(AEI Press, 1991) in which the author contended that HDTV developers should not receive subsidies, the position of the Reagan-Bush administrations. Such a view, of course, missed the role and efficiency of United States action and subsidy for high definition television. Years of support from the Defense Advanced Research Projects Agency, National Science Foundation and other federal agencies to universities and research centers for basic research in image compression, high speed computing, communications, encryption, flat panel displays and viewer requirements had laid the basis for innovations in digital technologies for high definition television as the industrial policy debate was raging. The United States promoted these researches in collaborations among government, industry and academy, so that unlike Europe and Japan, where centralized planning produced analog solutions for high definition television at estimated costs ranging from $2-4B US, the United States may get a vastly better return on its estimated $200 M industrial policy dollars in flat panels, high density recording devices for HDTV and compression technologies. The HDTV industrial policy controversy also shed needed light on strategic commercial technologies, which will be playing ever important roles in the balance of current accounts now that the cold war is over.

The Federal Communications Commission, as the responsible federal agency for broadcasting and telecommunications, stepped into the industrial policy debate gingerly, particularly during the

Reagan-Bush years, but adroitly with three key policies. First, the FCC specified that terrestrial, broadcast HDTV would be simulcast in a 6MHz frequency adjacent to a NTSC broadcaster's NTSC frequency allocation. In so doing, the Commission ruled out augmented HDTV systems, which would have required greater spectrum, and provided incumbent broadcasters a huge boost in asset value (at a time cable was challenging asset value) by indicating they would be the recepients of the additional spectrum allocation. Second, the FCC encouraged system proponents to consider a merged system, combining the best attributes of individual proponents. Third, the FCC indicated that the terrestrial, broadcast HDTV transmission system would have to be interoperable. In articulating these policies, the Commission fashioned industrial policy without expressly choosing any individual winner or loser.

The election of President Bill Clinton and Vice President Albert Gore also changed the terms of the industrial policy debate, especially, though not solely, because of Gore's competence in technology policy. Gore is responsible for technology in the administration and the administration is promoting strategic commercial technologies, most notably a National Information Infrastructure (NII) to speed development of information technologies (IT) and to accommodate the conversion of defense technologies to civilian applications and commercialization. In broad outline, the National Information Infrastructure reaches

across such sectors as educational media and computing, medical imaging, publishing and page graphics, business image communications, and scientific and defense image communications. It is characterized by strategic alliances in communications, including collaborations between regional phone and cable companies to deliver video services. (Liebhold) At present, discussion centers around the extent of private funding and state subsidy for infrastructure development, trade-offs between optical fiber or Integrated Services Digital Network (ISDN) delivery, and encryption protocols. A digital, interoperable, progressive scanned, broadcast HDTV system with square pixels would make a better long term fit with the emerging National Information Infrastructure than a system without these attributes. As a result, participants from sectors affected by development and deployment of a National Information Infrastructure now see a vital interest in the terrestrial, HDTV broadcast transmission standard and how it will affect their costs and activities. It is against this broad background that a Grand Alliance of HDTV system proponents emerged.

For example, it is noteworthy that HDTV system proponents formed the Alliance and incorporated computer industry specifications of progressive scanning and square pixels within a week of statement to the FCC from Apple, AT&T, Compaq, Control Data Systems, Cray Research, Data General, Digital Equipment, Hewlett-Packard, IBM, Silicon Graphics, Sun Microsystems, Tandem and Unisys that the

computer industry would develop a separate, interoperable system for advanced television. So critical are these computer industry concerns that FCC Commissioner Ervin Duggan replied to the computer industry that "the United States should seek a digital video standard that is fully interoperable among all video media" and that the terrestrial broadcast standard "must not leave important players stranded on islands of incompatibility."[3]

Less immediately pressing, though of comparable importance, display manufacturers within the consumer electronics industry recognize that growing markets for interactive programming of the sort produced by firms such as Nintendo and Sega, home shopping through cable television and electronic information applications (under development by regional phone companies, cable interests and newspaper publishers) now require them to produce televisions with greater programming capacities. The explicit threat of computer hardware manufacturers to develop a separate standard, coupled with these growing interactive software and information markets, required that consumer electronics firms accommodate interoperability, square pixels and progressive scanning.

Any consumer electronics manufacturer without displays for interactive software and information markets axiomatically loses market share. Display screens require square pixels and progressive scanning to present increasingly complicated, digital information. The first generation of interactive games used 8

bits of digital information simultaneously; a following 16 bit generation boosted resolution, graphics and memory; a 32 bit generation is poised for the market later in 1993.

