IS - 0012
14 Feb 90

FCC

Implementation Subcommittee

Third Interim Report

to the

FCC Advisory Committee on Advanced Television Service

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Implementation Subcommittee Status

The Implementation Subcommittee is comprised of two Working Parties which deal with issues related to policy and regulation and potential scenarios associated with making a transition from existing television service to an advanced television system (ATV). The objectives of Working Party 1 (Policy and Regulation) are to define and address the policies and regulations appropriate to guide the implementation process in order to recommend appropriate FCC actions in overseeing the implementation of an Advanced Television Service. The objectives of Working Party 2 (Transition Scenarios) are to critique the transition process for various generic system concepts in order to evaluate their implementation requirements and to develop an implementation plan for the selected system.

Working Party 1 (Policy and Regulation)

Working Party 1 has identified two areas where it could make significant contributions to the development of sound policies towards ATV. These areas are:

(1) The FCC's role in setting broadcast transmission standards. In particular, does the FCC have the legal authority to choose a single standard, should it exercise that authority, or should it leave the development of standards to the marketplace?

(2) The Ashbacker issue. Can the FCC set aside ATV spectrum for the use of existing broadcasters or divide limited spectrum among broadcasters (say three augmentation channels in a town with four TV stations) without a hearing or opportunity for competing applications?

Additionally, the Working Party, in response to a request from the FCC, has examined issues related to the problem of assigning individual ATV channels (augmentation or simulcast) to broadcast operators.

Developing a consensus on papers on the assignment issue and on the Ashbacker issue has been slow. These papers are still being perfected.

The standards issue has proved more tractable. The working party adopted two papers on the standards issue. (Copies of both of these papers are attached to this report.) One paper, titled **IS/WP1 Report on ATV Transmission Standards**, (IS/WP1-0020), discusses the legal authority and the policy basis for a single transmission standard. It concludes that the FCC has the authority to choose a single transmission standard, and that the FCC should announce its intention to so choose a single standard as soon as possible. The Working Party summarizes this conclusion with three specific statements:

- The Working Party has determined that the FCC has the legal authority to pick a single ATV standard for terrestrial broadcasting. It is virtually certain that the FCC's choice would be upheld on appeal, provided that the FCC had offered a reasonable basis for its choice and had observed the procedural requirements of the law.

- The Working Party believes that, given current knowledge, the choice by the FCC of a single terrestrial broadcasting ATV standard would strongly serve the public interest.

- The Working Party further concludes that, in order to promote cooperation among system developers and to facilitate the process of developing an industry-wide consensus, the FCC should, at the earliest possible time, announce its willingness to adopt, at the appropriate time, a single broadcast transmission standard.

The second standards paper, **Proprietary Standards in Advanced Television**, (IS/WP1-0025), as its name implies, discusses the policy issues associated with proprietary technology and intellectual property and the development of a federal standard for ATV.

During the next several months the Working Party intends to continue developing the papers on the Ashbacker issue and the assignment issue.

Working Party 2 (Transition Scenarios)

The dominant activity of Working Party 2 during the last 12 months was the refinement of the detailed PERT (program evaluation and review technique) charts and their integration into a single chart. Efforts continue to finalize the various industry PERT networks. Most individual industry networks have been completed with identification of dates and critical paths. Primary remaining efforts are in the area of broadcasting/transmitter facilities since these industries are most impacted by the specific ATV system proposal. Responses from a follow-up professional equipment manufacturer survey, currently in progress, are also needed in order to finalize the broadcast industry PERT network.

An overview transition scenario PERT network has been generated showing the various industry interdependencies. The final PERT network will be set up in a hierarchical fashion so that additional levels of detail can be evaluated. The finalized PERT chart(s) will be circulated amongst the ATV system proponents for review and feedback.

The final output from Working Party 2 will be a group of timelines for the different transition scenario categories that identify the transition time to an Advanced Television Service in the United States. Target for completion of a final report is the third quarter 1990.

Timeline and PERT-Chart Activity

Information obtained so far by the Working Party indicates the following:

- Development for consumer products can start 3....5 months after results of ATTC (Advanced Television Test Center, Inc.) testing are available. The type of system will influence the overall development time: augmentation and/or simulcast systems will require more lengthy product development due to more critical RF issues and additional receiver complexity. Displays will not be in the critical path. Products are expected to be available 18....24 months after FCC decision.

