

system proponents; 3) other sources (e.g., foundations).

It is the recommendation of the PS Chair that the Advisory Committee endorse the Working Party's efforts to find financing for their research projects. If the Advisory Committee elects to fund some or all of the proposed research, it is likely that it can be completed contemporaneously with the completion of system testing. If, however, other sources of funding must be canvassed, the time required to complete these efforts, and any subsequent research, should not be permitted to slow down the other work of the Advisory Committee. Therefore, to the extent funding can be obtained and research completed within the period of time needed to complete system testing, the PS Chair recommends that these results be factored into the Advisory Committee's deliberations. Because audience tests are not intended to compare attributes of various systems, per se, the Committee may wish to consider deferring these tests until the commencement of field tests.

F. IMPORTANCE OF CONCLUDING TESTS ON ALL PROPONENT SYSTEMS

In its first interim report, the Advisor Committee stated its belief "that efforts should be focused on establishing, at least ultimately, an HDTV standard for terrestrial broadcasting."³³ Although it will not be known

³³ "Interim Report of the FCC Advisory Committee on Advanced Television Service," June 16, 1988, p. 6.

with certainty until testing is completed, because of the pioneering efforts of a few, there is reason to believe this goal can be achieved.

The recent merger between two leading proponents has brought renewed prominence to the possibility of introducing, at least initially, a transmission standard offering significant enhancements to NTSC. Such a result could prove to be quite beneficial to broadcasters and viewers.

Nevertheless, the possibility of achieving an enhanced system should not, by itself, be sufficient to distract the Advisory Committee from its pursuit of an HDTV terrestrial transmission standard. It is also of utmost importance that whatever EDTV standard may be established is not an impediment to the development of full HDTV.

To make rationale decisions on these matters, the Advisory Committee must have complete information. Therefore, it is highly recommended that the Advisory Committee await the conclusion of testing before it attempts to reach any decision on either an EDTV or HDTV standard.

VII. RECAPITULATION OF RECOMMENDATIONS OF THE PLANNING SUBCOMMITTEE CHAIRMAN

It is evident that the Advisory Committee has made much progress in nearly reaching the critical testing phase of its work. For this work to continue, however, judgments and other guidance from the Advisor Committee are required on

several key matters. These issues, and the recommendations of the PS Chair, are recapped below.

- Production of motion sequence test materials must be funded. It is recommended that financing be contributed by system proponents.
- A decision as to which production method will be employed to prepare motion sequence test materials will be needed after the two schemes are demonstrated in June 1990. If consensus on the matter is not reached in PS/WP-6, it is recommended that the matter be resolved by the Advisory Committee's Steering Committee.
- It is recommended that source materials not be distributed to proponents (or anyone else) prior to, or during, testing.
- It is recommended that the Advisory Committee adopt the "range recording only" testing scheme in which in the initial (and perhaps only) round of subjective testing, system performance of only a limited number of interference and other impairments be evaluated.
- It is recommended that, if acceptable terms and conditions are reached, the Advisory Committee accept the offer of the Canadian Advanced Broadcast Systems Committee to participate in the subjective tests. It is also recommended that authority to establish a liaison with the CABSC be delegated to the Advisory Committee Chairman.
- It is recommended that the Advisory Committee deny the request to modify the subjective test procedure so that two different displays be employed.
- It is recommended that the Advisory Committee seek the assistance of senior FCC engineers as members of an expert panel of viewers.
- It is recommended that the Advisory Committee endorse the development of a series of channel allotment plans and assignment options by PS/WP-3.
- It is recommended that members of PS/WP-7 be encouraged to seek funding for the identified research and that, if it is completed prior to the conclusion of system testing, any results developed

be factored into the Advisory Committee's deliberations.

