unintentionally, cause interference to the public's reception of the signals of a third and fourth broadcaster. High technical quality has always been a hallmark of over-the-air broadcasting. It needs to remain so, with whatever wonderful enhancements, in service and quality, that can be added -- but not at the cost of the technical integrity of the basic service.

Whether it be "flexible use" of augmented broadcast spectrum or privately negotiated giving and receiving of interference (as to the use of non-NTSC ATV formats or to ATV operation contrary to the UHF taboos), the proposals are just too risky to basic technical integrity needed for this nation's television service. We cannot risk any degradation in service, whether expected or unexpected. Much less can we risk the chaos and cacophony that can come from unmanaged spectrum and from unadhered-to or carelessly-implemented agreements among private parties.

Two, NAB fears that "flexible" use could result in less spectrum, and therefore less coverage, for broadcast television. The trading-away of added spectrum or of interference protection well could result in a "permanent" reduction in stations' coverage areas, and, if extended, in the number of stations. So, too, could it compromise the ability of future owners to offer advanced television service because of prior long-term contractual "leasing" of spectrum that a new owner needs to provide ATV. Marketplace principles may not protect the public interest in the provision of "free" television service when that service is pitted against an entirely different market demand for non-broadcast services. As we have pointed out previously,[34] situations well may arise where it will be in the licensee's financial interest to lease its channel, or part of its service area, to other radio services even though there is a public need or demand for the established video programming. And, as we have also said, once a broadcast channel (or pieces of a channel) falls under the control of non-broadcasters, whether by leasing arrangements or otherwise, it might not be possible to rededicate that spectrum to broadcasting in the future, no matter how great the demand for new video service or enhancements. This would be especially so if a 6 MHz television channel were subdivided and occupied by several non-television users, as the process of reassembling a 6 MHz block for television service might not be possible. Situations will arise when a new television operator can't "outbid", for example, a single private land mobile operator and thus just can't reel in all the pieces of a dispersed channel, at whatever price.

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[34] Id.

And, as to high definition or "advanced" television service specifically, NAB is concerned that a "flexible" system that essentially allows HDTV or ATV use to be outbid by, say, a land mobile delivery service, works against a nation-wide implementation of ATV. Such a system would make a major industry transition more, rather than less, difficult -- and less sure. What might be intended to facilitate a local exigency could stymie a national objective.

NAB renews as well its previously made points about the questionable legal authority for these proposals as well as their potential impact on the renewal process. Under the Communications Act of 1934, the FCC has the obligation to allocate spectrum.[35] Flexible use and negotiated interference would seem to eviscerate the Commission's role and responsibilities in fulfilling that obligation and thus would be of questionable authority under the Act.

NAB remains troubled by the questions or uncertainties an extension of flexible use, as proposed in Gen. Docket 85-172 (of UHF-land mobile sharing), will bring to the renewal process. As we have said before, while the flexible allocation proposal offers a theoretical way to compare apples and oranges (i.e., service as a broadcaster verses service as common carrier), we are concerned that the process in practice would undermine the expectancies and certainties of the current renewal situation.

While NAB has here voiced its very serious opposition to the idea of flexible use, we also note the point sure to be made by other commentators less sure of their ultimate feelings about flexible use. At the least, these "flexible" proposals and any specific discussion of squeezing or sharing or trading of spectrum or interference is very premature. No one yet knows, and can't know, what interference protection criteria, or spectrum, will be required for any of the ATV systems presently under development. Those specifications are what will be determined in the coming months of technical evaluation and testing, along with the issues of what works, how well, at what costs, at what benefits. It is just too early to talk about agreements, private or otherwise, on implementation.

XI. CONCLUSION

NAB has here presented a full discussion of the challenges and tasks which face the industry and the Commission in making HDTV a reality for the entire American

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[35] See 47 U.S.C. 303 (b)(c)

viewing public. Other commenters will present and emphasize particular aspects of this monumental endeavor. NAB and the television broadcast indutry stand ready to meet these challenges, difficult as they will be. And we remain convinced that the results presented to the American people, an entirely new viewing experience, will be well worth the effort.

Respectfully submitted,

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November 18, 1987

National Association of Broadcasters

HIGH DEFINITION TELEVISION TASK FORCE

In January of 1987, the NAB Television Board established a special Task Force to advise on what is needed to assure that broadcasters will be able to compete technically with advanced television systems. The Task Force is specifically,

> "charged with the responsibility of making recommendations to the Executive Committee on how NAB should proceed in the high definition television field. Initially, the Task Force will evaluate the technical development of high definition television and make recommendations for the most useful actions which could be taken by the Association in order to produce a compatible system of terrestrial broadcasting for this country. These actions could encompass regulatory proposals, funding plans, and whatever other recommendations seem appropriate under the current circumstances."[1]

The Task Force held its first meeting in April, 1987, and has been actively studying the status of advanced television systems. One of the first actions was to issue a statement identifying broadcaster requirements. The Task Force recognized that much of the work which had been done on HDTV delivery systems was directed toward development of satellite broadcasting and disc and tape systems. While these systems, particularly satellite, might be very suitable to other countries, they do not appear to meet U.S. needs.

The Task Force statement is quoted here in its entirety. Following the statement is a current Task Force membership list.

Requirements for an HDTV Terrestrial Broadcast System

Introduction

High Definition Television (HDTV) is a rapidly developing technology but already widely used technology. Improvements include increased resolution of detail, better color rendition, a wider picture and freedom from defects common to NTSC. The attributes and parameters of HDTV have been documented by U.S. and international organizations.