- The cable industry is expected to require 6 months in case of a simulcast or 6 MHz solution without scrambling. In case of scrambling and/or augmentation, a switchover time of up to 30 months seems to be more likely.

- The time to upgrade the satellite link to ATV is system dependent as well. Under the assumption that existing satellites can be utilized, immediate transmission is possible if there is no change in modulation and transmission parameters. Should the system call for a redesign or new development of exciters and receivers, a range of 18....24 months would have to be planned for. The transcoder between terrestrial and satellite format forms a potential bottleneck: the estimated design time of 18....24 months (exclusive of laboratory and field tests) necessitates a design start prior to FCC system approval to avoid the satellite path becoming the critical one.

- For common carrier, immediate service is possible in some cases while others may require equipment modification or replacement. In any case, ATV transport by common carrier is expected to be accomplished within 6 months of an ATV system decision.

- The terrestrial transmission upgrade is believed to form the critical path. A well planned and exercised upgrade of the transmission equipment should be completed within 18 to 24 months as long as no legal action is required to settle zoning problems and/or citizens complaints against the new structure (expected to happen in approximately 10% of all cases). Stations in densely populated areas are most prone to face these types of problems which will not only delay the process by up to several years but increase cost as well, in some cases by several million dollars.

  In the northern part of the country, weather-related delays have to be taken into account as well.

- For the production area it was found that film production will not be in the critical path, whereas electronic production may be sensitive to the system selection. For the latter issue, a much stronger involvement of equipment suppliers is necessary for clarification; the response rate to the Working Party survey to date is only poor and efforts are under way to change this. A final time estimate cannot be given yet. Cost estimates for ATV production equipment are under development at SS/WP3 on economic assessment.

The indication that the transmitter facility is likely to be a critical factor in an overall transition scenario prompted the establishment of the following transition scenario categories for the purpose of generating PERT networks:

1. Existing transmitter facility can be used, no major modification required.

2. Additional transmitter/antenna facility required

   a) existing tower acceptable
   b) new tower required.

An initial PERT network for category 1, using proponent system ACTV-I as example, is in the process of being developed.

Additional Activity (IS/WP2)

In addition to these planned activities, two additional topics had to be dealt with and were completed. During early 1989 several issues were brought before the Implementation Subcommittee by Lex Felker [then Chief, FCC Mass Media Bureau; presently Technology/Engineering Consultant with Wiley, Rein & Fielding]. Two of these issues fell under the responsibility of Working Party 2 and are stated as follows:

(1) If different systems appear to be preferable for cable, broadcast, satellite, and/or VCR, would fostering convergence be beneficial? How could this be accomplished? What statutes or regulations could be used, or would have to be amended? Same questions, if different ATV systems prove to have different strengths and weaknesses; would convergence to obtain the best of the different systems be beneficial, and if so, how can the result be pursued?

(2) Some broadcasters have complained that any ATV system which will require a new antenna site will be impractical. How pervasive is this problem? What is the magnitude of the problem in dollars; number of stations potentially affected? Is this problem so severe as to rule out anything other than a six megahertz, compatible system?

In the case of Item (1), it was decided to support Working Party 1 with a technical statement concerning ATV system convergence issues. A subgroup was established and a report was submitted to WP1.

The report outlined, that even if one basic ATV system is embraced by all media, technical reasons require varying detailed implementation for the different media. Such a 'family' exists presently for NTSC and is characterized by the possibility of simple translation from one media to the other.

The report concluded that -- if different [ATV-]systems appear to be preferable for cable, broadcast, satellite and/or VCR -- fostering convergence

a) would be beneficial from a technical/economical perspective to the extent of assuring interoperability of the receiver/display with different media in an uncomplicated manner and without unnecessary cost. This means that interfaces should be defined which allow different media to utilize the maximum functionality of the receiver/display (convergence at the consumer hardware).

b) is an obvious demand of the marketplace: cable will have to distribute broadcast signals to consumers, consumer VCR's will have to record and play back ATV signals received from (at least) broadcast, cable media, and satellites (convergence intermedia--i.e. the ability of various media to handle signals originated by other).

Definition of a terrestrial standard and appropriate display interfaces should bring sufficient commonality between media. It is too early to establish standards for alternate media delivery to consumers which does not involve broadcast. Even if regulation of these heretofore unregulated media is contemplated, a set of competing proposals specifically tailored to these media must exist before a standard definition is potentially needed.