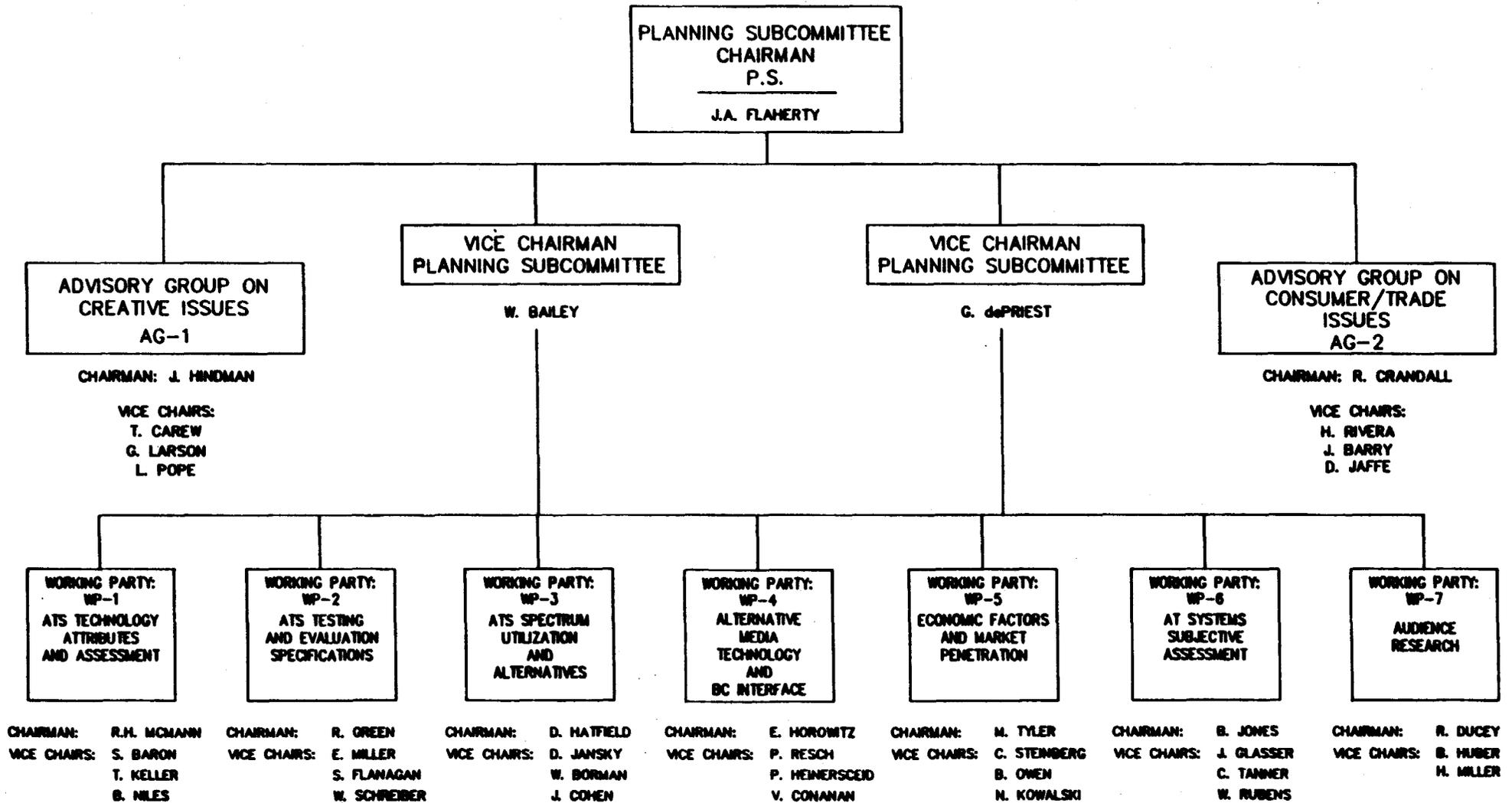
- Prior to making a final decision on transmission standards, it is recommended that the audio portion of finalist systems be fully evaluated.
- Make decisions and recommendations on HDTV (and EDTV, if appropriate) transmission standards after all appropriately scheduled proponent systems have been tested.
- It is recommended that development of field test procedures and other preparatory activities begin immediately.

VIII. APPENDICES

A. Planning Subcommittee Organization Chart

**FEDERAL COMMUNICATIONS COMMISSION
ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE**

1/31/80



**B. Second Interim Report of the FCC Advisory Committee
on Advanced Television Service**

March 21, 1990

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Federal Communications Commission
Office of the Secretary

**THIRD INTERIM REPORT OF THE
FCC ADVISORY COMMITTEE ON
ADVANCED TELEVISION SERVICE**

Richard E. Wiley
Chairman, FCC Advisory Committee

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- A. Roster of Advisory Committee Members
- B. Reports of the Planning, Systems and Implementation
Subcommittees
- C. Test Procedures Plan
- D. Richard E. Wiley Letter to ATV Proponents
dated - February 7, 1990

I. INTRODUCTION

This is the Third Interim Report of the Advisory Committee on Advanced Television Service.¹ The Advisory Committee was established by the Federal Communications Commission in 1987 to develop information that would assist the agency in establishing an advanced television ("ATV") transmission standard. The work of the Advisory Committee is being conducted primarily through its three Subcommittees (Planning, Systems and Implementation) and their constituent Working Parties and Advisory Groups.²

To date, substantial progress toward the Advisory Committee's overall goal has been made. During the first 18 months of its existence, as detailed in earlier reports, the Committee assembled the attributes of an ATV transmission system and developed a framework for assessing the performance of various proponent systems within each of these characteristics. Moreover, analysis of important spectrum issues and implementation scenarios were initiated.