However, consumer electronic manufacturers also wish to vend a first generation interlace HDTV receivers to reach the widest possible market. As a result, the proposed merged system tries to accommodate a range of commercial requirements for the consumer electronic industry by using interlaced technology, presumably to speed HDTV diffusion through sales of interlace receivers, but as importantly potentially causing significant downward and upward compatibility problems and limiting economic growth and efficiency for non-broadcast interests.

3. The Grand Alliance

The Grand Alliance of the Advanced Television Research Consortium (Compression Labs, NBC, the David Sarnoff Research Center, North American Philips, Thomson Consumer Electronics), AT&T and Zenith Electronics, General Instrument, and GI and the Massachusetts Institute of Technology has strategic advantages. By agreeing on technical standards and patent royalties, Grand Alliance participants are hastening commercialization of terrestrial HDTV studio equipment and receivers. A proposed merged system promises to enable each to participate in future revenues, provides the FCC with a less troublesome, consensus system to evaluate, and satisfies Congress that industry can reach agreements to promote

manufacturing in the United States. Unlike lengthy court battles over provision of information services that characterize policy making for the regional phone companies and newspaper and cable industries, the consumer electronics industry with partners in telecommunications equipment industry and the academy is now the unlikeliest heros promoting economic growth in the United States.

A negotiation process seems to have diminished the likelihood of litigation that would have slowed HDTV diffusion. System proponents found themselves increasingly fine-tuning increasingly similar systems (Davies), making it more difficult for the Federal Communications Commission (Commission, FCC) and its Advisory Committee on Advanced Television (Advisory Committee) to reach a clear cut decision favoring one over another. Faced with more costs and risks and prospects of crippling litigation, participants sensibly negotiated. Litigation would invariably slow commercialization by tying up the FCC's selection decision in the courts.

While it appears that the HDTV that will emerge from the Alliance's proposed merged system would contain the necessary technical specification for interoperability with the much larger computer, imaging, cable and telecommunications industries by including progressive scanning and square pixels, it is hotly contested whether the system will be truly interoperable. Shortly after its initial announcement, a subsequent Grand Alliance

statement indicated that at least one of the Alliance's formats entails rectangular pixels, and on going controversy surrounds the Alliance's multiple image formats and its plans for interlaced HDTV transmissions and receiver displays. Displays 34 inches in diagonal and above will be manufactured by Alliance members for 787.5 progressive line resolution at 60 frames per second. Displays less than 34 inches will be manufactured by Alliance members for either progressive or interlaced scanning resolution. While it would seem that computer and telecommunications enterprises could achieve volume economies by manufacturing progressive scanning receivers for television markets as well as for computer and telecommunications sector needs and achieve scale economies for sub-component systems through this arrangement, the computer industry favors progressive displays exclusively.

Grand Alliance participants agreed to disagree over a uniform transmission standard and modulation. For transmission, the proposed merged system specifies that initial, terrestrial HDTV transmission will employ a progressive scanning standard at 24, 30 and 60 Hz and interlaced scanning at 59.94 and 60 Hz with six differing line rates to accommodate different Hertzian transmission rates. All film at 24 Hz will be transmitted in progressive scanning from the onset of terrestrial HDTV broadcasting. Future work, the Alliance asserts, will be directed to creation of a 1,000+ line progressive transmissions and

eventual elimination of interlaced signals. Modulation is still to resolved between one of two variable vestigial sideband modulation systems proposed by Zenith, or one of two quadrature amplitude modulation systems proposed by others.

In this regard, the proposed merged system that the Alliance will develop does accommodate broadcast industry requirements for interlaced transmission by providing for initial HDTV transmission capabilities in progressive and interlaced scanning modes. Although Fox Broadcasting supported progressive scanning and CapCities/ABC was undecided between interlaced and progressive transmissions, most broadcasters wanted interlaced scanning transmission.

Development and testing will tell how the proposed merged system will meet broadcast industry requirements that it reach equivalent service areas without interfering with NTSC transmissions or degrading abruptly at fringe reception points. Development and testing will also show whether the proposed merged system will be structured technologically so that broadcasters can exploit channel capacity for additional services. On these critical issues, broadcasters will want greater assurance.

On technical and policy matters, Grand Alliance participants agreed to employ source adaptive processing in receivers and to

support a unified compression standard of prioritized, packetized data to be known as MPEG-2 HDTV in international standardization fora.

4. Policy Issues

Due to its multiple formats, the Grand Alliance's proposed merged HDTV system will likely constitute a complex, interim standard. As such, it raises several policy issues concerning the public interest in the terrestrial, broadcast HDTV transmission standard which will eventually emerge for FCC approval. While it is immediately clear is that developers reached an agreement that appears to be workable in parts for various broadcast and receiver/display equipment manufacturing interests -- though no single industry got all of what it wanted -- serious issues remain as to how well the proposed merged HDTV system will serve the public interest, or for how long if at all.