The necessary activities to encourage and technically define this convergence are in place with the FCC-ACATS and in the industry in the form of the EIA (Electronic Industries Association) standard setting activity for interface and ATSC (Advanced Television Systems Committee) consideration of these same issues.

To resolve Item (2), a two-part study was carried out to determine in detail the situation of the US television stations in the matter of a potential upgrade of a two-channel ATV system. The study focused on transmission equipment (transmitter, antenna, and tower) only. The first part consisted of a round of interviews with approximately 350 Chief Engineers, Technical Directors, or Station Managers. The goal was to determine statistically significant information on the availability of antenna space on the existing towers and the possibility to erect additional towers if needed. In the second part, time estimates for this upgrade were developed to be used as input to the PERT charts.

The survey indicates that there exist some major markets which are likely to experience severe technical and political difficulties when trying to obtain additional tower space. The majority of TV stations in these markets share one or two (community-)towers in the midst of a heavily populated area. Expansion possibilities are limited and plans for new towers are often opposed by the local population and/or government. Examples for these markets are: New York (World Trade Center and Empire State building), Chicago (Sears tower and Hancock building), San Francisco (Mount Sutro) and Minneapolis-St. Paul (three-tower cluster for all stations). Boston, MA, should be mentioned as well because of its strict radiation limits.

As for overall results, in case a full-power 2-channel ATV system would be selected, approximately **28%** of all surveyed stations would be able to accommodate the second antenna on their existing tower with no or only minor modifications. Seven per cent (**7%**) could upgrade their existing structure. The remaining 65% could either erect an additional tower at the existing site (**30%**) or would have to develop a new tower site (**35%**).

The percentages for an upgrade to a low-power ATV system are 50%, 5%, 19% and 26% respectively.

There is no statistically significant correlation between ADI (area of dominant influence) rank and fraction of positive responses for both cases.

The 1989 NAB (National Association of Broadcasters) survey contained three questions formulated by IS/WP2 dealing with the same issue. Draft results just became available and their consistency with the outcome of the Working Party survey has still to be verified.

As for dollar figures, SS/WP3 on economic assessment is in the process of refining their data on upgrade cost. A consolidation with the WP2 survey results has not been performed yet.

Future Activities (IS/WP2)

Near-term tasks awaiting completion are:

1. Compilation of information from professional equipment manufacturer survey;

2. Identification of broadcast/transmitter facility PERT chart dates for the two categories of systems; and

3. Establishment of software links between the overview transition scenario and the detailed industry charts.

This work will be completed by midyear 1990.

The final output from Working Party 2 will be a group of timelines for the different transition scenario categories that identify the transition time to an Advanced Television Service in the United States. Target for completion of a final report is the third quarter 1990.

Supporting Information

The detailed information supporting this status summary is included as an Appendix.

List of appendices:

Appendix A: Summary PERT chart

Appendix B: Timeline summary

Appendix C: 'Lex Felker Issues'

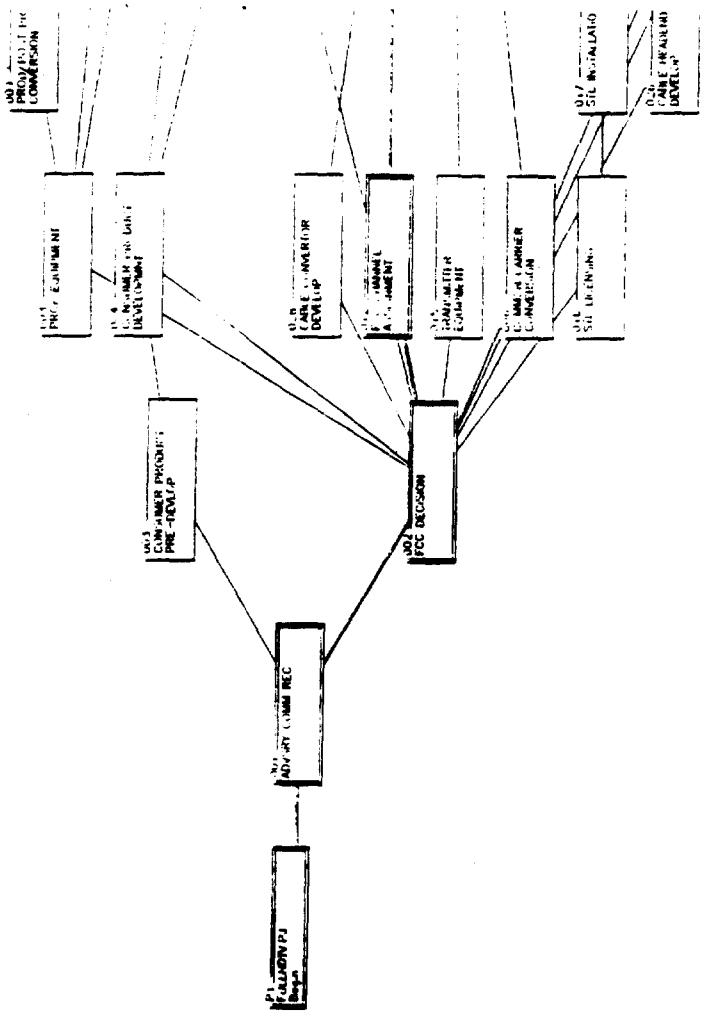
Appendix D: TV-Station Survey - Table of Results