Consumer electronics manufacturers appear to be moving toward an introduction of HDTV equipment in the U.S. in three to five years. Prototype equipment demonstrated so far is capable of delivering HDTV programs by satellite, cable, disc and cassette tape. Terrestrial broadcast is the only medium which cannot currently deliver HDTV. The HDTV picture contains on the order of six times

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[1] Minutes of the National Association of Broadcasters High Definition Television Task Force meeting April 17, 1987 .

more information than current pictures which means that additional spectrum space must be used for its transmission, even after application of the most advanced technologies for compressing picture information.

Even if the introduction of HDTV were delayed for some time, and there is no indication it will be, there is equipment now being introduced which is capable of delivering a better picture than can be delivered by terrestrial broadcast television. The Super-VHS video cassette recorder will be available to the consumer around September, 1987, and those who have seen it report excellent pictures with better resolution than broadcast. Sony has also announced development of a Beta vcr which is claimed to be even better than the Super-VHS.

In the area of satellite networks, there are now several companies in operation delivering programs of better-than-NTSC quality to small theater audiences at clubs, campuses and other such settings. At least one cable system, HBO, is actively seeking a means of delivering HDTV to its subscribers. NCTA has announced plans for tests of HDTV on cable.

For broadcasters to remain technically competitive with other video services, it is necessary to develop a new standard of broadcast quality for delivering significantly improved pictures to the home viewer. This must be done as soon as possible and with a minimum of disruption and cost to the viewer.

The following is a preliminary description of overall system performance required for broadcasters to maintain a technically competitive position.

Benchmark

The quality of pictures and sound delivered by the NHK MUSE system may be considered as a reference. Whatever system is adopted for terrestrial broadcast of HDTV should deliver at least as good subjective quality, that is, a picture quality perceived by viewers to be equivalent to that of MUSE.

Picture Quality

The attached Report 801-1, "The present state of high definition television," by the International Radio Consultative Committee (CCIR), describes HDTV as "a system designed to allow viewing at about three times picture height such that the transmission system is virtually or nearly transparent to the level of detail that would have been perceived in the original scene by a viewer with average visual acuity." The quality of pictures receivable in the home should be significantly better than the best that NTSC can deliver. Improvements should include the following:

Resolution, picture size, aspect ratio

> These attributes are described in the attached CCIR Report 801-1, particularly in sections 1 and 2.

Artifacts

> The picture should be free of such visible artifacts as cross color, cross luminance, and other objectional psychophysical effects.

Sound

An HDTV delivery system should deliver sound quality comparable to that of compact disc.

Transmission System

It is clear that the existing NTSC broadcasting service must continue for some years. It is not clear at this time what type of compatibility is possible; however, it is important that the new system should permit broadcasters to continue NTSC service to all their current viewers (including CATV) with no degradation in service. In addition, the system should permit broadcasters to add HDTV service to at least 90 per cent of their viewers (including CATV), and it should be as efficient in its use of spectrum as possible.

Excerpts from CCIR Report 801-1 (Mod F)[2]

"THE PRESENT STATE OF HIGH DEFINITION TELEVISION"

Large screen, high-definition television is the target for the next step in television, and may bring about a new standard system which will be common throughout the world.

A high-definition television system is a system designed to allow viewing at about three times picture height such that the transmission system is virtually or nearly transparent to the level of detail that would have been perceived in the original scene by a viewer with average visual acuity.

This generally implies in comparison with conventional television systems:

- *spatial resolution in the vertical and horizontal directions of about twice that available with Recommendation 601;*
- *any worthwhile improvements in temporal resolution beyond that achievable with Recommendation 601 with no significant cost penalties;*
- *improved color rendition;*
- *separate color-difference and luminance signals;*
- *a wider aspect ratio; and*
- *multi-channel high fidelity sound.*

(This report specifies certain attributes of the studio standard which may be applied to the consumer viewing situation. These include:)

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[2] International Radio Consultative Committee (XVI Plenary Assembly) Doc. 11/1008-E, Dec. 1985.

2.1 Picture presentation objectives

2.1.1 *Preferred angle of view - ... increased sensation of reality becomes apparent when the viewing angle exceeds 20 degrees.*

2.1.2 *Viewing distance - ... 2H to 3H are preferred ...corresponds to a viewing angle of 40 to 30 degrees.*

2.1.3 *Display size - ... larger size pictures generate a larger sensation of reality for a constant viewing angle ... more than 0.8 m^2 can be considered appropriate for HDTV.*

2.1.4 *Contrast and brightness - ...50:1 ... minimum contrast ratio for HDTV.*

2.1 Fundamental considerations on basic parameters

2.2.1 *Aspect ratio - Wider aspect ratio increase the observer's involvement in the pictures. Various psychophysical experiments have shown ... aspect ratio ranging from 5:3 to 2:1 would be attractive for HDTV.*

* * * * * *

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NATIONAL ASSOCIATION OF BROADCASTERS
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HIGH DEFINITION TELEVISION PROJECT PLAN AND SCHEDULE

The National Association of Broadcasters is embarking upon an ambitious effort with industry-wide support to develop and implement a high definition television terrestrial broadcast service for the United States within the next five years.

Television broadcasters and program producers world-wide are reviewing various options regarding high definition television. At least one production system is currently available and is the subject of final international standards negotiations. Equipment for high definition television production is currently available from a wide variety of manufacturers. There is no question that the producers of television programs desire and will have high definition television facilities within the next few years.

