of New York's Southern Tier. It, too, is an Appalachian region, but its population is double that of the four county area the RSEC system serves. The Chautaugua County system, and its eastern neighbor, the BOCES system in Cataraugus County, are the only other translator systems in the lower 48 states with FCC waivers permitting regular local origination of more than thirty seconds per hour. All the translators in both systems are on UHF channels and carry the signal of WNED, the Public Broadcasting Service affiliate station in Buffalo.

The Chautaugua County system serves only that county. Ken Wasmund, the director describes it as "the only unified mass media in the county." In keeping with that perspective, he instituted a 5-day-a-week program of local news, information, and cultural events, broadcast live for two hours every morning. In contrast to the RSEC system where most programs are taped, Wasmund's attitude is, "If it can't be done live, I question whether it's worth doing at all." The statement reflects an approach to local programming as much as the actual ratio of live to tape programs.

Besides the morning program, the system regularly covers sports, politics and community affairs. In 1977-78 there were nearly 500 hours of locally produced programming broadcast over the system. There are currently two full-time producers on the staff and there have been employees hired under federal Comprehensive Employment and Training Act (CETA) funds. The system relies heavily on an enthusiastic corps of volunteers which includes students, scouts

from an Explorers post, and other members of the community.³³ Much of the programming is produced from the system's mobile production van which travels throughout the county. The system does bring in some revenue from outside productions, but this comes in the form of grants for education programs which are well within the scope of what the system was intended to be.

The Chautaugua County BOCES system has no exact figures on who is watching. The system does receive extensive press coverage throughout the county. Wasmund's feeling, drawn from informal community responses and borne out by newspaper clippings is that there is considerable local interest in many of the programs the BOCES produces. Also according to him, all the schools in the county enthusiastically support the system.

Perhaps the greatest single obstacle faced by this, or any other UHF translator system is how little most viewers know about the proper methods for receiving UHF signals. To help overcome this barrier, the system publishes a pamphlet which explains how the translator system works and gives practical, well-illustrated hints for getting the best UHF reception. This pamphlet is one more indication that the Chautaugua system is an excellent example of a thoughtfully conceived system operating at its full potential.

The third of the authorized originating translator systems is also making serious attempts to provide a range of locally produced programming. The headquarters of the Cataraugus Area TV System (CATS) is located in Orlean, N. Y., about 70 miles southeast

33. This information comes from "Final Report: Mobile Television Van Project, Chautaugua County BOCES, 1977-1978," and the author's interview with Ken Wasmund.

of Buffalo. Cataraugus is the eighth largest county in the State and the forty-eighth most populous. The nine-translator system was begun in 1971 and now claims to cover 85% of the county with the signal of WNEB from Buffalo.

CATS began originating its own programs in December, 1977. All their programs are currently being produced first on 3/4 inch cassette VTRs before they are broadcast. CATS airs two regularly scheduled, bi-weekly programs--a 60-minute community magazine-format show, and a 30-minute school program. They also cover some local sports and politics. There are three people on the full-time production staff; a production co-ordinator (who doubles as on-air talent); a production assistant; and, a technician. Many of their productions are done with their mobile production van, equipped with low-cost video cameras and VTRs.

The Cataraugus system has performed some industrial production work in order to help support its television activities. The director of the system feels that an easing of the N. Y. State restrictions on this type of work might make it possible for him to support all his local programming costs with other production revenues.

All three BOCES systems were originally financed by grants from state and federal agencies.³⁴ Their productions directly

34. The original grant establishing the R. S. E. C. was made to the BOCES by the U. S. Department of Health, Education and Welfare. All three systems receive grant money from the New York State Department of Education. Each system applies regularly to federal, state and local agencies for grants to produce programming.

related to scholastic activities are supported by agreed upon contributions from each of the school districts they serve. Support for their community productions is more ambiguous. Chautaugua, for instance, considers reaching the general public as part of their educational mandate; and they energetically pursue local programming. They allocate their production funds accordingly. The opposite attitude prevails at the other end of the Southern Tier, where the director of the RSEC, referring to community programming, said, "It's nice to have, (but) we don't need to have it."

Some programs have to be funded by means other than school contributions. The major sources of support for non-scholastic programming at Chautaugua and the RSEC have been grants from federal, state, and private agencies. That the Chautaugua system has been highly successful in attaining these funds may reflect its already demonstrated commitment to high quality local production.

Originating translator systems must be considered as a special category of low-power broadcasting. One system can cover a large area while encompassing a broad range of transmitter powers (one watt to one kilowatt). All three systems described above have rendered the valuable service of providing public television where little or no signal was previously available. This, however, is only part of the service these systems originally proposed.

The other part was to provide locally originated--including locally produced--programs. The record of accomplishment in this respect is different for each system. The Chautaugua BOCES maintains a production schedule and a level of quality which rivals that of many public TV stations. The Cataraugus system is beginning

slowly but plans to expand. The original system, at the RSEC in Stamford, has turned over the operation of its translators to the public TV station in Binghamton, N. Y. It now airs only a meager and sporadic schedule by comparison.³⁵

These variations in the level of local activity from one station to the next are to be expected. In each case, the abilities of the staff, the communities served, and the economic and programming priorities are different. What is consistent is that the Appalachian regions of New York State are better served because these special systems exist.

Lanesville TV:

Even translators have "shadow areas" into which the re-broadcast signal does not penetrate. In the deep valleys of the Catskill Mountains are numerous settlements, not large enough to be called villages, in which TV reception is all but impossible. One such place is Lanesville, N. Y., just the other side of Hunter Mountain from the easternmost translator of the RSEC system. Lanesville is no more than a few clusters of houses, a gas station and general store (now defunct), and two bars (both recently burned to the ground). Most of the houses are on, or close to, state Route 214, which runs 12 miles between the villages

35. The system produces occasional quiz shows, seasonal chorus recitals, and one series by local high school students. A full time producer is employed, but part of his time is taken up in the production of educational and industrial videotapes which provide some revenue to the center. When asked about the size of the audience for local productions, the program director complained that he had no way of knowing who was watching or what they wanted to see.

The schools are the system's primary audience, the general public is second. In this respect, a major difficulty facing the RSEC is that the 50,000 or more people it could potentially reach are spread out over 2,000 square miles and four different counties. The assertion of the program director is that the people of the region have nothing in common. The system, therefore, no longer produces non-scholastic programming.

of Phoenicia at the southern end and Hunter and Tannersville in the north. All three villages are served by cable TV.

The Phoenicia cable TV system carries the seven New York City VHF stations. But in Hunter and Tannersville, the signals on the cable come from Albany, Schenectady, Utica and Syracuse. In Lanesville, about mid-way between the two cable systems, where the mountains rise sharply for at least a thousand feet on either side of the highway, there is not much reception at all.

Yet, a trip up one of the Lanesville mountainsides with a battery operated TV set reveals that there is a startling amount of TV in the air just above the community. On an 18" long whip antenna, it is possible to receive distinct video and audio signals on all but one of the VHF channels (only channel 12, from the RSEC translator system, does not come in) and on several UHF channels as well. In all, Lanesville is on the fringe of five different TV markets: New York; Albany-Schenectady; Utica-Rome; Hartford-New Haven; and Wilkes Barre-Scranton. With all this TV about, the residents of Lanesville, who live not on the mountainside but on the valley floor, must still pay about \$150 for a professional antenna installation capable of bringing in only channels 6 and 10 from Albany-Schenectady.³⁶ The quality of the picture leaves much to be desired.

Cable TV would seem to be the logical answer to the reception problems of Lanesville. Many residents have said that they would be willing to pay at least as much as the cost of a new antenna installation to support the construction of a local cable TV system. There are,

36. The most recent installation the author could find was made in the Fall of 1979 and cost \$146.

however, physical, political, and financial barriers keeping cable out of Lanesville.

The political boundaries of Lanesville put it in the Green County township of Hunter. But Lanesville is physically separated from the rest of the township by the state forest lands of the Catskill Park. No local telephone poles or power lines may run through this land. So Lanesville's phone and electric services must come from Phoenicia, at the other end of the valley. Phoenicia is not only in a different township, it is in a different county.

This situation creates many difficulties for the residents of Lanesville. For many years, as an example, it required a long distance call to another area code, placed through an operator in order to summon the Hunter rescue squad in a medical emergency. These difficulties were mirrored by cable TV.

The highest ground in Lanesville is on state land. The construction of cable TV facilities on this property (had any been proposed) would most likely have been prohibited. Lower down the mountainside, where the private property begins, signal strengths drop dramatically. The Cablemaster Corporation, which operates the cable TV system for the villages of Hunter and Tannersville, took some signal strength measurements in Lanesville in the mid-1970's. According to them, they could not find a spot convenient enough to act as a headend facility where the needle on their field strength meter would move. They decided there was no TV reaching the area. Modifying their position somewhat, the company later estimated that they might be able to bring in 4 stations. More important, however, they did not feel they could ever operate profitably in Lanesville regardless of the number of stations available. Of the approximately

100 houses in Lanesville, at least 25 are occupied only on a seasonal basis. Cablemaster left Lanesville with the suggestion that a citizens' group apply to the agriculture department for funds to build a publicly owned system.

There is only one organization in Lanesville, the Stoney Clove Rod and Gun Club. The Stoney Clove Creek runs along the valley floor and is considered an excellent trout fishing stream. Large herds of deer roam the mountainsides. Hunting and fishing are major attractions of the Catskills and the Rod and Gun Club has managed to capitalize on this by enlisting the help of most Lanesville landowners to post their land in the club's name, making membership in the club a nearly essential prerequisite for recreational use in that part of the valley. There is also a church which holds semi-annual suppers and allows the attached meeting hall to be used for the occasional odd meeting or event. But there is no resident minister and the church does not play a central role in community life.

It is difficult to say exactly what constitutes community life in Lanesville. This is partly because there are two very distinct, and very separate groups of people who live there. One group is the indigenous families. Some have been in the Stoney Clove area for several generations. The men of these families work at logging, truck driving or construction work when it is available. Some get winter jobs at the nearby ski slopes. The one business in Lanesville is the sawmill, which employs a few local residents. Because of scarce employment opportunities, most of the women do not have regular paying jobs. There are no schools in Lanes-

ville.

The second distinct group of people in Lanesville fall into the general category of urban expatriates. Most have left New York City or the surrounding suburban areas. Some are only part time residents, arriving either on weekends or for a season at a time. There is little communication and considerable mistrust between the two groups. Even within each group, there is no strong cohesion. The local families have their own internal quarrels and scandals. The "city people" are a diverse and transient group.