Attachment 1: Specialist Group Report on ATV System Convergence

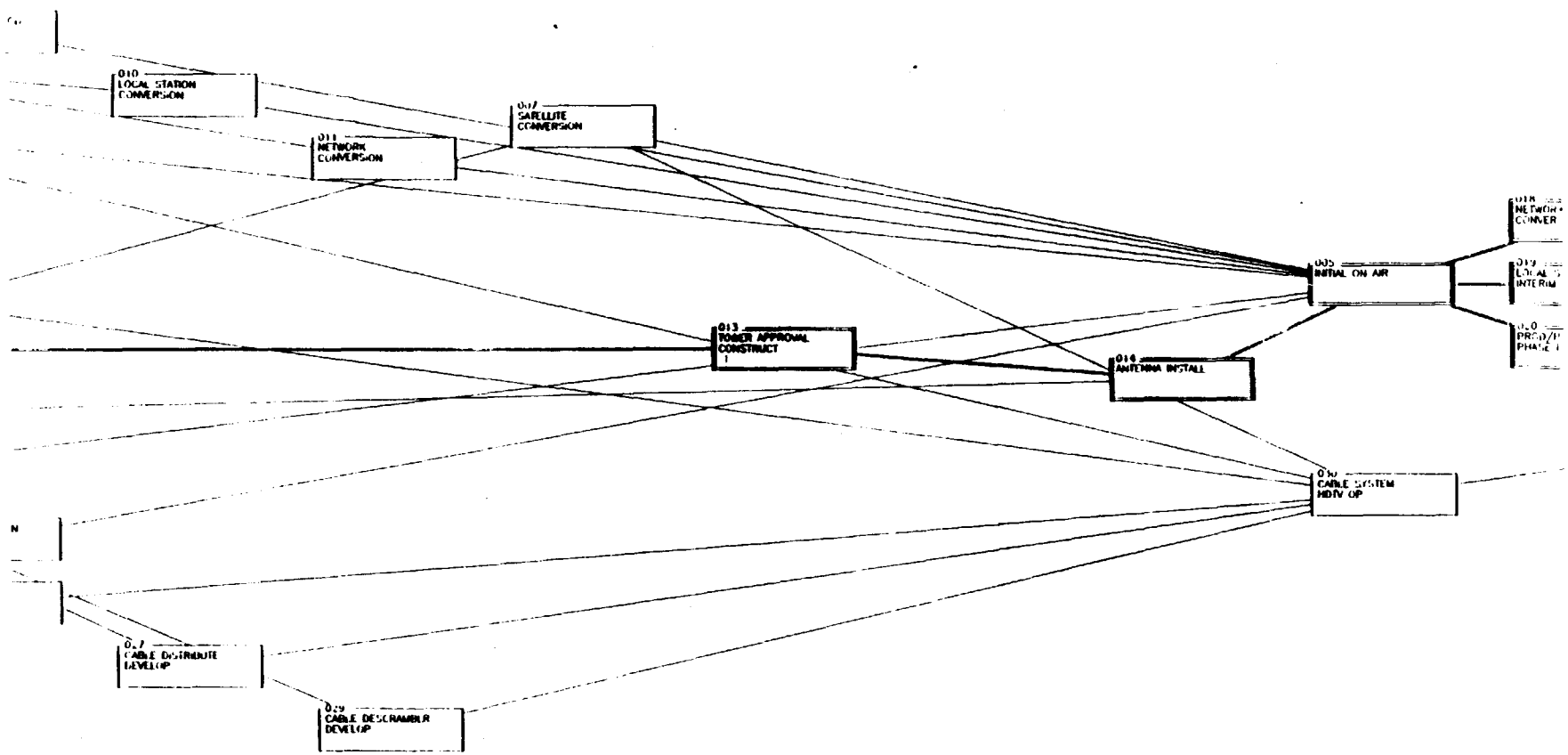
Attachment 2: TV-Station Survey - Final Report