Distribution of high definition television (HDTV) to the public will be by several means. One of the first will be via satellite. The Japan Broadcasting Corporation (NHK), for example, plans to begin a high definition television service in Japan by direct broadcast satellite (DBS) using the MUSE HDTV transmission system in 1990. Consumer equipment designed to receive the high definition signals is now under development and will be available to the public in Japan in the same time frame. DBS transmission of high definition television will also be available in the United States as needed by program producers.

Other distribution methods, such as cable antenna television systems (CATV), would be able to easily adopt high definition television to their systems. HDTV videodisc and video cassette recorders (VCR) will soon become available along with the high definition programming (most likely using the MUSE system).

Broadcasters, however, will most certainly need additional spectrum to provide a true HDTV service. Therefore, it is essential that the Federal Communications Commission reserve adequate spectrum to enable broadcasters to provide HDTV to the

public in the future. The FCC recently issued a Notice of Inquiry regarding the development of broadcast advanced television systems. Comments on the Notice are due by the end of November of this year.

As a result of the enormous interest in high definition television in general, and by broadcasters in particular, the NAB has initiated a major program for the development of a high definition television terrestrial broadcast system. The program has already begun and will continue for several years encompassing spectrum studies, propagation tests, laboratory testing and evaluation of various transmission systems, and culminating in an HDTV broadcast transmission standard to be adopted by the FCC by the end of 1991 or early 1992.

NAB HDTV PROJECT SCHEDULE

The NAB high definition television project schedule is attached. The schedule shows the major elements of the project and the time frames in which they are expected to be dealt with. The schedule contains several major milestones. The first is a demonstration of a transmission system which will prove that a terrestrial broadcast high definition television system is feasible and will provide quality, competitive with other modes of video distribution. The second major milestone is to complete testing of various transmission systems by the end of 1990. The third is to provide the FCC with the industry consensus and technical information and to urge them to adopt the recommended system as a standard in order to permit the efficient and orderly transition to high definition television for the public.

Market

NAB plans to conduct market studies during 1988 and again in 1989 in order to gauge how the implementation of broadcast and competing HDTV systems will be accepted and how both the consumer and manufacturing industry will react to a new system and NAB's project. NAB also estimates that receivers or display devices for the Japanese MUSE system will begin to appear in small quantities (about 100,000 units) on VCR and video disc in 1990, rising to a half-million units in 1991 and as many as one and one-half million units by 1992. These units will most likely be able to receive regular broadcast signals in the standard NTSC format as well as MUSE HDTV from the VCR and videodisc player.

FCC Action and Advisory Committee

The FCC's Notice of Inquiry on Advanced Television Systems has started a series of actions which coincide with other industry developments. The NOI requires Comments and Reply Comments by the end of January 1988. NAB will focus its Comments on the good faith efforts by terrestrial broadcasters to develop HDTV, the financial commitment by broadcasters to develop such a system and the time frame in which we must operate. In the Notice the FCC established, for two years, a top level Industry Advisory Committee to review the developments for HDTV and advise the Commission of industry activities. The Committee will contain several technical sub-committees to investigate spectrum requirements, evaluate competing transmission systems and consider implementation plans. NAB anticipates the FCC will issue a notice of proposed rulemaking later in 1988 suggesting various approaches to broadcast HDTV and asking for specific proposals from industry for such a system.

Project Office

The NAB has established an HDTV Project Office which will be part of the new NAB Broadcast Technology Center to conduct and coordinate much of the industry's work in developing the broadcast transmission system. The office will work closely with the Advanced Television Systems Committee and other industry organizations. At the heart of the office will be a laboratory established to support industry tests and evaluation of proposed broadcast systems. The laboratory will be staffed with scientists, engineers and technicians and equipped with the facilities needed to carry out the tests.

Propagation Tests (ATSC)

In order to evaluate those portions of the electromagnetic spectrum that could support a high definition television terrestrial broadcast system, NAB is supporting extensive spectrum tests that are being conducted in the field by ATSC. The first phase of the test program, now under way, examines the differences when VHF and UHF television bands are used simultaneously for HDTV. The results of these tests will be useful to certain proposed HDTV system designs using more than one channel to transmit the HDTV signal. The second phase of the propagation test program will compare UHF and SHF (12 Gigahertz) bands and evaluate the suitability for terrestrial broadcasting of HDTV. The results of these tests will be made available to the industry toward the end of 1988.

Demonstrations

NAB will prepare demonstrations for industry, government regulators and the public at various stages during the development of the HDTV broadcast system. A major demonstration is planned for late 1988 to prove conclusively that terrestrial HDTV transmission is both feasible and competitive in quality. Demonstrations are also planned for NAB Conventions and other suitable forums.

Spectrum Studies

Essential to the development of a broadcast HDTV system are detailed computer studies to determine which portion of the spectrum provides is best for local stations to reach the viewing public with high definition television. In addition, computer developed station allocation models and implementation scenarios will be devised to permit the orderly transition to HDTV. A series of spectrum studies is envisioned to 1) determine the required protection ratios for a new HDTV television transmission system; 2) determine exactly how a sample system could be implemented; and 3) develop and evaluate allocation models for each proposed HDTV transmission system. The sequence of studies shown on the schedule reflect the duration and times the studies are needed to support the laboratory and field tests.