1 In the summer of 1971, a new group of "city people" arrived in Lanesville. Media Bus, Inc., leased a three story, clapboard former boarding house known as Maple Tree Farm. Media Bus was an independent television production company specializing in highly experimental programming. Because of the limited commercial potential of experimental TV, the company had recently dropped its old name, Videofreex, Inc., and reorganized as a non-profit entity. The practical advantage of this was that Media Bus was eligible to receive direct grants from state and federal agencies. At the time Media Bus moved from New York City to Lanesville, the transition from Videofreex was not yet complete and both names were put on the mailbox.

2 The move to Lanesville was an attempt by Media Bus to reduce the staggering overhead of operating in Manhattan. The eleven people who comprised the staff planned to live at Maple Tree Farm as well as work there. For many Lanesville residents, local families and "city people" alike, this outwardly unorthodox approach was the

embodiment of a social phenomenon of that time called, among other things, the "counterculture." The organization and its members did not win immediate acceptance by either faction of the community.

The first few months after the company moved to Lanesville were occupied with remodeling Maple Tree Farm and fulfilling grant obligations elsewhere in the state. There was little contact with the Lanesville community during that time.

The first interest in broadcasting to the community came in response to a visit made by J. P., a young man recently convicted in federal court of having operated unlicensed AM and FM radio stations in defiance of repeated orders by the FCC to shut them down. J. P. was now interested in television broadcasting. He claimed to have considerable expertise in transmitting. In light of his recent experience in clandestine radio, the claim seemed justified.

Media Bus was also interested in experimenting with TV broadcasting. In 1970, the company had purchased a cable TV modulator set on channel 3 for just such experimentation. Although the output of this modulator was considerably more powerful than that of the small modulators in the VTRs, several earlier transmitting experiments had been unsuccessful.

J. P. discussed these failures with the Media Bus engineer. It was decided that J. P. would construct a transmitting antenna and that the Media Bus engineer would devise a power amplifier to be placed between the modulator and the antenna.

All the elements of this system were in place by the middle of March, 1972. The antenna designed by J. P. had been mounted on a

short mast attached to a roof peak of Maple Tree Farm, about 50 feet above the ground.³⁷ It was a three element yagi for channel three. The somewhat directional pattern this antenna was supposed to produce was intended to cover the majority of homes in Lanesville.

Maple Tree Farm was located northeast of the center of the community with about 75% of the homes situated directly down the valley from the knoll on which the building sat. Continuing up the road in a northeasterly direction, the valley makes a sharp turn about three quarters of a mile from Maple Tree Farm effectively blocking transmissions from the rooftop antenna beyond that point.

The Media Bus engineer had designed an amplifier using a commercially available RCA transistor in a circuit of his own invention. The device was developed by trial and error. He no longer remembers the specific component number and what notes he made have since been lost.³⁸ The output power of the amplifier was never accurately determined. A Lafayette Electronics passive metering device, intended to indicate the power and VSWR³⁹ of citizens band radios was placed on the output. The meter reading for VSWR was low on the scale intended for CB measurements. The power reading was approximately one watt. But how closely these measurements corresponded

37. The base elevation of Maple Tree Farm is approximately 1,475 feet above sea level. The mountains, which literally surround the house, rise to a maximum elevation of 4,000 feet above sea level. See contour map, appendix 2.

38. The engineer does recall that the RCA device was a stripline RF power transistor designed for operation with a minimum of external components. It had a low impedance input and a "moderate" output impedance.

39. Vertical Standing Wave Reflection.

to reality is subject to question, due to the disparity between the types of signal the device was built to measure and the TV signal fed through it. The only further information available in this respect is that the engineer recalls that the rated power of the RCA transistor was about one watt.

Because Media Bus was primarily engaged in the production of non-commercial video tape programs, a studio and control room were fit into the first floor of Maple Tree Farm. The modulator was placed in the control room so that any adjustments to it could be made in conjunction with the setting of the video and audio levels. The channel three signal from the modulator was fed over a co-axial line⁴⁰ to the amplifier in the third floor hallway, about fifteen feet below the antenna. The amplifier circuit was mounted in a small box about the size of a package of Animal Crackers. The CB power meter, approximately the same dimensions, was connected to the output. The only control was the Lafayette Electronics variable direct current power supply, also about the same size, which was set to one side.

Each time the station broadcast, someone would run up to the third floor and turn on the power supply until the meter read 12 volts. If the CB meter showed a power reading, the transmitter operator would call down the stairwell to the first floor control room, "You're on the air!" and programming would commence.

There were several factors motivating Media Bus to initiate the

40. Originally, all transmission lines in Lanesville TV were RG-79U, 75 ohm, co-axial cable. This is the type of cable often used in video work and for cable TV installations. Later, the transmission line from the power amplifier to the balun at the antenna was replaced with a lower loss, ½" diameter, solid aluminum shield cable, also 75 ohms. This cable came from a discarded cable TV trunk line.

the Lanesville station. The company was comprised primarily of producers and artists who were interested in experimenting with all forms of television. Local access on cable TV (outside of Lanesville) was not yet widely available and other outlets to general audiences were limited. Full service broadcast stations were not willing to play tapes made with half-inch VTRs because of the technical quality of the signal and, perhaps equally important, because the general availability of the equipment represented a challenge to their heretofore exclusive control over who could make programs.

Media Bus had held weekly showings of its productions in its New York City loft. Often, live segments had been interspersed among the video tapes. The move to Lanesville had ended these shows. Some members of the organization felt that regular broadcasts in Lanesville would provide a renewed outlet for already produced tapes as well as works in progress.

The idea of Lanesville TV (as the station was most often referred to) was also looked upon as a means of reaching out to the community; a way to diminish the isolations brought on by the misapprehensions of Media Bus' neighbors.

Finally, the initiation of Lanesville TV had a symbolic function. Lanesville TV was to be proof that a television station could be set up for a relatively small amount of money⁴¹ by people who were determined to do it.

Lanesville TV was created in the absence of rules to make it possible. The FCC did not provide for full service stations with

41. See appendix 2 for a cost breakdown of the Lanesville TV technical system.

transmitter powers of less than one hundred watts and, because Lanesville TV was not re-broadcasting another signal, it could not apply for a waiver as an originating translator. Like the translators of the early 1950's, Lanesville TV was not only unlicensed, it was unlicenseable.

Several years before LTV went on the air, one of the Media Bus staff members had received his first class radio-telephone operator's license. At the time, he had no idea he would someday be involved in the operation of an unlicensed TV station. Yet, as coincidence would have it, during the first few years of Lanesville TV, this first class operator was frequently present. It should be stressed, however, that his presence was not a prerequisite for transmitting. Indeed, several other members of the organization were far better prepared to cope with the station's technical problems than the licensed operator.

The first transmission from Maple Tree Farm was made late in the evening of March 18, 1972. The broadcast was conducted to test the system. J. P. and several members of Media Bus drove to a home about two miles down the road from Maple Tree Farm to see if the signal was traveling that far. Shortly after they left the studio, they called from the neighbor's house, thrilled by the clarity of the image and sound they were receiving. No further technical tests were conducted at that time.

Satisfied that the technical systems were operational, the Media Bus staff set about preparing a program to inaugurate their system. The next day, a video tape crew visited several residents of Lanesville to inform them of the station's first regular broadcast and to record their thoughts in anticipation of the new TV service. A test pattern with a note attached to it telling viewers

that programming would begin at 7:00 PM was broadcast throughout the afternoon of March 19th. The owner of the bar nearest to Maple Tree Farm characterized the advent of the local station as "Something new and something extounding," (sic) and agreed to tune in the shows on the set above the bar on a regular basis.

The first announced broadcast originated from the control room. It consisted of several video tape segments punctuated by live introductions and announcements. Throughout the program, the telephone number of the station was given out and the audience encouraged to call. Reports on the quality of reception as well as critical evaluations of the program were requested.

No list of the telephone responses by viewers were made until the second broadcast three days later. On that evening, the reports of reception quality varied radically. By the fourth broadcast, on March 29th, most of the people who contacted the station reported good reception. Copies of the phone call log for the initial broadcasts and a typical program log (which later incorporated a list of all callers) is attached to this report as part of appendix 2. Some of the calls came from as far away as four miles down the road. While the signal was not perfect everywhere, the initial audience acceptance of the programming appeared to be nearly universal.

The telephone was to continue to play an important role in Lanesville TV throughout the nearly five years the station was on the air. In all subsequent broadcasts, the phone number was displayed on the screen and calls were solicited. Often, when people reported reception problems, modulator adjustments were made on the air with the host of the program, on the phone, relaying messages between the viewer at home and the engineer in the control room.

Not every reception problem could be easily remedied nor were most problems due to the signal the station was transmitting.

The potential viewing audience for Lanesville TV was sharply diminished in 1974. At that time, the Phoenicia cable TV system ran their long-promised trunk line up Route 214 to the county line. Lanesville TV had been reaching as many as 40 homes in Chichester, just across the county line from Lanesville. But, with the arrival of cable TV, most people in Chichester subscribed to cable service and effectively cut themselves off from the station in Lanesville.

LTV was successful in delivering what could probably be described as a Grade B signal to most of Lanesville. There was much experimentation throughout the five years of the station's existence, however, in order to find more effective but still inexpensive transmitting systems. The first change in the transmitter system came in late 1973 when it was discovered that a used, tube type, cable TV line amplifier⁴² was actually more powerful than the prototype amplifier originally designed for the system. Shortly thereafter, the cable amplifier replaced the little aluminum box and power supply.

In 1975, LTV experimented with a demonstration model of a solid state, three watt, broadband linear amplifier manufactured by the ENI Corporation of Syracuse, N. Y. The power supplied by this amp more than doubled the range of the station in the direction of Chichester. That much power was wasted, however, because most people in Chichester were already hooked up to the cable. The cost

42. Manufactured by the Entron Corporation.

of the amplifier, at about \$3,000, was unjustified when compared to the adequate coverage provided by the cable TV amplifier which cost about \$50.

The antenna was also changed about three years after the inception of LTV. During one of the frequent local wind storms, the three element yagi built by J. P. had been damaged. It was feared that the antenna's efficiency, never precisely calculated, was irreparably impaired (this was deduced from increasing complaints of poor reception). It was replaced by a commercial, home TV reception antenna cut for receiving only channel three.⁴³ This antenna created a much narrower service contour which was even better suited to the terrain of the valley.

The last change in the system was the use of yet another amplifier; this time, a solid state amp designed for use in master antenna systems such as are often found in apartment buildings. This amplifier, while apparently no more powerful than the earlier cable TV amp, was more reliable because of its solid state design. It also created fewer spurious emissions capable of interfering with other TV channels.