Attachment 3: IS/WP1 Report on ATV Transmission Standards (IS/WP1-0020, 7 Nov 89)

Attachment 4: Proprietary Standards in Advanced Television (IS/WP1-0025, 12 Dec 89)



Appendix A: Summary PERT chart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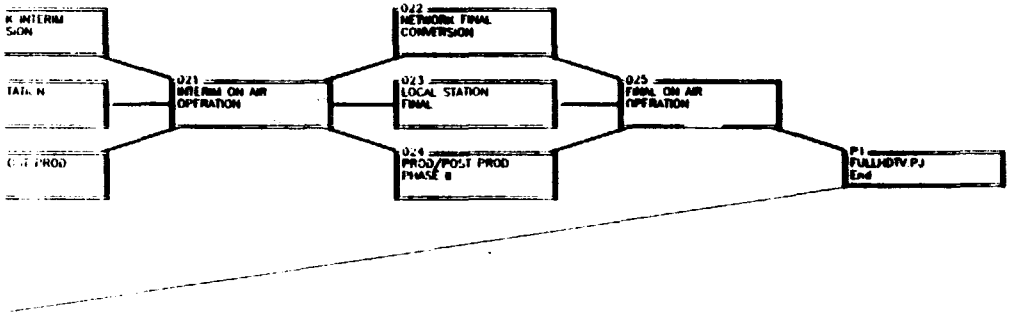
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INDUSTRY TIMELINES

• CONSUMER PRODUCTS	18 - 24 MONTHS
• CABLE	6 - 30 MONTHS
• SATELLITE	0 - 32 MONTHS
• COMMON CARRIER	0 - 6 MONTHS
• TERRESTRIAL	18 - 24 MONTHS (IF NO COMPLICATIONS)
• PRODUCTION	?

ZERO DATE - FCC APPROVAL

Appendix C: 'Lex Felker Issues'

Implementation Subcommittee Issues

1. How should additional capacity be assigned if not all existing broadcasters could be assigned an optimum amount of additional spectrum capacity for HDTV? Options explored might include: a) some type of comparative process; b) lotteries; c) auctions; d) assigning capacity to all licensees uniformly and allow stations to acquire additional capacity needed from others.

2. Ashbaker issues. Does the Commission have authority to award ATV broadcast permission to existing licensees without accepting applications from potentially new broadcasters? How is the necessity for such a decision affected by the four predominant scenarios -- i.e. -- 6, 9, 12, & 12-simulcast? Is the definition of "simulcast" an issue? Are statutory changes needed?.

3. In the event that a complete transition to ATV takes many years (e.g., a decade or more), what options are available for making productive use of spectrum other than the present freeze? For example, are there uses of the spectrum compatible with television broadcasting that could be implemented during the uncertain interim transitional time period? Could the freeze be scaled back or eliminated with little or no adverse consequences? What are the advantages and disadvantages of the flexible use scheme suggested by the FCC in its FNOI?

4. If different systems appear to be preferable for cable, broadcast, satellite, and/or VCR, would fostering convergence be beneficial ? How could this be accomplished ? What statutes or regulations could be used, or would have to be amended ? Same questions, if different ATV systems prove to have different strengths and weaknesses; would convergence to obtain the best of the different systems be beneficial, and if so, how can the result be pursued?

5. Some broadcasters have complained that any ATV system which will require a new antenna site will be impractical. How pervasive is this problem? What is the magnitude of the problem in dollars; number of stations potentially affected? Is this problem so severe as to rule out anything other than a six megahertz, compatible system?