Much of the past year has been directed to developing methodologies for testing the various ATV proposals that have

¹ In addition to the two previous interim reports (dated June 16, 1988 and April 26, 1989), the Advisory Committee, pursuant to a request from Congress, issued a report on February 4, 1989, addressing the matter of interrelationship between advanced television and U.S. "competitiveness."

² A roster containing the names and affiliations of the current members of the Advisory Committee and its Steering Committee (composed of the Advisory Committee Chair and the Chairman and Vice Chairs of the three Subcommittees) is attached at Attachment A.

been introduced. This work has progressed to the point that the critical testing phase of the Advisory Committee's work is nearly ready to begin.

During Working Party deliberations on the test plans, however, several matters have arisen upon which Advisory Committee judgments must be rendered before actual testing can commence. Moreover, the Committee's guidance has been sought on future efforts to be undertaken by the Subcommittees. In this Third Interim Report to the FCC, findings and conclusions are presented on those several unresolved matters before the Advisory Committee and direction is provided concerning the tasks assigned to the Subcommittees over the course of the next several months.

II. SYNOPSIS OF ADVISORY COMMITTEE ACTIVITIES

The three Subcommittees and their various Working Parties have been extremely active over the past year. Their work is detailed in the Subcommittee Reports attached to this document (see Attachment B). A recap of their activities is presented in this section of the Interim Report.

A. Planning Subcommittee

Because much of the Advisory Committee's work has shifted to the Systems Subcommittee, Planning Subcommittee Working Parties 1, 2, 4, and 5 have experienced a diminished

level of responsibility.³ However, Working Parties 3 (PS/WP-3 Spectrum Utilization and Alternatives), 6 (PS/WP-6 Subjective Assessment) and 7 (PS/WP-7 Audience Research) remain highly active.

PS/WP-3, in conjunction with the National Association of Broadcasters, surveyed television chief engineers on auxiliary band usage to establish congestion levels. The Working Party also worked to further define the effect that various "taboos" would have on spectrum availability. In addition, a new Specialist Group was formed to consult and coordinate ATV spectrum plans with Canada and Mexico. Finally, the Working Party briefed system proponents on the nature of interference situations that would have to be accommodated for NTSC/ATV coexistence.

³ Advisory Groups 1 and 2 (PS/AG-1 Creative Issues and PS/AG-2 Consumer and Trade Issues) were not active during this period. Working Party 1 (PS/WP-1, Technology Attributes and Assessment) modified the attributes matrix in several respects. Working Party 2 (PS/WP-2, Testing and Evaluation Specifications) specified methodologies for seven of these new items for inclusion in the test parameters plan and referred three items to PS/WP-6 (Subjective Assessment). Working Party 4 (PS/WP-4 Alternative Media Technology and Broadcast Interface) continued its work of monitoring proponent system development and impressing upon the industry the need for broadcast advanced television standards to interface efficiently with non-broadcast media. Working Party 5 (PS/WP-5 Economic Factors and Market Penetration) held a joint meeting with SS/WP-3 to further review the factors affecting market demand and penetration and to discuss the market projections that SS/WP-3 requires in conducting its cost studies.

Among the notable achievements of PS/WP-6 during this period was the near completion of work on the creation of the necessary "still" test images and the development of plans for producing the "motion sequence," or dynamic, test material. Moreover, based on a reassessment of the requirements for motion sequences, the total number of required test segments has been reduced from 32 to 23 -- nine still and fourteen motion. This refinement will bring important savings in both the resources and time needed to produce the original motion sequences used for testing. Finally, PS/WP-6 has developed alternative techniques for producing the ATV dynamic test materials which require the shooting of identical scenes in either two or four formats. Although much of the resources needed to produce these materials has been made available, it has been estimated that roughly \$800,000 in cash may still be required. A formal analysis and comparison of the two techniques is scheduled for June 1990.