The net result of all this experimentation was a highly reliable transmission system, which except for the modulator, was purchased at an electronics store in a nearby city for less than \$300.

LTV was able to cover the majority of the community with a signal that was better in quality than the commercial stations available over-the-air. There were, however, several technical obstacles to the delivery of service, some of which were overcome

43. Channel Master model 1523, a ten element yagi.

and some of which were never solved.

Most households in Lanesville had TV sets. The majority were black and white because color reception was poor. There are no data on the age of the sets in use there, although several of the families who helped LTV monitor its signal had all-tube sets at least five years old in 1972. The older sets were much more susceptible to picture distortion and interference. This was especially apparent when video tapes were broadcast.

Most people had their antennas pointed toward Albany and Schnectady for channels 6 and 10.⁴⁴ The mountains reflected these signals in unpredictable ways and many people found that the best reception required that they point their antennas away from the stations and toward the source of the strongest reflection. This meant that Lanesville TV had to reach its viewers through antennas cut for different channels and, often as not, pointed away from Maple Tree Farm. No one had an antenna specially for LTV because the station was only on the air for a few hours a week. Reception quality varied, therefore, from home to home.

The Lanesville TV modulator may have been imprecisely aligned. As the modulator tubes aged, they caused a drift from the proper frequency to occur. The modulator was re-tubed at least once, but the engineer did not have all the necessary test equipment to properly re-align it. Also, the band pass filter, a part of the modulator designed to delete frequencies other than the one the modulator was intended to produce, was removed from the output. This was done after an attempt to align the filter failed and it was

44. Some people received only Channel 2 from Utica. Others watched primarily Channel 3 from Hartford. The best reception at Maple Tree Farm was on Channels 16 and 28 from Scranton/Wilkes Barre, Pa.

determined that the untuned filter was severely diminishing the modulator's output power. It is possible that none of these problems would have arisen with a solid state modulator.⁴⁵

The signal from LTV was never outside the capture range of the TV sets in the community. But, as one watcher put it, "You had to monkey around a lot," to tune in some of the broadcasts.

Removing the band pass filter on the modulator allowed harmonics of the original frequency and spurious emissions created within the modulator to be broadcast along with channel three. Because of this, some people claimed they received channel three better on channel 8.

A problem with the low band VHF frequency of channel three is its susceptibility to electronic interference, especially from automobile ignitions. This was extremely noticeable in Lanesville because of the proximity of most houses to the main road. LTV broadcasts in the wintertime would often coincide with the heavy traffic period caused by the exodus of skiers from the nearby slopes. A poorly timed ignition would temporarily disrupt reception on many sets as it passed along the valley.

LTV was channel 3 because that was the frequency of the modulator Media Bus owned. Had the modulator been set up for channels 6 or 10, there might have been some major conflict. Only a few residents could receive channel 3 from Hartford, Conn., and their reception was frequently interrupted by atmospheric interference.

45. Most half-inch and 3/4-inch cassette VTRs either come with, or have available as an option, a small modulator, usually called an "RF unit." Media Bus had several of these but never used them for broadcasting from Maple Tree Farm because the power of the Jerrold modulator was much greater.

There were a few instances when LTV created co-channel interference which blocked a resident's reception of the Hartford station. On one memorable occasion, the local garbage collector called to say that LTV was preventing her from watching "All in the Family" from Hartford. She requested that LTV leave the air and her request was honored.

Some technical problems of Lanesville TV arose in the control room. The modulator had no automatic limiting circuitry on the input. When too strong a video or audio signal was inadvertently fed to it, it simply overmodulated, creating severe distortions. Another factor was the inherent instability of some of the earlier VTRs. Tapes made on these machines had to be evaluated individually to be sure they met the standards of stability which experience had taught the Media Bus staff was necessary for a satisfactory picture in most Lanesville homes.

For all the technical difficulties experienced by the station, it should be re-emphasized that LTV delivered the best reception available in the community. There were no guidelines for this type of operation--everything done was experimental. It is fair to say that Media Bus managed to push the equipment available to the limits of its capabilities while at the same time maintaining the highest standards possible.

Programming and Finances:

Lanesville TV never received financial support from any source but Media Bus, Inc.; and Media Bus never received any direct support for Lanesville TV. However, had Media Bus not continued to operate the station, there is little question that funds to the company would

have been drastically reduced. In effect, even though the station as such was not being supported directly, the tacit approval of the New York State Council on the Arts and the National Endowment for the Arts was essential to keeping LTV on the air for nearly five years.

The bulk of Media Bus income in the years from 1972 to 1977 when LTV was on the air came in the form of grants from the TV/Media Department of the New York State Council on the Arts. Much of this money was earmarked for the support of staff and facilities of the media center operated by Media Bus at Maple Tree Farm. The media center was loosely defined as a place the general public could go to learn about, and work with, various media. The emphasis in Lanesville was obviously on television, but there were also a photographic darkroom, an extensive videotape library, and other media-related facilities there. Hundreds of people came to the media center⁴⁶ and it was generally regarded as one of the most important experiments in alternate television.

The activities of LTV were never mentioned in any contract Media Bus entered into with any state or federal agency, even though a central part of every media bus proposal was a description of the station's program activities. It is safe to assume that the funding agencies which supported Media Bus were well aware of both the experimental value of LTV and its unlicensed status. They were also aware of the totally non-commercial nature of the station's operation which was in keeping with the restrictions of Media Bus as a non-profit corporation. What non-governmental support did come to LTV was in the form of contributions to the programming by visiting

46. Incomplete records show that at least two hundred guests per year used the Media Bus facilities during the last two years of LTV.

artists and producers, not cash or equipment.

Between March 1972 and February 1977, the Lanesville TV logs recorded 258 different programs--an average of one a week--all of them containing at least one, originally produced live segment. There were three shows a week in the beginning, Sunday and Wednesday evening shows and a children's show on Saturday morning. This heavy production schedule soon proved to be more than the staff could bear or the Media Bus budget justify. By the summer of 1972, there was just one weekly show.⁴⁷

No matter what the content or form of the show, and those factors varied wildly week to week, viewers were always encouraged to call the station. The voices of the callers were put over the air without delaying their voices for possible editing. This procedure, religiously adhered to, gave the viewers a real chance to address the entire audience at once. This telephone access was never abused throughout the 258 show tenure of the station. Often, this procedure proved quite effective in the airing of community conflicts and issues.

There are 436 taped or specially produced live sequences listed in the LTV logs. 74% of these sequences were produced by Media Bus staff members. These productions can be classified in three general categories: 1. news and local events; 2. Media Bus tapes not produced for LTV but shown on the station; and, 3. drama and comedy produced especially for LTV. Many of the guests who visited

47. The shows eventually moved to Saturday nights at 7:00. The only variation from this day and time came during two summers when the shows were moved to 8:30 for a few weeks in order to allow for the longer daylight hours, when people were not normally inside watching TV.

the media center were encouraged to take an active part in the weekly productions which led to the broadcast of numerous tapes by independent artists. The few movies which were shown on LTV were mostly borrowed from the local library system. Of the 436 segments, about 15, or 3%, were repeated. Some repeats were made because of audience demand.

LANESVILLE TV CONTENT

News/Local Events.....	42%
Media Bus Tapes not made for LTV.....	21%
Tapes by Independent Artists.....	18%
Comedy and Drama Specials (live and tape).....	11%
Commercially available films.....	05%
Repeated Segments.....	03%

There is no scale by which the effect of LTV on the community can now be measured. Over the nearly five year period the station was active, there were only four brief periods when programming was temporarily discontinued. These times usually coincided with the necessity for studio maintenance or with some Media Bus activity which required the efforts of the entire staff.

The first of these down-time periods was in February of 1973. At that time Media Bus prepared and mailed a questionnaire asking for viewer response, and accompanied it with a cover letter attempting to explain the LTV activities.⁴⁸ The questionnaires were sent to all the postal patrons in Lanesville, but no exact record was kept of the number of questionnaires mailed. In any case, the response was slight and predictable. The people who regularly contacted the station by telephone, and whose views were already known, were the ones who returned the forms. The size of the audience was more easily

48. See appendix 2.

assessed by word of mouth than by printed forms.

Despite strong and continued encouragements to do so, few local people became involved in producing programs. The taciturn nature of the local people, their pressing economic conditions and the disquieting sense they felt toward the communal arrangements at Maple Tree Farm prevented a strong bond from developing between Media Bus and the community. The station always remained in the hands of the "city people."

This is not to say that there were not great programming successes. The extensive coverage LTV gave to local events was extremely popular and stayed in the minds of many viewers for years after a particular tape had been shown (this was particularly true of early segments on the Rod and Gun Club's activities). Certainly, the residents of Lanesville had a far more diverse programming service available to them than any other small community.

Lanesville TV made undeniable contributions to the growth of low-budget, locally produced community television. New program formats were created, and new and expanded applications were found for existing equipment. During the years Lanesville TV was on the air, the participants in this experiment viewed themselves as pioneers in the effort to develop community television. They were aided in their work by outside support that allowed the station to function with complete economic independence from the community it served. This independence accounted, in part, for the abiding suspicion of many local people toward the station, as well as for the incredibly rich and original programming the station offered.

Lanesville TV was part of the evolution of very low-power and

low-power broadcasting systems throughout the country. The station was one response to the needs of a community that lacked adequate TV service, just as translators and mini-TV stations were--and continue to be--in other locations. Perhaps what Lanesville TV illustrates best is that reliance on locally produced and originated programming is one workable mode of operation for a very low-power TV station.

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VERY LOW-POWER BROADCASTING IN CANADA

Canadian experience with low-power broadcasting is extensive. In that country, low-power television systems have proved an effective means of providing TV services to far-flung settlements in which full service stations would never have been built. In Canada, the sheer distance between many rural communities creates ideal isolation from various forms of TV interference. The isolation of these communities has challenged Canadian broadcasters to find innovative ways of delivering television to those who want it. In order to better understand how low-power TV has been used in Canada, it may first be helpful to briefly outline the varied elements of Canadian television broadcasting.

There are two separate agencies concerned with the regulation of broadcast services in Canada. The larger of the two is the Department of Communications (DOC). It is part of the Canadian political government and is represented by the cabinet-level Minister of Communications. The DOC's 2000 employees are responsible for several different functions. They develop the government's communication policies, which often take the form of bills introduced by the government in Parliament. The DOC also undertakes, or supervises, communications research projects. In TV broadcasting, the DOC is in charge of spectrum management and approving the types of equipment which will meet Canadian transmission standards.