Accommodation of a second antenna
Detailed breakdown into TOP-10 and subgroups

Answers for high-power antenna

ADI Market	yes	reinforce	no	don't know	n.a.	sum
New York	1	1	15	1	0	18
Los Angeles	7	1	10	0	0	18
Chicago	3	0	12	0	0	15
Philadelphia	4	0	11	0	0	15
San Francisco	4	0	13	0	0	17
Boston	0	5	10	0	1	16
Detroit	2	0	6	0	0	8
Dallas	6	0	6	0	1	13
Washington	2	3	7	0	0	12
Houston	7	0	5	0	0	12
total	36	10	95	1	2	144

Subgroup	yes	reinforce	no	don't know	n.a.	sum
SG 1	7	1	12	0	0	20
SG 2	4	1	15	0	0	20
SG 3	7	1	12	0	0	20
SG 4	7	2	11	0	0	20
SG 5	10	0	10	0	0	20
SG 6	4	1	15	0	0	20
SG 7	5	1	13	1	0	20
SG 8	5	3	11	1	0	20
SG 9	3	2	14	1	0	20
SG 10	5	0	15	0	0	20
total	57	12	128	3	0	200

Answers for low-power antenna

ADI market	yes	reinforce	no	don't know	n.a.	sum
New York	2	1	10	3	2	18
Los Angeles	10	0	6	2	0	18
Chicago	3	0	12	0	0	15
Philadelphia	5	0	3	7	0	15
San Francisco	10	0	4	3	0	17
Boston	0	3	7	5	1	16
Detroit	2	0	5	1	0	8
Dallas	6	0	6	0	1	13
Washington	2	0	5	5	0	12
Houston	9	0	2	1	0	12
total	49	4	60	27	4	144

Subgroup	yes	reinforce	no	don't know	n.a.	sum
SG 1	12	1	6	1	0	20
SG 2	10	1	9	0	0	20
SG 3	12	0	6	2	0	20
SG 4	10	1	8	1	0	20
SG 5	13	0	7	0	0	20
SG 6	6	1	8	5	0	20
SG 7	8	0	8	4	0	20
SG 8	8	2	6	4	0	20
SG 9	11	1	6	2	0	20
SG 10	10	1	6	3	0	20
total	100	8	70	22	0	200

Table DET_ANT.XLS

Attachment 1:

Specialist Group Report on ATV System Convergence

Report of Specialist Group

Question:

a. If different systems appear to be preferable for cable, broadcast, satellite, and/or VCR, would fostering convergence be beneficial ?

b. How could this be accomplished ?

General Discussion

It should be understood at the outset that even if one basic ATV system is embraced by all media, the detailed implementation must vary by media. This is a technical necessity because of the different modulation formats used (FM vs AM or Digital) and the different types of impairments which dominate different media. For example, FM modulation is generally used on satellite to achieve needed signal to noise. Subcarriers do not fare well in FM because of triangular noise, making MAC (Multiplexed Analog Components) formats desirable. Quadrature amplitude modulation, which might be used terrestrially, is not an option for satellite. Similar concerns arise for tape recording. It should also be understood that these differences may be innocuous, requiring only simple translation media to media and to a common decoder/display input. A "family" of formats with these sorts of differences exist currently for NTSC.

The question can be viewed in two ways since there are two types of convergence which can be defined:

1. "Convergence" intermedia - i.e., the ability of various media to handle signals originated in other media.

2. "Convergence" at the consumer hardware - the ability of the consumer appliance, with or without accessories, to display the signal delivered by various media.

Regarding the first interpretation, "Convergence Intermedia":

Some aspects of this are crucial and appear at the consumer level. For example, it will be necessary for cable to distribute broadcast signals to consumers, presumably in the broadcast format, regardless of any other ATV service cable undertakes. Basic consumer VCR's will have to record and play back ATV signals received from (at least) broadcast and cable media. These are obvious demands of the marketplace and require no other stimulus, although cable carriage of broadcast signals has a long, and likely to continue, regulatory history.

It is also necessary to assure a practical chain of delivery for terrestrial signals. Certainly, testing of all links of this chain of delivery (not necessarily including VTR's which may follow) should be completed before finalizing a terrestrial standard. The broadcast industry itself is in the best position to make technical judgments on these issues in ATV as it has for the NTSC chain of delivery. Capability of direct carriage of the terrestrial signal on cable and delivery of a suitable signal to the broadcast point by satellite or other medium is necessary as has been recognized by SS/WP4 in their statement of the process by which they intend to establish a recommended terrestrial standard.