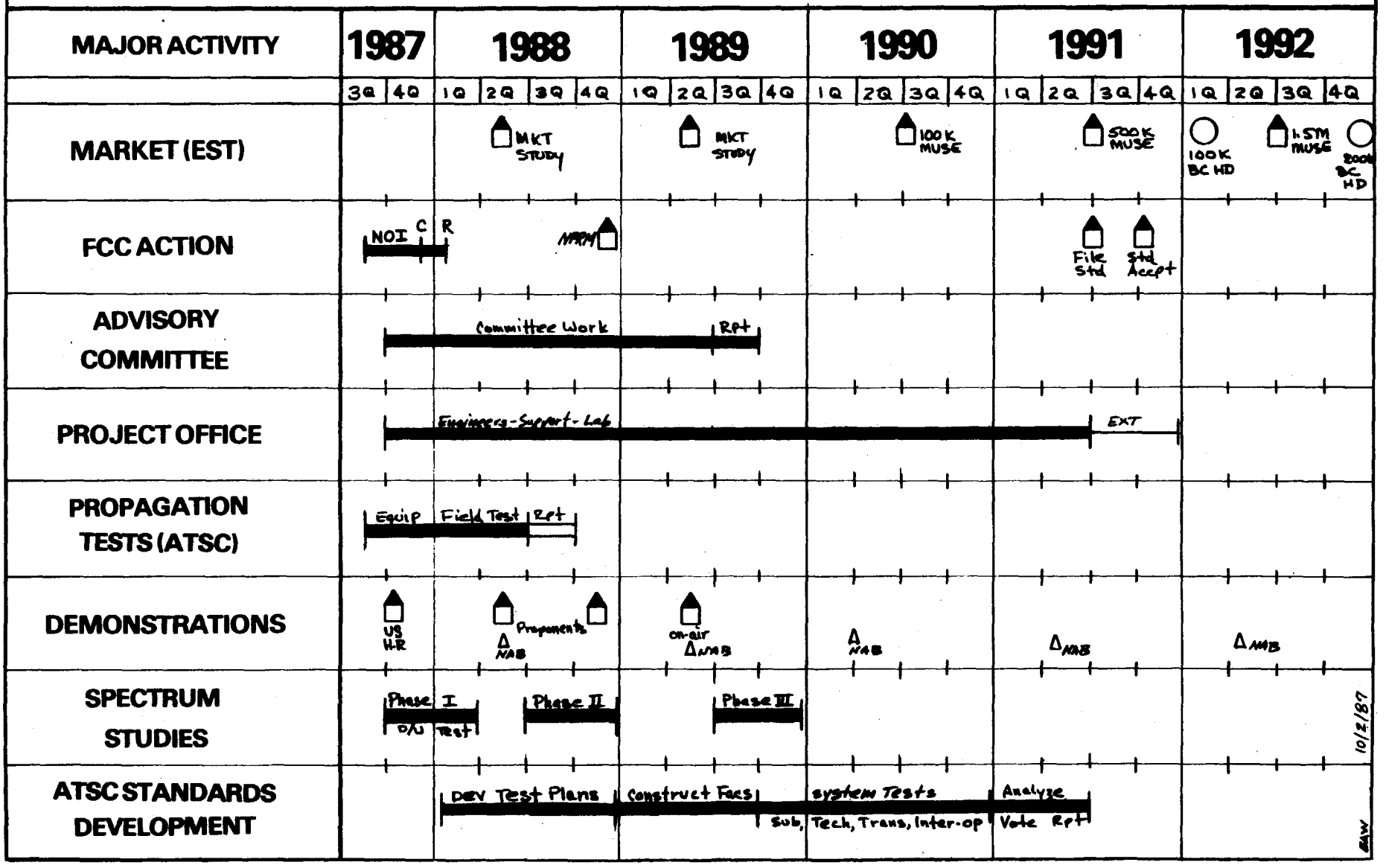
ATSC Standards Development

A major element in the NAB HDTV Project schedule is the work of the ATSC and the anticipated activities needed to conduct the HDTV terrestrial transmission system standardization development effort. While ATSC is concerned with other aspects of HDTV delivery in addition to broadcast, they will be intimately involved with the process of evaluating potential systems and documenting the system to be proposed to the Commission for standardization. The NAB Project Office will support these activities that includes 1) development of the overall systems evaluation test plan during 1988; 2) construction of the test facilities and acquisition of test instrumentation during 1989; 3) conducting technical, subjective, transmission impairment and inter-operability tests in 1990; and 4) adopting, documenting and presenting the results to the FCC for standardization in late 1991 or early 1992.

* * *

October 2, 1987

NAB HDTV PROJECT SCHEDULE



NAB SUPPORT FOR STANDARDS WORK OF THE ADVANCED TELEVISION SYSTEMS COMMITTEE

The NAB strongly supports the work of ATSC. The brief description which follows was prepared by NAB staff as an introduction to the HDTV standards development plan which has been proposed to ATSC by NAB. For more information on ATSC, please see Comments of the Advanced Television Systems Committee, MM Docket No. 87-268.

The Advanced Television Systems Committee (ATSC) is an industry-wide committee which includes U.S. companies and organizations with interests in terrestrial and satellite broadcasting, cable television, program producers and distributors, and manufacturers of both professional and consumer equipment. There are also observers from Canada and Japan.

NAB believes that broad base of membership, representing all aspects of the television industry, is the best organization to conduct the studies and evaluation necessary to the development and agreement on standards for television improvements.

Within ATSC, Technical Group T3 was established to deal specifically with high definition television. Members of T3 established a smaller Specialists Group (T3S4) to work on standards for the delivery of HDTV to consumers.