The second organization involved in regulating Canadian broadcasting is the Canadian Radio-television and Telecommunications Commission (CRTC). It is an independent regulatory agency with a staff of about 500. The CRTC regulates all non-technical aspects

of broadcasting, such as programming and finances. Technical questions concerning new and existing licenses are referred to the DOC.

Both agencies are relatively new. Prior to 1968, Canadian broadcast regulators had been part of several other government agencies (including the Department of Transportation). The CRTC and the DOC were created by the Broadcasting Act of 1968 and the Department of Communications Act of 1970, in an attempt to consolidate the regulation of telecommunications in Canada.¹

There are both commercial and government supported television systems in Canada. The largest commercial network is CTV, although there are other, more regional networks in competition with CTV. The commercial stations are full service, high-power facilities carrying a heavy diet of shows produced for US commercial TV.

The government supported network is the Canadian Broadcasting Corporation (CBC). CBC owned and operated stations do carry some commercials within the strict guidelines established by the government. There are also government requirements concerning the amount of Canadian produced programming the CBC stations must carry. These rules do not necessarily apply to those privately owned stations that are affiliated with the CBC.

The intent of the Canadian programming rules is to create a Canadian service which is culturally distinct from that of the U. S. But it has been an uphill struggle, for, as the 1979 CRTC decision on the renewal of the CBC's licenses stated, "English-

1. The Canadian Government designations of these laws are RSC b-11 and RSC c-24, respectively.

speaking Canadians spend about 75% of their television time viewing foreign, essentially US, programs."²

In 1974, the Canadian government announced its Accelerated Coverage Plan to help speed the delivery of CBC broadcast services to all communities with five hundred or more residents, no matter how remote. The program was to rely heavily on the Canadian Anik I satellite to beam CBC programs down to translators.³ The project worked well technically, but the programming did not meet with universal satisfaction, especially among native peoples.

The CRTC itself recognized these problems, noting: "The TV programming day is a big putdown to the people of the North."⁴

One way the CBC has chosen to alleviate the problems of programming in the northern reaches of Canada is with the use of their extensive system of translators.

CBC Translators:

The Canadian Radio-television Commission has a policy of encouraging the CBC to help local, native-speaking communities to originate programming on its translators. The most extensive use of translator origination is made on the FM radio band. By June, 1979, there were 67 local FM stations on the air.⁵ There are also three CBC TV translators that are authorized for local origination.

2. CRTC document "Decision: Renewal of the Canadian Broadcasting Corporation's television and radio network licenses," 30 April 1979, p.3.

3. Ibid.

4. Ibid., p. 29.

5. From "Community Radio in Canada," Spring 1979, published by the CBC, English Services Division.

The CBC provides the modulator and the studio-to-transmitter link. They also ensure that those parts of the system will be properly maintained. The communities are required to provide the TV production equipment. All three CBC originating translator operations are strictly non-commercial.

Pond Inlet is a community of about 550 people on Baffin Island in the Northwest Territories. The primary language of the area is Inuktitut. Pond Inlet has a TV and an FM station, both of which use CBC translator facilities. According to the CBC, translator origination on the 10 watt Pond Inlet station accounts for about a half hour per week on the system. The rest of the time the CBC service is broadcast. The tribal council is the sponsor of the local origination activities and it is that group which equipped the studio. The system uses 3/4-inch cassette VTRs and a time base corrector⁶ in order to try to meet the technical standards applicable to full service stations. But the CBC, which actually holds all the licenses for the individual groups, does not have an active plan for the enforcement of the rules. Instead, they prefer to spend their energies trying to make sure that all the stations are kept operational within practical limitations. The requirement for a time base corrector raises the cost of a rudimentary production system substantially. Today, a single camera, single VTR system with a time base corrector and associated monitoring

.3.

6. A time base corrector is a video signal processing device that electronically eliminates many of the technical problems inherent to tapes played on half-inch and 3/4-inch VTRs. Signals from small format VTRs, passed through a time base corrector usually meet DOC (and FCC) standards.

equipment would cost a minimum of \$12,000 (US).⁷

The CBC still views the use of translators for TV origination as experimental and no funds are specifically allocated for this purpose. They do publish a pamphlet entitled "Procedure for Establishing Community Television Program Service Through Access to a CBC Transmitter," attached here as part of appendix 1. The procedure involves six steps: (1) the incorporation of a local society; (2) obtaining a letter of support from the community council; (3) filling out the CBC access form; (4) a visit from a CBC representative; (5) signing an interim letter of agreement with the CBC, which is followed about three months later by; (6) the receipt of a formal letter of agreement for access which is renewable yearly. The CBC appears from the application form to be most concerned that these stations maintain an open policy of access toward the community, stating in the "Broadcasting policy and Restrictions" section:

The community TV programming should show the community to itself. To do this, local TV programs must give the listeners a balanced service of information and entertainment for people of different ages and interests.

Most of the rest of the policies (which take up little more than a typewritten page) are specific steps the CBC feels are necessary to achieve these goals. The CRTC does not require special licenses or waivers for local origination. If the CBC requirements are met,

7. The time base corrector would account for most of this cost, at least \$10,000. The remaining \$2,000 would easily cover the cost of a black and white camera and a home cassette VTR.

the Canadian commission does not become involved.

St. Jerome:

The other Canadian experiments in low-power TV were begun outside the regulatory framework of the CRTC and the DOC. In 1975, the community of St. Jerome, situated about 20 miles northwest of Montreal, began broadcasting locally produced programs on Channel 4 without government authorization. The St. Jerome station used a vacant channel assigned to a Montreal suburb to beam its 100 watt signal to the small industrial city.

The station had applied for a license but had been caught in a jurisdictional dispute between the Provincial and Federal governments. The impetus to establish the station had arisen when the workers at a local textile mill had decided to purchase the factory and operate it themselves. Television was an obvious forum for the discussions of this crucial community issue. With the help of the people from Videograph, a Canadian Film Board project in Montreal, the station was activated while the mill takeover was still in progress.

The original funding for the St. Jerome station came through a grant from Quebec Province.⁸ Perhaps as a harbinger of the outcome of the licensing controversy, the DOC quietly reassigned the Channel 4 frequency to St. Jerome even as the discussions were in progress. After some time, Channel 4 was granted a full license to broadcast. The station is on the air only sporadically, just

8. All information on the St. Jerome experiment was provided by Robert Forget of the Canadian Film Board. Mr. Forget, who was the Director of Videograph in 1974, was one of the initiators of the system.

as it was in the beginning. The residents who operate it consider it to be a community educational television station which only need address itself to local issues as they come up. The station does not supply a regular, outside program service because the town is served by television from Montreal.

The major technical problem encountered by the people who set up the St. Jerome system had to do with the placement of the transmitting antenna, installed on the church steeple in the center of town. Several homes received too strong a signal because of their proximity to the antenna. The community attempted to remedy this situation by the use of a di-pole antenna with a negative gain, thus reducing the effective radiated power of the system. The resulting shrinkage of the service contour did not impair the station's ability to serve the community because the signal still traveled well beyond the borders of the town. People working on the St. Jerome project visited the homes still experiencing overpowering signals and installed attenuators to further reduce the signal strength.

The DOC does not require the station at St. Jerome to have the Canadian equivalent of a first class radio-telephone licensed operator on duty whenever the station is on the air. However, the station has always employed a time base corrector in order to improve the stability of the programs originating on videotape.

Northern Access Network:

Although the St. Jerome station involved protracted negotiations with the CRTC and the DOC, it did not bring about fundamental changes in the Canadian system of broadcast regulation of low-power

television. The rules were stretched here and there and the station's operation was made to fit within existing regulations. No manner of stretching, however, would have accomodated the TV stations of David Brough's Northern Access Network.

"Brough forced the Department's hand," said a DOC official in reference to the licensing of Northern Access Network (NAN) stations.⁹ In fact, the DOC had to create a new category of broadcast service in response to Brough's growing network of one watt stations in remote villages all over northern Canada. The new rules define a service known as "Very Low Power TV,"¹⁰ but Canadians more often call it "flea power broadcasting."

David Brough had learned something about both TV and life in northern Canada long before he installed his first station in Pickle Lake, Ontario. His interest in entertaining children had led him to a job on a Toronto TV station as a musical magician and storyteller. But, knowing that there were vast areas of his country where people had little access to outside entertainment, let alone television, he left the station and took his act on the road to the distant villages of Canada's North.

The absence of television in the region irked him. The Canadian Broadcasting Corporation's Accelerated Coverage Plan had no provision for bringing TV to communities with fewer than 500 people. Even in those places where translators had been installed, he was quickly made aware of the viewers' keen disappointment with the CBC programming service.

9. From an interview by the author of John Davidson of the DOC.

10. DOC document BP-15, 14 October, 1978.

Brough took it on himself to bring TV to the North. In the process of looking for a way to accomplish this, he met I. "Sruki" Switzer, head of a highly respected Canadian broadcast engineering firm. Switzer suggested to Brough that the elements necessary for the assembly of a TV station were cheap and readily at hand. The system Switzer described to Brough was quite similar to the one used in Lanesville, with the exception that Switzer believed the modulator provided with the half-inch and 3/4-inch VTRs would be adequate for use in a low-power station (thus avoiding the more expensive, complex, and potentially more troublesome cable TV modulator used in LTV).

According to an article by Mark Schubin in "Videography" magazine,¹¹ Brough's Pickle Lake station went on the air on December 23, 1976. The studio and transmission facilities were located in the kitchen of Pickle Lake resident Marlin "Spike" Roy. What David Brough had intended to do with this and the other early systems was to devise a means by which small communities could have their own TV stations capable of producing shows on topics of local interest. To augment this service, he decided to provide some tapes of commercial TV programs recorded off-the-air at his home in Toronto.

His programming priorities were soon reversed. When people of remote northern communities learned that they could have the same TV fare as urban dwellers, they demanded that Brough increase the supply of commercial TV tapes. There was little general

11. "Videography," December, 1978.

enthusiasm for local programming after the initial novelty had worn off.

NAN was able to accommodate this demand by a simple but ingenious modification to Beta-format home video cassette recorders.¹² By cleverly outboarding a larger reel of tape, Brough concocted a system to allow these VTRs to record and playback 10 hours of programming at a time.

Each evening, NAN records several hours of commercial television from the US and Canada from a cable TV signal in a suburban Toronto home. Several VTRs record the same programs at once. When the 10 hours on each tape are filled, they are mailed to NAN stations on the first link of a pre-arranged circuit that sees tapes bicycled from one station to the next. When each station along the designated circuit has played the tape, the last station to have it returns the tape to NAN in Toronto where it is re-used. Tapes are constantly in circulation.