These and similar considerations will exercise a strong influence on the freedom of choice of alternate media in selecting an ATV system, hence on the ultimate convergence of systems at the consumer.

It is technically quite possible that very different systems might be desirable for some media. The primary reason alternate media might opt for an ATV system different from that selected for terrestrial broadcast is to fully utilize the capability of a particular medium - in short, to deliver better pictures at the expense of bandwidth or cost, expecting a competitive advantage. A secondary reason could be to achieve signal security and addressability. If these media could command a large enough market to attract manufacturers of displays, they could proceed separately from any broadcast concern. On the other hand, it is very likely that TV manufacturers will choose to include the broadcast market for what must certainly be an expensive display. This provides strong technical and commercial reasons for the systems of other media to converge with the broadcast system, at least to the point of being "interoperable" or "friendly". The selection of a terrestrial standard of high quality will reduce the incentive for alternate media to choose a different system.

Thus, the best way to foster this convergence is to select (as rapidly as can be practically done) a terrestrial system which provides the highest possible quality and which accommodates tape recording, signal security, and which can be carried by cable etc. These are the stated objectives of SS/WP4 which is to recommend standards to the FCC through the FCC-ACATS.

Regarding the second interpretation, "Convergence at the Consumer Hardware":

Allowing for the possibility of different systems for different media, certain commonality must exist, of course, if the consumer is to be able to have access to different media in an uncomplicated way and without undue expense. The questions of implementation and interrelationship are being considered specifically by the ATV Receiver Interface Subcommittee of the EIA ATV Committee as well as PS/WP4, SS/WP4 and others. The EIA group is defining interface(s) at logical points within a receiver which can accommodate the needs of alternate media. Of course, this involves selection of parameters "friendly" to both terrestrial broadcast and other media. The completion of this definition must await selection of the terrestrial standard.

The EIA is the proper forum for such definition from both a technical and business perspective. They represent those who must make a business of manufacturing receivers and those whose business lies in alternate media delivery. The EIA should be looked to for technical definition of this interface whether the ultimate implementation is mandated or voluntary standards or the marketplace.

Conclusions:

Question a.:

If different systems appear to be preferable for cable, broadcast, satellite, and/or VCR, would fostering convergence be beneficial ?

Response:

Fostering convergence would be beneficial from a technical/economic perspective to the extent of assuring interoperability of the receiver/display with different media in an uncomplicated manner and without unnecessary cost. This means that interfaces should be defined which allow different media to utilize the maximum functionality of the receiver/display.

Definition of a terrestrial standard and appropriate display interfaces should bring sufficient commonality between media. It is too early to establish standards for alternate media delivery to consumers which does not involve broadcast. Even if regulation of these heretofore unregulated media is contemplated, a set of competing proposals specifically tailored to these media must exist before a standard definition is potentially needed.

Question b.:

How could this be accomplished ?

Response:

Several approaches for fostering convergence have been suggested. The following, for example, is abstracted from the FCC-ACATS second interim report:

> In this regard, consideration may be given to a variety of approaches including: establishing a "family" of standards, adopting standards governing the receiver display device, and developing a multiport receiver to accommodate different media."

The necessary activities to encourage and technically define the needed convergence are in place within the FCC-ACATS and in the industry in the form of EIA standard setting activity for interface and ATSC consideration of these same issues. The development of a receiver interface definition is needed for the technical reasons stated above. Expeditious selection of a high quality, well planned, terrestrial standard will allow this effort to be completed and interoperability established.

It is premature to consider a requirement for inclusion of various interfaces in the receiver. There are many possible methods of delivery, none of which have established industry standards for HDTV within the medium. Even after such definition, mandatory requirements should be approached with careful consideration of the economic ramifications. Requirements for inclusion of special interfaces across the board could increase the cost to many consumers unnecessarily. There are alternatives of voluntary standards or marketplace determination. Industry organizations such as EIA should provide guidance in these areas.

A "family" of formats will necessarily be developed to establish the "chain of delivery" for Terrestrial Broadcast ATV signals as has been established for NTSC. This requirement is a recognized part of the system selection process outlined by SS/WP4. If standards are to be developed, the broadcast industry itself is best qualified to define and implement these standards.