T3S4 held its first meeting on February 17. 1987, and has been meeting on the average of once a month since then. Its work is generally regarded as urgent and essential to the establishment of HDTV in the U.S. in a manner which will benefit both the public and the industry. T3S4 meetings have included representatives of the FCC, NTIA and the Canadian Department of Communications.

The following statement was proposed by T3S4 and accepted by T3 as a description of its overall goal and the specific objectives which must be reached to attain that goal.

HDTV Transmission and Distribution Specialists Group (T3S4)

Statement of Goal and Objectives [1]

Goal:

> *Study and provide recommendations to ATSC regarding a single standard or family of standards for delivery of high definition television to the consumer.*

Objectives:

1. *Gather information about delivery systems.*
2. *Define "compatibility" as it applies to delivery systems.*
3. *Develop criteria for evaluation of system performance including, but not limited to, compatibility, spectrum efficiency, propagation, interference (potential to cause or be affected by), complexity.*
4. *Analyze and test spectrum utilization characteristics and availability for terrestrial and satellite broadcast and cable delivery.*
5. *Analyze technical feasibility and economic tradeoffs of system implementation, using the criteria developed in Item 3, above.*
6. *Conduct tests of proposed systems.*

Note 1. Many of the terms used here will require further definition. "Compatibility," for example, is a multidimension concept which could include receiver compatibility, channel compatibility, and the interface between media such as broadcast to cable to vcr, etc.)

Note 2. Delivery systems include real time and non-real time systems, including tape and disc.

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[1] Advanced Television Systems Committee Technical Specialist Group on HDTV Delivery to the Consumer (T3S4), Document T3S4/04, 10 Mar 1987.

NAB has proposed that the work of T3S4 be divided into two phases. The first is concerned with preliminary data-gathering and the development of plans for the second phase. Phase two covers the implementation of the formal evaluation process: constructing and equiping a test facility, conducting tests, analyzing the results and voting on stnadards.

The tasks included in these phases are shown, in their relation to each other, in the attached PERT chart. These tasks are described below. Details on the overall plan and individual tasks will be made available to the Commission and to the industry as they are developed.

PHASE 1 ACTIVITIES

The first phase is expected to include the following activities:

1. CATV Tests: tests of cable transmission environments in terms of possible effects on signals used to carry wide band video and audio in analog, digital or both forms, possibly with special control signals and with video at considerably higher or lower scan rates.
2. Subjective Studies: reviews of the literature, evaluations of prior test methodologies and results, studies of basic parameters where data are not available or are unsuitable, all leading to the development of a formal test and evaluation plan for phase two.
3. Propagation Tests: tests of the broadcast environment similar to the work done for cable but reflecting the need for wide-area broadcast coverage. Tests are currently under way comparing the simultaneous relative performance of UHF and VHF bands to determine the capability of two-channel systems to handle variations in amplitude, timing and other factors which could shift due to transmission path differences. Other tests being

set up include multipath (ghost) effects and coverage at such frequencies as 2.5 GHz and 12 GHz.

4. Solicit Proposals: the group will request formal proposals from all those who are developing delivery systems which may serve the television needs.

5. Test Plan: a formal plan for testing and evaluating proposed systems is being developed, based on information being gathered in other activities and prior experience of members in standards work. This plan will be refined as more information and test data become available and will be coordinated with the Commisssion to assure its suitability.

6. System Information: the group will gather all information available on possible HDTV delivery systems, to be used to develop and analyze tests in both phase one and two.

7. Project Administration: NAB has proposed to establish and staff an office to serve as the secretariat for the work of ATSC. This will proved office space, word processing and computer facilities and staff to support the gathering of information, data analysis, report preparation and the publication and preservation of all the information and data collected or generated in the standards work. This activity will continue through the duration of the work and will help to provide continuity and assure access to information.

PHASE TWO

The second major phase of this work is expected to begin with the actual design and construction of a laboratory for test and evaluation of proposed systems. This will be the formal facility in which will be conducted the evaluations of system technical and subjective performance.

It is not known yet wether this can be accomplished within a single laboratory or whether it should be conducted in several facilities. Decisions on these matters will depend on details of the test plan being currently developed.

At the same time, NAB expects that studies will be conducted on the technical aspects of proposed systems to determine how these systems can be implemented. What is currently known suggests that implementation schemes will differ considerably in such dimensions as time and complexity. Results of these studies, along with data gathered in the laboratory on the interference characteristics of system signals, will permit studies of possible receiver designs for each system.

With completion of labroatory tests and receiver studies, it will be possible for ATSC members to begin evaluation of these data. At the same time, system proponents will be invited to demonstrate their systems and to make detailed presentations on all aspects of their proposals.

The end result of all this is intended to be an ATSC consensus on a single system which can be recommended to the industry and to the Commission as a standard for delivering high definition television to the consumer.