For its part, PS/WP-7 reviewed and responded to the Advanced Television Test Center ("ATTC") proposed study of consumer reactions to letter box displays. In addition, PS/WP-7 issued RFPs for the four study designs that it had developed previously, resulting in the submission of over twenty proposals by more than a dozen research organizations. These proposals were carefully evaluated and, on the basis of

the subsequent interaction with the respondents, PS/WP-7 has concluded that the research program that it has developed can be completed satisfactorily in 12 to 18 months at a cost of perhaps \$850,000.

B. Systems Subcommittee

Over the past 12 months, Systems Subcommittee Working Parties SS/WP-1 (Systems Analysis) and SS/WP-2 (System Evaluation and Testing) have been busy laying the groundwork for the tests of system proponents.⁴ On the basis of information developed both in written submissions from proponents and through oral presentations made at its January 24, 1990 meeting, SS/WP-1 has pre-"certified" six of the nine proponent systems that had been originally scheduled to be tested⁵: ACTV I and II submitted by David Sarnoff Research

⁴ Work is also progressing in the other Systems Subcommittee Working Parties. Estimates of the cost of each of the proponent systems are being developed in SS/WP-3 (Economic Assessment). This information, as well as the data developed in the tests and also input from components of both the Planning and Implementation Subcommittees, will form the basis of recommendations reached initially in SS/WP-4 (System Standards) on a terrestrial broadcast ATV transmission standard.

⁵ To facilitate planning by the Advisory Committee and the test facilities (ATTC and the Cable Laboratories, established by the broadcast and cable industries respectively), proponent systems are required to be "certified" well in advance of the scheduled test date. Certification will be accomplished in two stages. A preliminary certification will be issued if, following a precursory review, it is determined that the system is
(continued...)

Center; HDS NA-6 (analog simulcast) submitted by North American Philips; MUSE-6 and Narrow MUSE submitted by NHK, and SC-HDTV submitted by Zenith. The offerings of three other companies -- Genesys from Production Services, Inc., SuperNTSC from Faroudja Laboratories, and a channel compatible system to be developed by the Massachusetts Institute of Technology -- have not yet been pre-certified.⁶ SS/WP-1 will endeavor to pre-certify these remaining systems, through either paper analyses or on-site hardware examinations. However, as discussed more fully in Section III below, systems which are not pre-certified by June 1, 1990 will no longer be guaranteed a testing slot.

All tests will be conducted in accordance with the Test Management and Test Procedures Plans, which were developed by SS/WP-2.⁷ These plans are essentially complete and, once the

⁵(...continued)
technically feasible and that the proponent will actually develop hardware for testing. A second, more rigorous, review will take place ninety days before the date that a particular system is scheduled to be tested.

⁶ At a September 28, 1989 meeting between the Advisory Committee Chairman and system proponents, a "Sequence and Pro Forma Calendar" was developed in which all nine of these systems were scheduled for test. Each proponent has paid the required non-refundable reservation fee.

⁷ All of the objective, and some subjective, tests of proponent systems will be conducted at ATTC in Alexandria, Virginia. As discussed in the following section, subjective tests may be conducted jointly by the Advisory Committee and the Canadian Advanced Broadcast Systems Committee.

test material and the last remaining pieces of testing equipment are delivered to ATTC, testing can commence. A revised, and near final, test schedule (with testing expected to begin in the early fall) will be established at a forthcoming meeting of ATV proponents. However, as experience is gained through actual testing, some further refinement or modification of even this schedule (and of the test plans themselves) may prove to be desirable. Moreover, as discussed in Section III below, it is contemplated that additions will be made to the test plans to provide for both the assessment of audio quality and dynamic resolution and also the conduct of (non-laboratory) field tests.

C. Implementation Subcommittee

The Implementation Subcommittee is composed of two Working Parties: IS/WP-1 (Policy and Regulation) and IS/WP-2 (Transition Scenarios). Both have met regularly during the past 12 months.

IS/WP-1 has considered the legal and policy implications of both the standards-setting activity and various spectrum assignment concepts. The Working Party has not yet resolved all of the issues presented in developing a means of assigning spectrum for advanced television. With regard to the first issue, however, IS/WP-1 has concluded that the FCC legally can, and, as a policy matter, should establish a

single broadcast ATV transmission standard. The Working Party also has produced a paper discussing the policy issues associated with proprietary technology and intellectual property rights in the context of advanced television.