Attachment 2:

TV-station Survey - Final Report

FCC-IS/WP2
Doc. #
February 5, 1990

Survey of US Television Stations

By: Detlev Otto, PCEC

Executive Summary

A study was carried out to determine in detail the situation of the US television station in the matter of a potential upgrade to a two-channel ATV system. The study focused on transmission equipment (transmitter, antenna, tower) only. The first part consisted of a round of interviews with nearly 350 Chief Engineers, Technical Directors or Station Managers. The goal was to determine statistically significant information on the availability of antenna space on the existing towers and the possibility to erect additional towers if needed. For the second part cost and time estimates for this upgrade were developed.

The survey indicates that there exist some major markets which are likely to experience severe technical and political difficulties when trying to obtain additional tower space. The majority of TV stations in these markets share one or two (community-)towers in the midst of a heavily populated area. Expansion possibilities are limited and plans for new towers are often opposed by the local population and/or government. Examples for these markets are: New York (World Trade Center and Empire State building), Chicago (Sears tower and Hancock building), San Francisco (Mount Sutro) and Minneapolis-St. Paul (3 tower cluster for all stations). Boston, MA, is worth to be mentioned as well because of its strict radiation limits.

As for overall results, in case a full-power 2-channel ATV system would be selected approximately 28% of all stations would be able to accommodate the second antenna on their existing tower with no or only minor modifications. 7% could upgrade their existing structure. The remaining 65 % could either erect an additional tower at the existing site (30%) or would have to develop a new tower site (35%).
The percentages for an upgrade to a low-power ATV system are 50%, 5%, 19% and 26% respectively.

There is no statistically significant correlation between ADI rank and distribution of responses.

A well planned and exercised upgrade can be performed within 18 to 24 months as long as no legal action is required to settle zoning problems and/or citizens complaints against the new structure. Stations in densely populated areas are most prone to face this type of problems which not only will delay the process by up to several years but increase cost as well, in some cases by several million dollars.

1. Introduction

Some time earlier this year objections to a two-channel ATV system were expressed by several television stations which claimed that an upgrade would not be technically feasible due to existing restrictions concerning the availability of additional antenna and tower space. This issue was brought before the Implementation Subcommittee ('Lex Felkner Issue' # 5, see Appendix A). It was decided to carry out a survey to clarify the severity of this issue and obtain factual information on the severity of this potential problem. The survey was conducted during October and November 1989 and reflects the situation at this time.

2. Sample description

The samples were selected based on the latest information available from Warren Publishing, Inc, Washington DC (TV-factbook). A sample size of 300 to 400 was regarded as necessary to obtain statistically relevant data. The following sample plan was used:

- Only TV stations on the US mainland were selected (excludes also Alaska)
- The stations were sorted by
    1. ADI rank
    2. City of License
    3. Call sign
- For the top-10 ADI markets a 100% sample (152 TV stations) was selected.
- The remainder was split into 10 subgroups of equal size (118 stations each, except SG10 with 121 samples) and 30 call signs were randomly selected out of each group. After accounting for double selection of call-signs (random number generator) the first 20 call signs of each group were defined as sample of the according subgroup. The remaining samples were retained in case a 'runner-up' was needed. In case the prepared list was insufficient more stations were randomly drawn of the population and interviews conducted until the planned sample size of 20 per subgroup was reached.
- Special attention was given to stations which share space on a tower with other stations to allow for a separate analysis at a later point if necessary.

The interviews were conducted by phone, contact was made with either the Chief Engineer of the station or the Engineering Manager, Director of Engineering or VP Engineering & Operations.

The goal during the first round of interviews was to obtain attributes (primarily yes/no answers) to develop a global understanding of the tower/antenna situation as a whole.
In the second round the timeline and expenditure estimates were developed with input from broadcast engineering consultants and tower/antenna manufacturers.

In several cases the contact person could provide information on more than one television station. If this was a 'tower-sharing' situation with more than two TV antennas mounted (within the top-10 markets) at least one confirming interview was conducted. In case of satellite operation or having one station operate several others as well (very often the case with PBS) the information was obtained as well but not included in the tables of overall percentages to avoid any possible distortion of the results. For subgroup analysis all obtained results can be utilized.