The NAN concept proved so popular that as of December, 1979, there were NAN stations in 37 different communities (most of which were broadcasting simultaneously on two or more different channels) with 20 more stations ready to start broadcasting in the immediate

12. Brough figured out a way to outboard 7-inch diameter open reels of Sony, high density, half-inch videotape. This tape is the same size and of the same composition as that used inside the Sony Beta-max cassettes. There is simply more of it on a 7-inch reel. The modification is strictly mechanical, requiring only a few cents worth of parts, most of which are available at any hardware store.

Threading the modified machines was difficult, but Brough reported no complaints by his station managers because tape changes were so infrequent. He has found the machines, and his modifications to them are highly reliable.

future. NAN no longer has to solicit for new communities in which to establish stations. Communities call NAN asking for installations.

Even before the intervention of the Canadian government, Brough offered his service in a manner that demanded community participation and protected the community from being swindled by unscrupulous, outside operators. In each location, he required that a citizens' board be formed to administer the collection and disbursement of funds for the TV station.

A NAN station costs about \$2,000 (Canadian) to install. That price includes the video tape recorder with the 10-hour modification, the transmitter, the antenna, the mast it is mounted on, and a camera and microphone for local productions. These elements combine to form the three criteria Brough laid out for any low-power TV station: (1) it must provide a "viewable" TV picture; (2) it must be reliable; and (3) it must be inexpensive to install and operate.

Many of the communities NAN stations serve are already receiving television via the CBC satellite/translator system. Brough claims that these communities are his best customers. CBC viewers are dissatisfied, he says, with the content of that service even though the picture quality on CBC is superior to that of the VTR originated signals from the competing NAN stations. Brough's programming decisions are made in response to audience demand. He simply mails his station managers the Toronto TV guide and asks them to ask their viewers what they would like to see.

The station managers are selected as much for where they live as for any other qualification. Almost all NAN stations are set up in private homes. Station managers are residents who are willing

to do the job for a fee and who live on the highest ground in town. The elevation of the NAN station/home is important because the antenna height is a crucial factor in determining what distance the signal will travel. The NAN video tape recorder is set up in a convenient room of the house, usually the kitchen. Except for changing the tapes every ten hours, and producing an occasional local program, the stations run unattended. If problems do arise, most systems have at least one back-up VTR.

Station managers are paid \$600 a month for their services. The total overhead for a typical NAN station, including the manager's fee, shipping of tapes and maintenance, is about \$1000 per month. Revenues are derived almost exclusively from subscription and installation fees. The installation fee is charged to cover the costs of setting up the station and varies between \$10 and \$20 per household depending upon the size of the community. Small communities must pay more to cover the fixed capital costs of the station's equipment. The installation fees are collected by the citizens group which solicits the funds from each home in the community. Thereafter, either that group or the station manager collects the monthly subscription fees. Some local businesses do advertise on the stations, but the income is negligible and usually goes directly to the station manager. Another way some stations make money is by running on-the-air bingo games. But bingo, like advertising, does not figure prominently in the revenues of NAN, according to Brough.

The major economic problem faced by NAN stations is enforcement of the subscription payments. Unlike cable TV, which can disconnect a subscriber for failure to pay, NAN has no way to disconnect delinquent

viewers without disrupting service to the entire community.

The way around this dilemma for NAN will be to use encoded transmissions of its signals, so that viewers who want to watch its programs must pay a monthly rate for a decoding box capable of rendering a watchable picture. If his method of encoding, or "scrambling" the picture is successful, Brough feels he will have a stable source of revenue capable of supporting all NAN operations. He plans to offer some un-encoded channels in any scrambled system he installs so that those people who cannot, or will not, pay for the service will still have some TV.

As the number of NAN stations grew, the Canadian Government felt pressured to act. Brough's unlicensed network was in open violation of the rules and it was attracting a great deal of attention. Even worse, the stations were drawing audiences away from the government supported CBC service. So the Department of Communications decided to seize the equipment of the NAN station at Longlac, Ontario. In so doing, the Canadian regulators learned what the FCC had discovered with translators twenty years earlier: that it is no trifling matter for a government to deprive its citizens of a TV service already fulfilling a public need.

The response of the community was swift and resolute. In the words of a CBC television reporter, "The entire Longlac Town Council and twenty other residents beseiged the Department's offices... and for almost a day refused to leave until Mr. Brough's equipment was returned."¹³

13. From a transcript of CBC Inuvik "Sunday Morning" program, 9:30 AM, 22 October 1978.

Chagrined by the political repercussions of the Longlac response, the DOC decided its next step should be to commission a study of the NAN stations. The study was to evaluate the technical operation of the systems and to recommend standards and regulations for a very low-power TV service. The firm the DOC chose to conduct the study was I. Switzer, Engineering, Ltd.--run by the same engineer who had first described the possibility of practical very low-power broadcasting to Brough some two years earlier.

The two parts of the Switzer study and the DOC standards for the Very Low-Power Broadcasting service are included in appendix 1 of this report. Because of the thoroughness of the Switzer study, no further attempt will be made here to describe the technical performance of NAN stations.

The Switzer study concluded that the NAN stations worked quite well. They produced a slightly inferior quality picture to that from the CBC translators serving many of the same communities; but, the content of the programs NAN offered outweighed any purely technical considerations from the audience's standpoint. The study did note the nearly unavoidable problem of all low-power systems that home receiving antennas are often incorrectly installed or do not add enough gain for homes more than two miles from the transmitter to obtain acceptable reception.

The characteristics of the modulator built into the VTR (which is what all NAN stations use) and the amplifier were found to be within the practical limits of what TV sets were designed to receive. Switzer's conclusions that the service was indeed technically acceptable were endorsed by the DOC when it adopted the Very Low

Power Broadcast Regulations.

The CRTC issued licenses to David Brough for NAN transmitters in five different communities in August of 1979. In doing so, the Canadian Commission cited its own earlier statement that, "...new and innovative means must be found to meet the immediate and pressing needs of Canadians to whom basic broadcasting services are not available. For its part, the Commission is prepared to consider exceptional regulatory procedures to facilitate the implementation of extension of service plans."¹⁴

What made the NAN license decision particularly noteworthy was that the licenses granted Brough allowed him to encode the signal of his stations. Thus, NAN was legally entitled to operate one watt stations which broadcast scrambled signals of "free" program services recorded from cable television in Toronto.

The CRTC decision stated that Brough was expected to secure proper rights to the programs he used. But copyright was not made a condition of license. Brough had, in fact, tried to clear the rights to CTV programming he was using on his stations. At first, CTV had refused to reply to his inquiries. Later, the Canadian network threatened to bring suit against NAN to stop the recording and redistribution of their programs. The suit was never brought. Probably the only reason the program owners and suppliers have not acted to enforce the protection of their copyrights is the small size of the audience at stake.

Assuming that no copyright problem is posed in the future, the development of NAN and similar systems depends, in large part, on the success of the scrambled TV service. Brough's projections

14. Decision CRTC 79-531, 22 August 1979, p. 2.

indicate to him that a scrambled signal system could continue to pay a part-time wage to a station manager and be profitable to an outside franchiser, but not if the system has to depend on bicycled tapes. Even if the copyright question remains unresolved in his favor, the logistics and expense of circulating all programming on video tapes are not economically attractive.

Brough plans to switch his stations to TV receive-only earth station systems to obtain programming from the communications satellites. With installation fees covering much of the cost of building such systems and scrambled signals as a means of enforcing subscriber payments, he expects to have NAN act as an equipment distributor and installation consultant. Thus NAN will no longer be faced with the costs, delays and other problems inherent in a far-flung tape distribution system.

Brough's satellite plans raise several major issues for the Canadian government, not the least of which is that NAN may be in direct competition with the government's plan for its own scrambled TV service on the Anik II satellite. But, the history of the Canadian regulators' involvement with commercial very low-power TV is one of response, not initiation.

Brough now plans to increase the power of some of his stations to 10 watts in order to provide better coverage. In every previous instance, he has been able to take such unilateral action because he has carefully cultivated community support for his stations. If he can maintain that support, it is not likely the Canadian Govern-

ment will interfere.¹⁵

Postscript: Syracuse Pirates:

The residents of Syracuse, N. Y. were surprised in April of 1977 to find pornographic movies playing on a previously unused TV channel in their area. For several nights the movies continued. But the channel went off the air before the FCC could locate the transmitter.

The supposition was that the broadcasts had been a college student prank. The reality was that the "Pirate Broadcasters," as the New York Daily News dubbed them in banner headlines, could have been anyone with about \$1,500 to spend on video and TV reception equipment available at most electronics stores. The knowledge needed to go on the air with a TV station of about one watt is little more than the knowledge required to hook up a home TV antenna.

The ability to broadcast a TV signal is now available to anyone who wishes to do so.

15. In January, 1980, the CRTC established a committee to further investigate the extension of service to northern and remote communities. Among the many topics to be addressed by the committee are satellite distribution and pay TV.

A MICRO-TV SERVICE IN THE UNITED STATES

This report has made frequent reference to full service television stations. In order to meet the basic requirements for licensing (and triennial renewal) by the FCC, each of these conventional stations must operate a studio for origination¹; they must have a licensed technical staff; and they have to meet such regulatory requirements as the maintenance of technical and program logs and a public file.

Licensed full service stations are authorized to operate at powers of up to 316 kilowatts on VHF and 5 megawatts on UHF. While they are permitted to operate at power as low as 100 watts, in practice, most stations transmit at comparatively high powers. In contrast, very low-power, low-power, and translator TV systems operate at power levels of between 0.85 watts and 1,000 watts (1 kilowatt).

There are actually two different measurements of a transmission system's power, be it low-power or full service. The first measurement is the manufacturer's rated output power. This rating is useful for comparing one transmitter to the next, but it is not necessarily an accurate reflection of the area the transmitter is capable of covering. Thus, a second measurement, known as Effective Radiated Power (ERP) is useful. ERP takes into account all the elements of a transmission system including the efficiency of the antenna. Because transmitter systems are tailored to conditions in the community to be served, transmitters of the same rated

1. Except for full power re-broadcast facilities called satellite stations.

output power will have different ERP's in different communities.

This report uses the manufacturer's rated output (except where otherwise noted) as the standard measure of power because it represents an easy basis for comparison. This measurement is also the one the Commission uses in its rules for translator applications.