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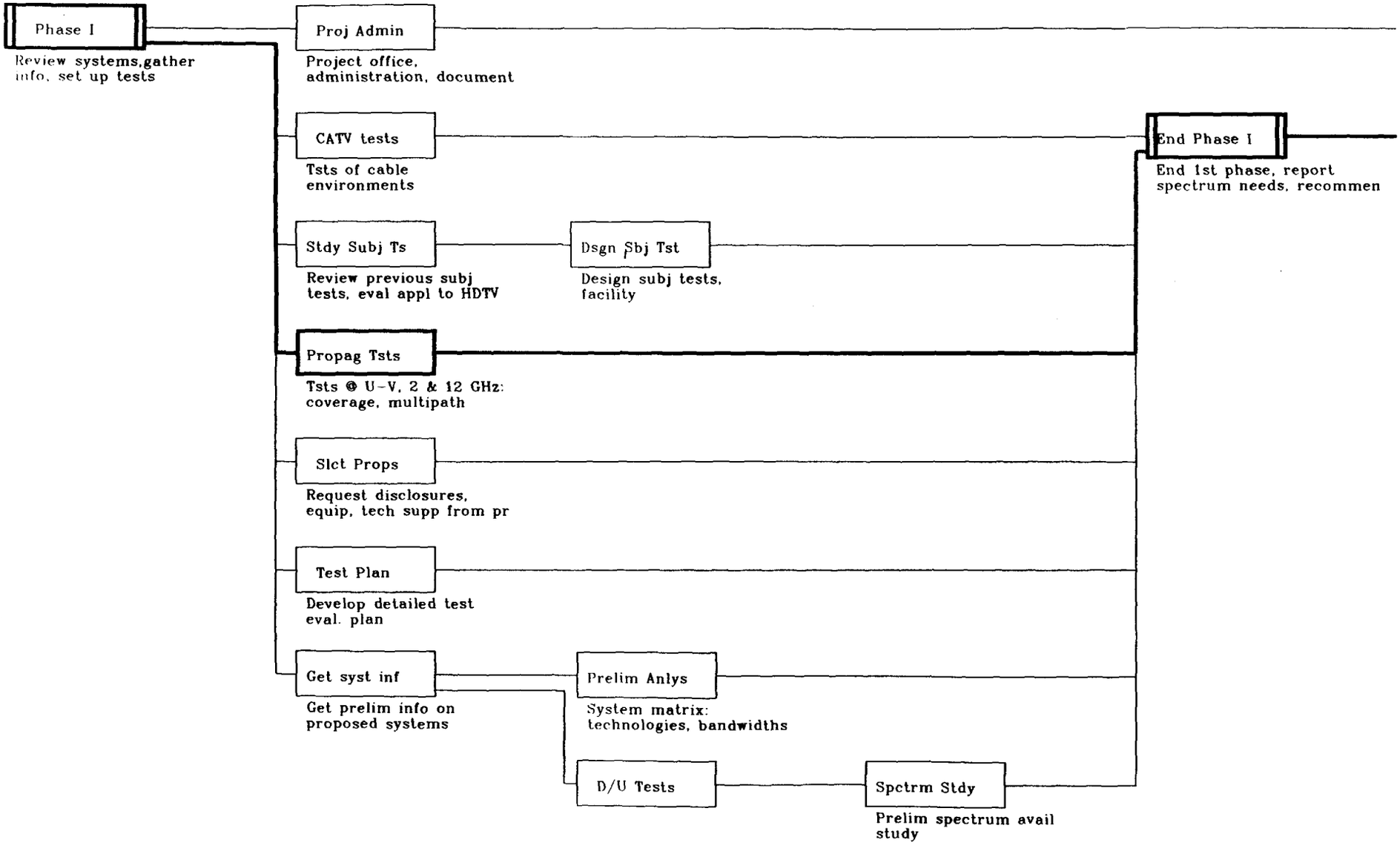
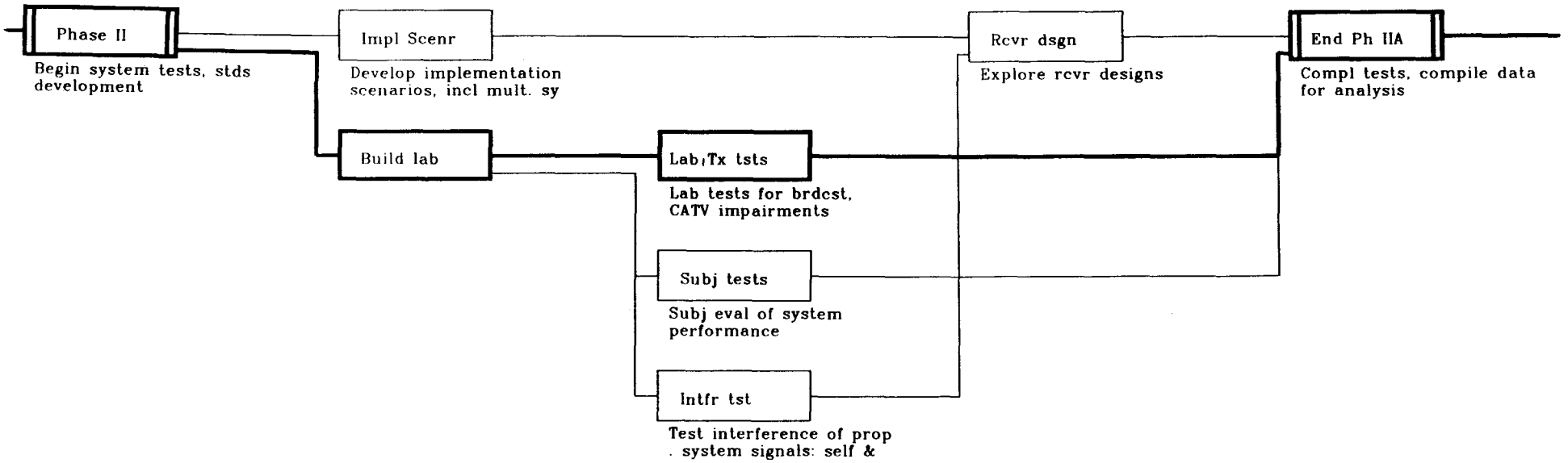
PERT CHART