IS/WP-2 has been devoting the bulk of its efforts to describing the activities and events associated with converting from NTSC to ATV so as to identify and understand fully the critical implementation factors that are presented by various methodologies. PERT charts have been produced for every scenario, and it appears that the most important element in each is the transmitter facility. To more fully understand the various aspects involved in facility changes, the Working Party conducted a survey of broadcasters throughout the country.⁸ The study's results indicate that expansion at existing sites may be difficult in some major markets, including New York City. Overall, however, a majority of licensees should be able to upgrade their facilities without developing a new tower site.

⁸ A 1989 NAB survey also contained questions on this matter. Draft results of the survey have not yet been verified for consistency with the IS/WP-2 study results.

III. FINDINGS AND CONCLUSIONS

As indicated, a number of matters have arisen in the work of the Subcommittees and their constituent Working Parties upon which judgments must be rendered by the Advisory Committee before testing can commence. Additionally, the Committee's guidance has been sought concerning future efforts that should be undertaken by the Subcommittees. The findings and conclusions of the Advisory Committee on these, and other, matters are presented below.

A. Test Plans

1. Approval Issues

The Test Management Plan has been approved previously by the Advisory Committee. The Test Procedures Plan (see Attachment C) -- which encompasses the Objective and Transmission Tests, the Cable Television Transmission Tests, and the Subjective Tests -- has now been completed, and is likewise approved.⁹

⁹ In approving these plans, the Advisory Committee is also rejecting the request to provide for the use of two different monitors. The Committee concurs with the views expressed by the Planning Subcommittee Chair that such a procedure would tend to reduce the test process to an evaluation of the test instruments rather than the systems under test. Moreover, granting this request could open the door to future proponents who might seek to tailor the test equipment to the characteristics of their own transmission

(continued...)

Some further refinement or modification of these plans may prove to be desirable, however. Furthermore, as discussed below, these plans will be expanded to include evaluation of dynamic resolution, audio quality, and field tests. To permit the testing process to continue on as expedited a schedule as possible, it is envisioned that these, and other, changes will be implemented through the normal Working Party/Subcommittee process. Although the right of final review resides in the full Advisory Committee, any disputes that arise will be addressed by the Advisory Committee Chairman and, if necessary, the Steering Committee. The Advisory Committee Chair will circulate material changes in these plans to members of the Committee.

2. Additions to Test Plans

For various reasons, the Test Procedures Plan, as currently drafted, does not contain subjective dynamic resolution or objective and subjective audio tests, nor the method to select which test materials, once video taped in the laboratory with transmission impairments, will be finally assessed subjectively by non-expert viewers. It also does

⁹(...continued)
system. It is the Advisory Committee's view that accommodating such requests would be inappropriate.

not provide for field tests, even though these will surely be necessary.

Dynamic Resolution Test Procedures: A procedure for evaluating dynamic resolution had been developed previously which, in the opinion of at least some knowledgeable individuals, would not prove practical. The major point of concern is a highly technical matter involving certain characteristics of high definition television cameras. Although it is recognized that procedures have never been developed to assess this attribute of television images, the Advisory Committee believes that this matter is not insoluble. Moreover, information as to the relative performance of various systems on this parameter appears to be of critical importance. Therefore, it is necessary to provide for an evaluation of this attribute in the Test Procedures Plan.

Audio Test Procedures: It is apparent that a final decision on a new transmission standard cannot be reached until the performance characteristics of audio subsystems known. However, the present plans do not call for testing in this area due to the relative difficulty of designing an improved video subsystem, compared with an improved audio subsystem, and also the fact that the proponents had a very brief period to develop their ATV systems under the original test schedule. Since testing has been delayed nearly a year

later than originally planned, and on the basis of recommendations from both the Planning and Systems Subcommittees, the Advisory Committee now believes that proponents will have sufficient time to fully implement the audio portion of their systems prior to test.¹⁰ Hence, it is appropriate to modify both the Test Management Plan, to require that ATV systems include complete audio subsystems, and the Test Procedure Plan, to include audio quality tests.