Compared to full service stations, all the facilities described thus far can be described as low-power, although their areas of coverage and technical sophistication differ radically. Because of these differences, the label "low-power" requires further refinement; and so, the remaining sections of this report will concentrate on only the lowest power facilities, referred to as Micro-TV.

In broadest possible terms, a Micro-TV station can be defined as a television broadcast facility operating at a maximum transmitter power of one watt VHF or ten watts UHF and designed to serve a specific community with provision for local origination as well as outside program services. The regulation of this service can be limited primarily to a realistic protection of other broadcast services from TV interference arising from the operation of a Micro-TV station.

The licensing procedures, the equipment acceptable for Micro-TV service, and the manner in which stations might support themselves add meaning and detail to this definition. It must be kept in mind, however, that the Micro-TV service proposed in this report is simply one that is technically and economically practical. The legal basis for the authorization of such a service is a matter that

must be decided by the Commission and the courts.

Licenses

The first question that must be addressed is licensing. How, and to what extent, should Micro-TV stations be regulated?

The application procedure for a full service station would undoubtedly prove too complex and costly for the prospective operator of a Micro-TV station to complete. The technical and financial requirements for full service stations are not easily met by the resources of small communities.

At the other extreme of regulation is the possibility that the Commission should relinquish all control over such stations, allowing them to operate in a totally unlicensed fashion. Neither the full service station application procedure nor the unregulated approach would be in the public interest. Rather, it appears that a limited monitoring of this service would help to encourage its growth while limiting the potential for harmful interference. This concept of minimal but essential regulation is embodied in the Canadian Department of Communications application procedure for establishing a very low-power TV station.

In the Canadian form, applicants are required to supply their names, addresses and telephone numbers along with those of anyone else responsible for the station when it is on the air. Applicants are also required to supply the make and model number of all equipment to be used in the station. The name and location of the community to be served and a map showing the location of the antenna and indicating its height must be supplied. The applicant is also asked to list the type of program feed the station will transmit.

Finally, the applicant must sign a statement acknowledging his familiarity with the Very Low Power TV (Micro-TV) rules.

In keeping with this approach, US licensing procedures for Micro-TV stations might require the same information, including a statement that the applicant acknowledges his responsibility to correct any interference with other broadcast services or go off the air. He should also acknowledge his secondary status as a claimant to any already assigned frequency in his community.

If these conditions are met, the operating realities of a one watt VHF/ten watt UHF service might well dictate that no further licensing or construction permit procedures be required. The Commission staff could be empowered to routinely approve signed, witnessed applications which fit these general guidelines.

This is obviously a radical departure from standard licensing policies and procedures. For a justification of this major change, it is necessary to consider how the technical and financial implications of this new service might affect the existing world of television, and what benefits this approach might have for the public.

Micro-TV Transmitter Power:

The specific limits set on transmitter power will play a major role in determining frequency allocations, station separations, operator requirements and equipment performance standards of the Micro-TV service. The power of a station will also help determine who can afford to build and operate one and even, to some extent, what types of programming services that station will carry.

This report envisions the Micro-TV service to be authorized at transmitter powers of one watt on VHF frequencies (channels

2-13) and ten watts on UHF frequencies (channels 14-69). The difference in power levels is accounted for by the disparity between the distances VHF and UHF signals will travel at a given power level. UHF signals don't go as far as effeciently as VHF signals.² And, because it is likely that all Micro-TV stations will operate at maximum power, some of the disadvantages of UHF can be overcome by an increase in power at UHF frequencies, just as is permitted for full service facilities.

A rationale for the specific power differences can be found by comparing the results of two separate studies on low-power TV. Part of the Switzer report on NAN prepared for the Canadian Department of Communications contains estimates of distance the (approximately) one watt signals from NAN transmitters traveled. Low band VHF signals from a directional antenna travel about two and a half miles (4.0 km).³

In a report prepared for the Corporation for Public Broadcasting entitled "Public Television Service in Rural America," rough coverage contour estimates are presented in vector form.⁴

2. For a full discussion of VHF vs. UHF systems, see "A Quantitative Comparison of the Relative Performance of VHF and UHF Broadcast Systems," prepared by the Corporation for Public Broadcasting, 1974.

3. "A Study of Very Low Power TV and FM Transmitters for Remote Communities," prepared for the Canadian Department of Communication by Switzer Engineering Services, Ltd. A copy of this study is attached as part of appendix 1 of this report.

4. "Public Television Service in Rural America," prepared for the CPB by the Public Service Satellite Consortium. A copy of the predicted contour map for a ten watt UHF station is attached as part of appendix 3 of this report.

For a ten watt UHF transmitter (with an Estimated Radiated Power of 60W) the farthest distance the signal is estimated to carry is 2.6 miles, or roughly the same distance as the signal from a one watt VHF transmitter. It must be emphasized that the two studies are not exactly equivalent. Nevertheless, the two sets of data indicate that the use of higher power UHF transmitters would result in comparable services between the two bands.

There is no "average community" for which power levels can be set and then applied uniformly across the country. Other criteria must be found, therefore, to set the arbitrary upper power limits for Micro-TV. One determining factor is the equipment now available that would be suitable for use in Micro-TV service.

David Brough says that his one watt NAN stations cover "85% of the town" in any given community, depending on the location and height of the antenna. He claims that most communities NAN serves are satisfied with the coverage his stations provide. (However, Brough is planning to increase the power of a few of his transmitters to 10W to improve coverage in certain communities).

The Micro-TV service is envisioned by this report as operating within extremely relaxed regulations and standards. This concept, where applied to operators, would be an extension of the 1960 and 1976 Amendments to the Communications Act which allowed for the unattended operation of translators, even those which originate limited messages.⁵ An outgrowth of this approach is the assumption

5. Public Law 94-335, pertaining to Section 318 of the Communications Act. The wording of the section was changed so that unattended operation of a translator would be permitted even if the translator were originating some programming. With the change, translators are permitted unattended operation if they are, "engaged primarily in the function of rebroadcasting the signals of broadcast stations..." (emphasis added).

that the operators of Micro-TV stations will not likely be trained as engineers and that the less adjustment and routine maintenance they are required to do on their transmitter systems, the better off everyone will be. Random fiddling with the equipment by untrained hands holds the potential for disastrous results in the form of poor reception and harmful interference.

One way to avoid the need for constant adjustment is to use solid state equipment. Many solid state translators work for years without need of major realignment. But, current technology does set limits. As this report was written, commercially available, solid state transmitters with output powers of greater than ten watts were just being introduced. Above 100 watts output power, all current UHF transmitters employ vacuum tubes (as do most currently available 100 watt UHF devices). Tube-type equipment requires far more frequent maintenance and routine adjustment, which should only be done by qualified personnel. One watt, solid state VHF transmitters (as well as those of higher powers) are also commercially available at this time.

Transmitter technology will obviously continue to advance in the direction of solid state devices of greater and greater power. In the final analysis, therefore, the limits on the power employed in the Micro-TV service must be derived from a compromise between the desired coverage of the service and the equipment

available to implement it. If the rough equivalence of one watt VHF and ten watt UHF transmitters is accepted, along with the desirability of using highly reliable solid state equipment requiring the absolute minimum of operator attendance, then the limits on transmitter power in a Micro-TV service should be predicated on the presumed ability of the powers chosen to cover small communities effectively. In this regard, the practical experiences of Lanesville TV and the Northern Access Network indicate that the one watt/ten watt powers do indeed represent a good compromise between available technology and desired service.

Spectrum Availability and TV Interference:

In order for Lanesville TV to have gone through the procedure for obtaining a broadcast license, Media Bus would first have had to check to see whether Lanesville had been allocated a TV frequency on the FCC table of assignments (it had not). In the absence of an assigned frequency which was available, Media Bus would have to have gone through the expensive and time-consuming process of determining if another frequency was available. The organization would have to have proved to the Commission that the channel for LTV was far enough away from other stations on the same or adjacent channels to meet all of the Commission's minimum mileage separation criteria.

This procedure, while appropriate for full service facilities, does not seem warranted for the Micro-TV service in light of the proposed limits on transmitter power. The one watt VHF-ten watt UHF limits would restrict the coverage areas of these stations to demonstrable boundaries. With UHF frequencies, this assertion is clearly the case because of the sharp drop-off in signal strength at the fringe of the predicted coverage contour. The Lanesville TV experiment,

which operated on a VHF frequency at a transmitter power of approximately 1W, seldom exceeded the predicted boundaries of its desired coverage area as determined by practical measurement in the field.

Another approach to the frequency allocation problem might be for the Commission to state that any frequency is available for use in the Micro-TV service as long as the Micro-TV station is located outside of the Grade B service contour of a full service TV station and not on the same channel as a locally licensed translator or low-power TV station. Micro-TV operators would then be free to choose whatever frequency they wanted to use within the above-stated restrictions. The result of such a policy would be to make a great number of channels available to the Micro-TV service. It would also relieve the Commission of the long and difficult task of preparing a new table of assignments for the Micro-TV service.

One translator manufacturer, Acrodyne, stated that it was opposed to any use of VHF transmitters in a Micro-TV service. Personal experience with translators, the signals from which traveled as much as ten times farther than predicted, was cited as the reason for the opposition to VHF. This phenomenon, caused by atmospheric and topographical conditions, has long been known as a property of VHF signals. The president of EMCEE, another translator maker, also voiced some reservations about VHF transmitters for much the same reasons.

There is no question that some element of unpredictability exists with VHF transmissions. What must be addressed is the severity of those problems at transmitter powers of one watt and what the relative advantages of including VHF in the Micro-TV service would

be.

The Switzer engineers developed a table of separations for Micro-TV (Very Low-Power TV) stations in Canada. The separations were indicated not only between Micro-TV stations, but also between Micro-TV and 100 watt TV stations, and between Micro-TV and full service stations.

Because the propagation assumptions in this study were very conservative, they could be used as a safe guide to domestic United States authorizations, given the similarity in TV broadcast environments in this country and Canada for comparable facilities.

TABLE 1

<u>Type of Interference</u>	<u>Separation Between Stations (in km)</u>		
	<u>VLPT to VLPT</u>	<u>VLPT to LPS</u>	<u>VLPT to MFS</u>
Ch 2 - 6 Co-channel	96	109	180
Ch 7 - 13 Co-channel	118	128	196
Ch 2 - 6 Upper Adjacent	19	32	103
Ch 7 - 13 Adjacent	14	24	92

Assumed Operating Parameters:

- VLPT - Very Low-Power Transmitter based on a transmitter output of 1 watt and an antenna gain of 15dBi at 30m EHAAT.
- LPS - Low-Power Station based on an ERP of 100 watts at 100m EHAAT.
- MFS - Maximum Facility Station based on an ERP of 100 KW on Ch 2 - 6 or 325 KW on Ch 7 - 13 at 300m EHAAT.