DRAFT PLAN PROPOSED FOR ATSC, p. 1



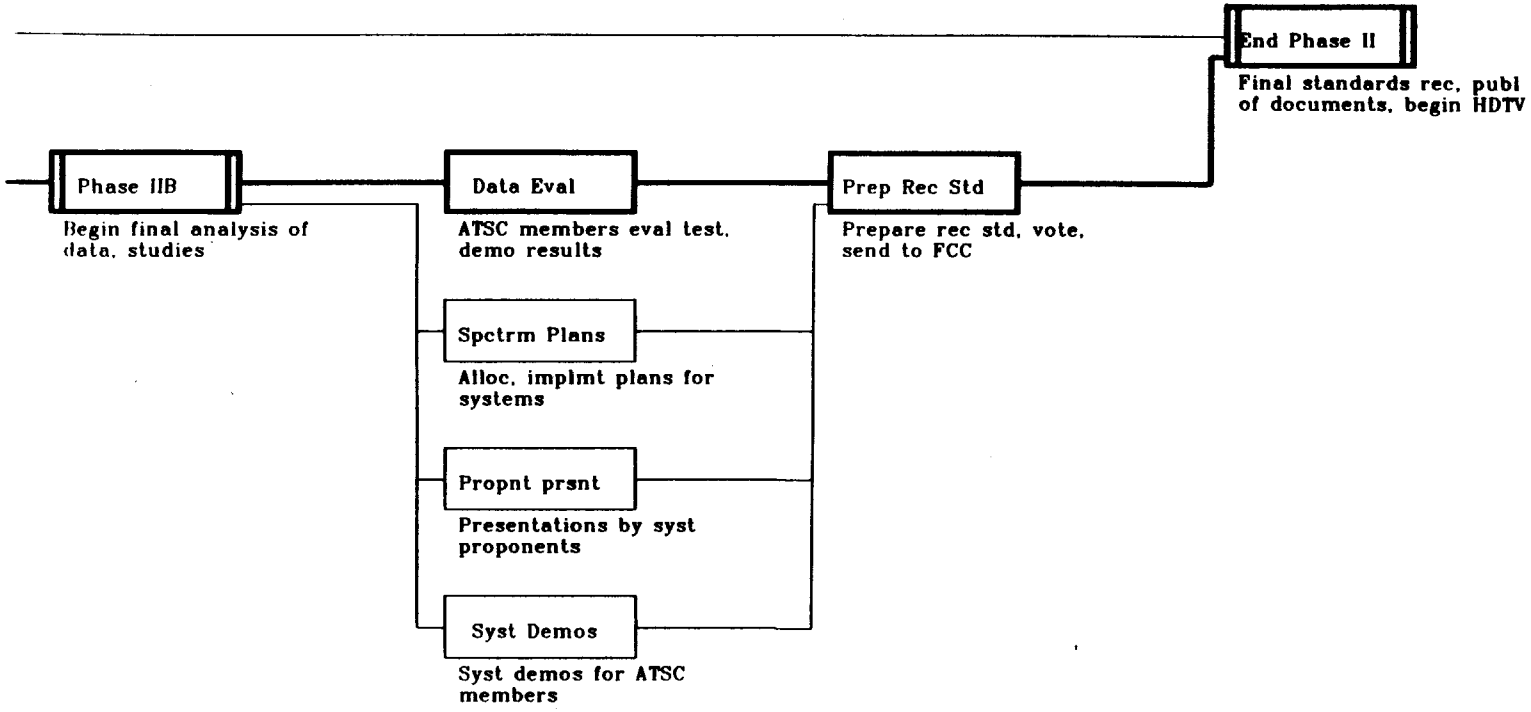
PERT CHART

DRAFT PLAN PROPOSED FOR ATSC, p. 2



PERT CHART

DRAFT PLAN PROPOSED FOR ATSC, p. 3



APPENDIX D

NEW VIDEO TECHNOLOGIES

CONSUMER ACCEPTANCE AND PRICE HISTORIES

MARK R. FRATRIK

NATIONAL ASSOCIATION OF BROADCASTERS

NOVEMBER 10, 1987

Introduction

Consumers increasingly are being confronted with new technologically improved products. From digital watches to minicomputers to microwaves, new consumer products are being introduced. Nowhere has this been more evident than with the video choices now available. With the introduction of color television in the early 1960s to the emergence of cable television services in the mid 1970s to the availability of videocassette recorders in the late 1970s-early 1980s, and finally to stereo television receivers in the mid 1980s, consumers are being offered many new and improved video products.

The acceptance of these new products does not occur immediately. This has been well documented in thousands of innovation diffusion studies.[1] In all cases there are a few key consumer segments who buy the new technology soon after introduction while many other consumers wait. Part of the waiting is due to the typically high prices charged soon after introduction. The prices of these products tend to drop dramatically as manufacturers gear up their production and realize significant economies of scale. Due to the competition among manufactures, these economies of scale are passed along to the consumers in the form of lower prices.

In this paper we review the history of consumer acceptance for four new video services: color television receivers, cable television service, videocassette recorders, and stereo television receivers. For color television and VCRs we examine both the price history and consumer acceptance once that product and service was generally introduced. For stereo television and cable television service we provide only consumer acceptance information since price data were not available. In all four cases, consumer acceptance increased dramatically once a threshold was reached.

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[1] Everett M. Rogers, Diffusion of Innovations, 3rd Ed., (New York: The Free Press, 1983).