Working Parties 1 and 2 of the Planning Subcommittee and Working Party 2 of the Systems Subcommittee have already begun to resolve the various technical issues involved in developing a set of procedures for the evaluation of both dynamic resolution and audio subsystems. Because laboratory testing will begin this fall, new and modified procedures affecting these tests should be drafted, circulated and approved by the relevant Working Parties and Subcommittees no later than July 31, 1990. These new procedures will then become part of the Advisory Committee's Test Procedure Plan. As indicated above, although the Advisory Committee will retain right of final review, any disputes which may arise during the completion of this task will be resolved by the Committee Chair or, if necessary, the Steering Committee.

¹⁰ In fact, the technical documentation submitted to SS/WP-1 recently indicates that all but one of the systems currently scheduled for testing include a full audio system.

Again, material decisions will be circulated to Advisory Committee members.

Field Test Plans: Procedures to govern field testing must also be developed as soon as practicable. The Planning and Systems Subcommittees have incorporated the necessary tasks into their upcoming work schedules. It is envisioned that these plans will be completed no later than the end of 1990.

3. Proponent Certification

ATTC, the institution at which the bulk of the testing will be performed, does not have unlimited funds. Moreover, the Advisory Committee does not have unlimited time to complete its work. Thus, a certification program has been established to help ensure that only those systems which have been reduced to hardware and are likely to work are scheduled to be tested.

To facilitate an expeditious test schedule, but also in recognition of the evolutionary state of development of many systems, a two stage process has been developed by SS/WP-1 to certify proponent systems for testing. As noted above, six of nine systems were pre-certified by SS/WP-1 at its January 24, 1990 meeting. Pre-certification of the remaining proponents must be accomplished by June 1, 1990 (approximately 90 days prior to the commencement of

laboratory testing). This date also coincides with the deadline date established by ATTC for payment of the required remainder of testing fees. Systems which have not been granted pre-certification prior to June 1 will not be guaranteed a testing slot. However, time and resources permitting, they may become eligible for testing at a later date.

B. Source Material

1. Production and Funding

Prior to the initiation of ATV proponent testing, appropriate video test materials must be produced. Before such material can be produced, however, financing must be identified and a production method selected.

The types of video material required, and two general approaches to producing this ATV material, have been identified¹¹: 1) the production of "identical" picture materials in four distinct scanning formats using the BTS KCH-1000 multiscan camera; and 2) the production of "identical" picture material in two scanning formats using the BTS KCH-1000 multiscan camera, with images in the remaining formats derived via a standards converter. As

¹¹ Each methodology also includes the production of material via electronic graphics and film transfer.

discussed, a comparison between video material generated using these two production methods is planned for June 1990. PS/WP-6 is prepared to assess the results of that comparison and make a recommendation as to which to employ. If a consensus is not achieved, the Advisory Committee Chair and, if necessary, the Steering Committee should resolve the matter in the interests of expedition, with right of final review remaining with the Advisory Committee.

The Ad Hoc Group on Production Planning, which was formed under the auspices of PS/WP-6, has estimated that production costs will range between roughly \$2 and \$2.2 million, depending upon the production method employed. It is anticipated that approximately \$1.4 million of this total will be obtained through the generous loan of equipment from members of the Ad Hoc Group. Nevertheless, a sizeable amount of cash -- the Ad Hoc Group estimates \$800,000, and it could run as high as \$1 million -- is still needed for professional services of various types to actually produce the test materials.

There appear to be only three realistic options for addressing the source material funding issue¹²:

¹² Because all of the proponent systems rely heavily on video compression techniques to meet the bandwidth constraints imposed by the FCC, it is not possible to dispense with the tests employing motion sequences. Without some way of assessing the motion artifacts of those

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1. Obtain necessary funds from some or all of the system proponents;
2. Obtain necessary funds from the Advisory Committee through a mandatory or voluntary assessment of Committee members;
3. Obtain necessary funds from the Federal Government and/or private foundations.

The Advisory Committee has carefully considered these options and concludes, on balance, that it should endorse the first option (consistent with the view of Committee Chair, contained in a letter to system proponents, dated February 7, 1990, and attached hereto as Attachment D). Many firms and companies without a direct financial stake in this process are already spending significant amounts through support of the ATTC and the Cable Labs. The proponents potentially have the most to gain from the adoption of a new ATV transmission standard and, therefore, are logical candidates for supporting it. Additionally, the level of funding would appear to be modest compared to the investment that most of the proponents have made, and will continue to make, in developing their systems. The Advisory Committee Chair is directed to meet with the proponents within the next month to work out an arrangement for funding the production of motion

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techniques, it will be difficult to reach a rational conclusion on a new transmission standard.