UHF Television:

The separations in the following table are based on those of appendix B, BP22 (Zone II). The co-channel desired to undesired ratios at the Grade B contour (+65 dbu) of the Maximum Power Stations

(MPS) and Low-Power Stations (LPS) are maintained, but with VLPT parameters substituted for LPS. An additional 16dB margin has been added to account for the probable absence of frequency-offset in VLPT's. The separation between to VLPT's is based on a ratio of 43dB. This ratio has been derived from BP22 requirements for the separation between two LPS's. Adjacent channel separation have been calculated as for VHF with similar considerations in the case of double side band operations. The remainder of the table is taken from Appendix B, BP22, substituting VLPT for LPS.

TABLE 2

	<u>Separation Between Stations</u> <u>(in km)</u>		
	<u>VLPT to VLPT</u>	<u>VLPT to LPS</u>	<u>VLPT to MFS</u>
Co-channel	35	60	134
1st Adjacent	8	30	74
+2, +3, +4, +5, +8 Adjacent		6	32
+7 Adjacent		50	95
+14 Adjacent		32	45
+15 Adjacent		35	69

Assumed Operating Parameters:

- VLPT - Very Low-Power Transmitter based on a transmitter output power of 1 watt and an antenna gain of 15 dBi at 30m EHAAT.
- LPS - Low-Power Station based on an ERP of 10 KW at 100m EHAAT.
- MFS - Maximum Facility Station based on an ERP of 1 megawatt at 300m EHAAT.

The philosophy that led to these figures is expressed by Switzer at the beginning of the section on TV interference:

It is envisioned that (Micro-TV) stations would operate on an unprotected, non-interfering basis, i.e., they would not cause interference to any existing allocated broadcasting service, nor would they receive protection from any other service except another (Micro-TV station).⁶

The important point here is that Micro-TV stations would be required to correct interference with other services immediately or go off the air. As a practical matter, disputes between Micro-TV stations could most likely be settled between the stations involved, with questions of channel allocation ultimately resolved on a first-come-first-serve basis. The minimum mileage separations could serve as a guide to frequency selection and as a final arbiter of co-channel disputes. It need not be regarded as immutable in the face of demonstrated isolation of Micro-TV stations closer together than the table recommends.

This approach to frequency separation should, in theory, make even more channels available for use in the Micro-TV service. Only practical, not a priori, limits would exist on channels available outside the Grade B contours of full service stations.

The experience of NAN and Lanesville TV indicate that this open approach is workable. One watt VHF signals do not travel more than a few miles regardless of atmospheric conditions. The Switzer separations appear to be extremely conservative.

Another problem with VHF transmissions is that they are highly

6: "A Study of Very Low Power TV and FM Transmitters for Remote Communities," Switzer Engineering Services, Ltd., April, 1978.

susceptible to electrical interference from such sources as car ignitions. Both Lanesville TV and NAN experienced some problem with this type of interference on their low band VHF Channels 2-6.

Considerations in favor of VHF, as well as UHF, authorizations for Micro-TV service are the superior effectiveness of VHF signals in covering rough terrain and the lower costs of purchasing a VHF transmitter. VHF signals are far better at covering rugged areas because they can penetrate where UHF signals cannot. Also, VHF receiving antennas are much more efficient in "capturing" the broadcast signal.

Furthermore, using Acrodyne costs as a guideline for Micro-TV transmitters, a 10W UHF transmitter would cost almost 30% more than its 1W VHF counterpart (\$7,150 and \$5,150, respectively). Added to this cost differential is the traditional handicap of UHF-- lack of knowledge among many viewers about how to properly receive UHF signals. In many rural areas like Lanesville, some TV sets are so old they do not have UHF tuners, while others have poorly designed ones.

Both UHF and VHF frequencies have inherent problems. But neither set of frequencies presents problems so intractable as to preclude its use in the Micro-TV service. The goal of Micro-TV is to provide a method by which the TV watching public can be better served. The conclusion, therefore, is that it will take both VHF and UHF channels to achieve that goal.

Antennas and HAAT:

The location of the antenna tower for any Micro-TV station and the height above average terrain (HAAT) at which it sits will

be determined as much by the type of programming service the station carries as by the community's topography. In systems that are fulfilling the traditional translator function of re-broadcasting the signal from distant full service stations, and interrupting that service for local origination, the transmitting antenna will most likely be erected next to the antenna, which is sited for the best possible reception of the incoming program service. Other Micro-TV stations might receive their program feeds via microwave links or from satellite earth stations built especially for the Micro-TV facility. These systems would also be most efficiently operated if both reception and transmission antennas and facilities were constructed on the same site.

Still other stations might rely on a combination of video taped programs and local origination in much the way that stations of NAN now function. These stations, as explained earlier, are located in private homes near the highest elevation in the community in contrast to translators, which are often located on a more remote site, such as mountainsides.

No matter where the antenna is located, the cost of the tower is likely to be the limiting factor on HAAT. The type of tower that many NAN stations use, for instance, is a 50-foot, telescoping mast designed to support a home receiving antenna. This type of mast is expected to be the type commonly used in the Micro-TV service. Masts of greater length are available, but the costs escalate rapidly with increases in height. There is also the added problem of professional help necessary to install extremely high masts. The service contour of Micro-TV stations has always been

determined by experimentation within the community. Because this situation is likely to persist, it is equally likely that the shortest possible mast requiring the least amount of effort to install will continue to limit the height of the antenna.

This leads to the recommendation that for masts of less than 50 feet, there be no requirements for HAAT other than applicable FAA regulations.

The choice of the antenna to be used in any Micro-TV facility should be left up to the operator of that station. Under many rural conditions, as was true in Lanesville, the use of a directional antenna is desirable. In some of the communities served by NAN, the station is located in the center of town, requiring the use of an omni-directional antenna. Just as with antenna height, experimentation and the layout of the community will determine the most suitable type of antenna.

Program Feeds:

Micro-TV stations should be allowed to re-transmit signals received from satellite transmissions and licensed microwave relay links, or any other suitable source as is now allowable for translators. A practical method of receiving outside programming will be absolutely essential to the economic viability of many Micro-TV stations. In keeping with the translator rules, there is no technical reason to require that a Micro-TV station be attended by an operator when these feeds are being re-broadcast.

Another type of microwave system that may prove desirable for the Micro-TV systems is a transmission link between a community studio and a far less accessible transmitter site. A low-power microwave transmitter at the studio could beam programs to the

transmitter when local origination was to begin. The activation of this microwave system would automatically switch the transmitter over to the local signal, and temporarily cut off the outside programming service. This type of microwave system is simple enough to be operated by the non-engineers expected to be involved with Micro-TV stations. The cost of this kind of microwave link would be in line with the cost of the other components of a Micro-TV station. Microwave studio-to-transmitter links would allow systems to be built that could take advantage of antennas located on high ground while still maintaining maximum flexibility for the presentation of locally originated programming.

Encoded Signals:

One way Micro-TV stations will be able to support themselves is through the broadcast of encoded signals. Viewers who wish to watch the encoded channels must obtain a decoding device for an installation charge and a monthly fee. Without the decoder, the television signal is untelligible. Because there will be only a limited number of other revenue producing options, none of them presently as promising as encoded signals, this method will undoubtedly attract the greatest interest among prospective Micro-TV station operators.

Several systems now exist for encoding and decoding television broadcasts. Others will probably be developed in the near future. The primary concern for the Commission is that these systems deliver a signal to the viewer that is not distorted by the interjection of the encoder/decoder combination. Micro-TV stations should be allowed to use whatever encoding system they choose so long as the picture at the output of all decoders is the same as it would be if the

encoding system were not in use and the same program were being broadcast "free". Obviously, this is a standard easily verified in the field.

Technical Standards:

The Switzer report on the technical acceptability of the Northern Access Network stations recommended that Very Low Power Television (VLPT) stations be allowed to operate within extremely relaxed technical standards. Specifically, the report stated the view that home videocassette recorders be allowed for use not only as the VLPT station signal source, but also as the modulator for the station's transmitter. While the report admitted that these machines and their built-in modulators were not capable of meeting all current Department of Communications technical standards, it had the following to say about the effect of lowering those requirements:

"We believe that quality in VLPT's will be..... self regulating. VLPT licencees will offer their communities what they can afford and what they think their audiences will accept in the local circumstances. This view.....is borne out by our examination of several of the unauthorized VLPT's in present operation. They work!" (Switzer's Emphasis)

It is important to note that Canadian technical standards for full service TV stations are essentially identical to those for similar stations in the U.S.

The Switzer report does not recommend a complete abjuration of federal regulatory control over very low power stations. What

it does recommend is a limited set of standards designed to keep the potential for harmful interference from Micro-TV stations at a minimum. Because the modulators in the home video recorders are solid state devices with no external adjustments, the burden of the Canadian regulations falls on the companies that make them and not on the station operators.

This approach also represents a significant reduction in cost to the station operator. Whereas the home video recorders including modulators cost between \$750 and \$1,200, the next level of modulator, those designed primarily for cable TV local origination applications, cost in the range of \$3,000 (which does not include the VTR). They are more stable and, from a purely technical perspective, offer less chance for creating interference. They do require monitoring and adjustment which is not something for which the operators of Micro-TV stations are likely to be trained. Thus, the very sophistication of these devices may limit their application in a Micro-TV service. The lowest cost modulators normally found in licensed broadcast transmitters in this country begin at about

7. Ibid.

\$19,000.⁸

The institution of a Micro-TV service in the US patterned after Canada's VLPT would make available large numbers of previously unusable channels. The use of these channels for Micro-TV holds the potential of bringing television to communities where adequate reception is not possible now. But, one of the reasons some communities are presently underserved is that they do not possess the financial resources to avail themselves of traditional television options (cable TV, translators, and full service stations). Without drastically relaxed technical standards along the lines of those for VLPT in Canada, new channels would be available but the communities who stand to benefit most from Micro-TV would not be able to afford to set up a station. The cost of meeting current FCC signal stability and monitoring standards is far in excess of the cost of an entire minimal Micro-TV facility.⁹

The Switzer study determined that relaxed Canadian standards for VLPT did not, of themselves, represent a reduction of services to Canadian viewers. This report foresees that the same could be true here, if only the potentially interference-causing elements of Micro-TV stations (the modulators and amplifiers) were regulated. This approach, applied to a Micro-TV service in the US, would significantly lower the cost of building and operating a Micro-TV station and, therefore, would stimulate its more widespread use.