Consumer Acceptance

When an innovation is introduced, there is typically not an immediate acceptance by the consuming public. One reason, as will be shown later, is the typical price decrease history after a new product has been introduced. Consumers have recognized this trend and many wait for the prices to decrease. There are still, however, some consumers who soon after introduction purchase the new product. This reflects varying motivations, demands, resources and interest of different consumer segments. In video services, typically, the early adopter is younger, upscale (in terms of income and eduction), is married and has children.[2]

The history of the four products acceptances were examined together by setting a starting date for each.[3] Those relationships are depicted in the figure below.

A few explanatory notes are necessary. The following starting dates for these new products were selected:

Color Television	1961
Cable Television	1968
VCRs	1978
Stereo Television	1984

In all these cases prototypes of these new products were available sooner than the dates selected. For color television, VCRs, and stereo television, the first year selected corresponded to the year where they first reached 1% penetration. For cable television, 1968 was selected since that was the first year for which reliable data were available.

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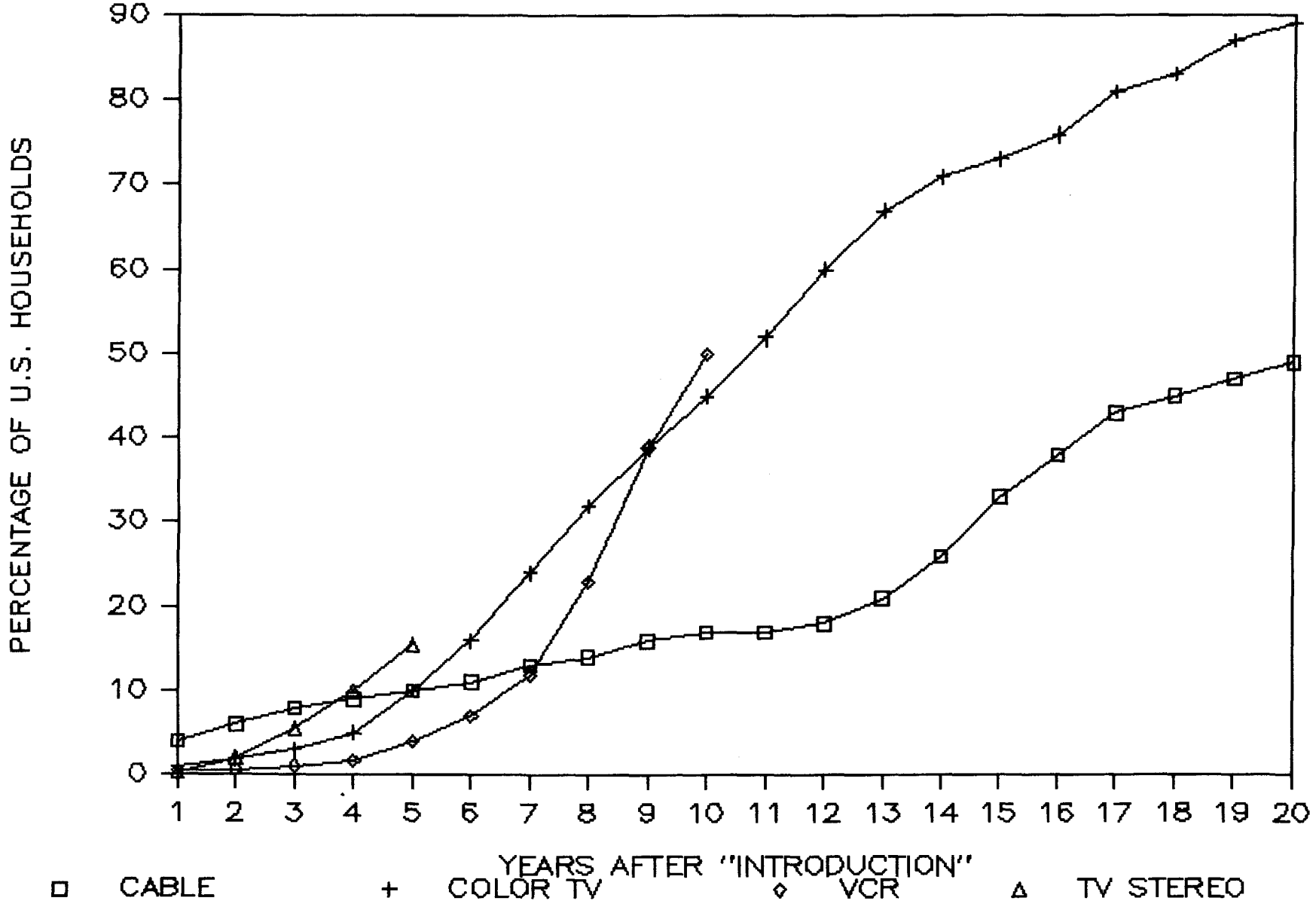
[2] See e.g., Ed Cohen, "An Analysis of the 1987 CONTAM/SRI Television Ownership Study," Research and Planning Department, National Association of Broadcasters, Washington, D.C., October 1987.

[3] Data for color television receiver penetration are from Chris Sterling, Electronic Media, (Praeger Publishing, New York, NY), 1984, pp. 236 - 37. Cable television penetration data are from A.C. Nielsen Co., May sweeps except for 1969 (November) and 1970 (March). Video cassette recorders and stereo television receiver data are from the Electronic Industry Association.

PENETRATION RATES — VIDEO PRODUCTS

COLOR TV, VCR, CABLE & STEREO TVS