8. The modulator most often used by the manufacturers contacted during the preparation of this report was made by the Philips Corporation and cost about \$19,000.

9. A wave form monitor sensitive enough to meet FCC monitoring requirements costs at least \$3,000. A time base corrector, necessary for most low cost VTRs to meet broadcast standards, costs at least \$10,000.

Financing and Programming:

The methods by which Micro-TV stations might support themselves and the sources from which they will draw their programs must be seen within the context of existing television services. Full service stations rely on a variety of sources for their programming. Network affiliates (including those stations affiliated with the Public Broadcasting Service) receive several hours per day of programming from the network. The rest of each station's programming is either purchased from non-network program suppliers or produced by the station's own staff. Independent stations rely solely on these last two options. Translators, as explained earlier, simply re-broadcast the signals of full service stations.

It is doubtful that existing full service stations, whether commercial or public, can serve as instructive models after which Micro-TV stations could be patterned. The three major commercial television networks, in their comments in the low-power television proceeding, stated that they could see no reason for the establishment of a low-power TV service.¹⁰ Their comments imply that they would not look favorably on an application by a Micro-TV station for network affiliation, even if the operator were willing to pay for programming link. Furthermore, it would be beyond the means of Micro-TV stations to purchase commercially dis-

10. "Summary of the Comments in the Inquiry into the Future Role of Low-Power Television Broadcasting..." etc., Docket No. 78-253. Specifically, the summaries of the comments by the National Broadcasting Company, p. 27, "In sum, NBC feels that Commission action regarding low-power broadcasting is not necessary to promote diversity in either urban or rural areas;" and, CBS, Inc. "...does not support the desire to achieve greater diversity of programming by means of the establishment of a low-power program-originating service."

tibuted TV programs on the program syndication market.

On the other hand, no one with any experience in low-power TV suggests that Micro-TV stations could produce all of their own programming. Full service stations certainly cannot claim that distinction. Even Lanesville TV, which presented mostly original material, relied on many outside sources in order to meet its once-a-week schedule. Because of this, special approaches to Micro-TV programming, perhaps combinations of outside and locally originated material will be necessary to allow the Micro-TV service to develop. At this point, then, it is necessary to consider what methods Micro-TV stations will use to support themselves in order to understand just what programming options are available.

The Corporation for Public Broadcasting (CPB) is definitely interested in fostering the development of low-power TV stations as its comments and reply comments in the low-power television proceedings indicated. CPB has taken the further step of encouraging the PSSC to file applications for 12 Mini-TV stations in Montana and Wyoming based on the recommendations of the PSSC report.¹¹

Another funding source the PSSC study recommends is the use of local taxes. This type of "coercive tax" is presently used in parts of Montana to support translators. Because of a per-capita tax

11. This information came from a conversation with Philip Rubin of CPB, conducted during the preparation of this report, October 30, 1979.

ceiling, this method is not always adequate to cover all the costs of translator systems. This report does not advocate the direct application of such tax money to the operation of Micro-TV stations.

It is fair to assume that if funds to build the "Mini-transmitter" or Micro-TV stations envisioned in the PSSC report could be secured, the operating costs would be low enough for many small communities to support them on a voluntary contribution basis. This would not account for any locally produced programs nor would it necessarily encompass damage to equipment due to unforeseen technical catastrophes.

Public television is a special case. Institutional support in the form of grants and subsidies may well be available to enable this service to reach much more of the rural United States than is presently covered. This does not solve the problems of areas where commercial TV services are inadequate--where reception is poor because of terrain, geographical isolation and TV interference.

Recently, the National Telecommunications Information Administration (NTIA) studied the possibility of creating a federal loan program with a structure similar to that of the Rural Electrification Administration. The NTIA proposed that low cost loans be made available to private companies for the construction of facilities designed to bring commercial TV services to rural communities. The study listed several methods of delivering these services and concluded that the development of independent cable TV systems

was the best option.¹²

Because of the emphasis of this proposal on cable TV, it is not clear whether these low cost loans would be available to Micro-TV station operators. In any case, no further action had been taken on the proposal at the time this report was written.

The financial barrier to entry into the Micro-TV service with a minimal facility (similar to a NAN station) is extremely low. But, for commercial stations without recourse to grants and subsidies the operating costs may be relatively high. Advertising by local merchants, as indicated by the experience of the NAN would not be able to support a Micro-TV station in a rural community. The alternate method previously used by NAN was a monthly subscription fee. But because the payment of this fee is left to the discretion of the viewer, the income from this method can be undependable and hard to collect.

Perhaps the most economically attractive solution to the Micro-TV money problem lies in the transmission of encoded signals at standard TV frequencies. As explained earlier, this system provides the operator with a sure way to collect a monthly fee for his programming. Encoded systems are presently used by some full service stations, but there is nothing inherent in the technology necessary to implement them that precludes their use in a Micro-TV service.

One manufacturer of encoding and decoding equipment is Blonder-Tongue Laboratories. In its comments to the Commission, Blonder-

12. Letter of 14 September 1978 from Henry Geller, Assistant Secretary for Communications and Information, Department of Commerce, and Alex P. Mercure, Assistant Secretary for Rural Development, Department of Agriculture, submitted as appendix "D" of NTIA comments on Docket No. 78-253.

Tongue outlined a plan for an encoded low-power system.¹³ The Blonder-Tongue scheme involves a series of adjacent UHF channels, all broadcast to the same community through the same amplifier and antenna. Any, or all, of the channels might be encoded. The choice of what channels to encode and at what hours of the day would be left to the discretion of the station operator. Blonder-Tongue refers to this plan as "cable over the air" because it supplies essentially the same service as cable TV, without the necessity of stringing wires.

Blonder-Tongue claims that the cost of this system would be comparable to that of a cable TV headend facility.¹⁴ The company goes on to state that this type of multiple channel system could be profitable enough to support a local entrepreneur in a community of 500 or more households. For smaller communities, this type of multiple channel subscription service could be operated by someone as a part-time job. No attempt has been made in this report to verify the figures presented in the Blonder-Tongue plan.

Encoded, subscription TV systems are currently permitted only in communities that are already served by at least four full service stations--the so-called "complement of four" rule.¹⁵ It appears that this requirement could be met by a Blonder-Tongue-type system which brought in four distant stations and re-transmitted them unaltered along with one or more scrambled signals.

13. Comments of Blonder-Tongue Laboratories, Inc., On Docket No. 78-253.

14. No attempt has been made to verify the Blonder-Tongue figures. It was assumed that there was some rational basis for them given the fact that Blonder-Tongue is a major manufacturer of cable TV equipment.

15. FCC Rules and Regulations, Section 73.642(a)(3).

Even if the rules were satisfied by such a system, there is the distinct possibility that the reception of four distant signals (other than the signal to be encoded) might not be within the means of a Micro-TV station. But, a single channel Micro-TV station fed, perhaps, from a TVRO satellite link might well be affordable in the same community. The Commission is then faced with the choice of relaxing the "complement of four" rule or of denying a TV service to an inadequately served community on the rather anomolous grounds that the community has already been denied service from other sources.

The recommendation of this report is that the Commission relax the "complement of four" rule and authorize Micro-TV stations to broadcast scrambled signals wherever and whenever they want. Though it is clearly beyond the scope of this report, it is hard to imagine that the relaxation of restrictions on encoded TV signals would not be equally applicable to other low-power services such as Mini-TV and translators.

If the Commission authorized Micro-TV stations to encode their transmissions, they stand a far better chance of being able to afford quality program services. It will then be up to the individual Micro-TV operators to choose their stations' program mix from among the variety of entertainment, sports, information and experimental program suppliers.

Further Regulatory Considerations:

The Micro-TV regulations proposed in this report were designed to anticipate many of the troublesome issues that surface in connection with any broadcast service. Obviously some questions cannot be resolved in advance of the implementation of the service. The

following paragraphs represent an effort to address briefly several issues which are likely to arise if Micro-TV stations are authorized. Many are issues that do not pertain only to Micro-TV; however, the recommendations for the resolution of each issue keep in mind the overall design presented in this report for a Micro-TV service in the US.

There is reason to suspect that some operators might try to use a large number of channels in a single community in order to exclude competitors. The Commission might want to consider a regulation aimed at preventing such "spectrum greed." A limit should be set on the number of channels (or the percentage of channels available) any individual Micro-TV operator may use in a single community.

The Commission currently prohibits the cross-ownership of cable TV and broadcast facilities in the same community.¹⁶ The intent of this restriction is to prohibit monopolies of TV services. In some rural communities, however, it may also restrict the delivery of TV services. If it can be clearly demonstrated that a local cable operator is the only person willing and able to extend service to a rural area via a Micro-TV station, the cable operator should be granted a license to operate a station.

Another possibility for the involvement of cable TV and Micro-TV facilities is a situation in which the operator of a Micro-TV station would lease the signal from cable TV just as if he were a "super subscriber" on the cable. This arrangement is foreseeable when the cable operator is unable to profitably extend service to

16. Section 76.501 of FCC Rules and Regulations.

lower population density areas and the Micro-TV station operator is unable to afford to build an extensive receiving system which essentially duplicates the headend facility of the cable system. The execution of agreements between cable TV and Micro-TV operators should be left up to the parties involved, with the possible intervention of the local franchising authority. There appears to be no need for federal regulation in this area.

Besides over-the-air reception, microwave links, and satellite-fed TVRO systems, there is also the likelihood that Micro-TV stations may receive and transmit their programming primarily on video tape (and, in the near future, on video disc). Regardless of the method by which programs are received, and no matter what programming services are used, copyright agreements should be entered into between the station operators and their program suppliers, subject only to existing law and not to FCC guidelines for program carriage.

The length of time a Micro-TV station is on the air in any given day, week or month, should be determined by the station operator. The determination of the minimum hours of operation would be best left up to the market the station serves and the resources of the operator.

The Commission might want to draft a set of staff guidelines for the speedy resolution of Micro-TV disputes. It is anticipated that most questions and complaints can be handled expeditiously by an impartial explanation of rules, regulations and standards. Hearings before a Commission Administrative Law Judge and recourse to the courts would provide Micro-TV operators with the

same array of methods for the settlement of disputes as are available to full service stations and, as is true with full service stations, these methods would come into play only in rare instances, given the large number of stations. It is worth reiterating, however, that most problems can, and probably will be, resolved within the community. The ultimate redress for people dissatisfied with their Micro-TV service is, of course, for them to set up their own station.