At the outset, it would be a mistake to construe Alliance agreement over broadly. Formally, the Alliance is limited to recommending transmission standards to an Advisory Committee for its recommendation to the FCC. Standards for cameras and displays are beyond Alliance authority. Nor can the Alliance impose a compression standard on the Motion Picture Experts Group. Nor is the Advisory Committee or Commission bound formally to accept a final Alliance system. (Schreiber) The Commission has maintained that it will consider an applicant with a superior system.

To be sure, the Alliance can attempt and may well be attempting to impose de facto standards for displays and cameras and a de jure, international standard for compression by setting transmission standards and by specifying technical standards for displays among its members and by forming a united front for compression in international standardization fora. Formally, however, displays, cameras and standardization of compression technology reach beyond the Alliance's grasp.

The proposed merged system will likely raise costs for viewers, consumers, broadcasters and participants in a National Information Infrastructure (NII) by proposing to develop interlaced as well as progressive HDTV scanning. Viewers will almost certainly find their initial choices in displays limited to interlaced HDTV receivers. Consumer electronics manufacturers are geared to produce interlaced rather than progressive displays. Consumers may also face higher display costs because HDTV receivers will be manufactured to accept progressive and interlaced transmission signals, placing a redundant function in receivers. Multiple buffers and scanners also add to costs of interlace receivers. Deployment of interlaced HDTV receivers is hardly in consumers' interests. The Alliance agreement specifies decoding a signal to baseband video and then transcoding it for interlaced HDTV display or converting it for NTSC display. These complex algorithms will increase HDTV receiver costs without providing for upward compatibility. As economist Robert Cohen

pointed out, progressively scanned, interoperable receivers developed with a common system architecture would cost consumers less and provide better quality. (Cohen)

Broadcasters will face double upgrades. First, broadcasters will have initial costs purchasing interlaced camera and studio equipment in order to stay competitive in image quality. Then, after initial investments in interlaced technologies, broadcasters will again be faced with a second upgrade for progressive camera and studio equipment not unlike the scenarios for European broadcasters with MAC technology. Broadcasters have little choice but to upgrade or suffer potentially ruinous competition in image and sound quality with other programmers carried over cable and optical fiber.

For National Information Infrastructure participants -- those diverse educational media and computing, medical image communication, electronic publishing, scientific visualization, and defense and other technical application sectors -- the proposed interim standard will likely increase costs of interoperability and participation. Ideally, a HDTV system would provide easy transcoding, conveyance, viewing and manipulating of interactive information across ranges of professional and consumer applications. If it would, all these sectors could more easily and less expensively promote information-based products and services.

As a consequence of attempting to grandfather-in interlaced scanning, the Alliance's proposed merged HDTV system could freeze technological development at an inferior, interlaced HDTV image quality. Because interlaced scanning inherently has less resolution than progressive scanning by virtue of presenting images in alternate rather than sequential lines, problems of downward compatibility could well cripple improvements in sound and picture quality for terrestrial HDTV and severely limit HDTV's positive economic effects for many others as a population of interlaced HDTV receivers diffuses. To sustain increased image quality beyond a 1050 interlaced signal, interlaced receivers will have to be equipped with vertical filters to eliminate interline flicker. Source adaptive processing in receivers alone is insufficient. (Schreiber).

In other words, any improvement in transmission and cameras beyond 1050 interlaced would degrade the images on the initial, interlaced HDTV displays with flickering lines. If broadcasters use interlaced cameras to provide programming, the vertical resolution will be no more than 500 lines and will place demands on the bandwidth for additional spectrum. Nor does the public benefit from interlaced displays: a 1050 interlaced HDTV image has lower vertical resolution than a 787 line progressive image.

To the extent history can guide decision-making, the FCC has repeatedly based innovation decisions for television upon their impact on the installed base of studio equipment and receivers. When broadcasters and consumers held relatively little NTSC studio equipment and receivers following World War II, the FCC decided against a more sophisticated standard to protect broadcasters' and consumers' investments in an installed base of NTSC equipment. After a brief foray supporting an incompatible color standard, the Commission welcomed a compatible color standard in 1953 on the perfectly sensible grounds that a compatible color standard did not disrupt an installed base of black and white NTSC studio equipment and receivers and provided compatible upgrading to color. Similarly, the Commission would be comparably hard pressed to obsolete interlaced HDTV once a population of interlaced HDTV receivers has diffused. No matter how pressing and sensible the views of enterprises and interests in telecommunications and computers that progressive receivers provide better quality for television consumers and promise greater economic growth in non-broadcast applications, the Commission would be impelled to give significant consideration to the installed base of terrestrial interlaced HDTV studio equipment and receivers that comprise terrestrial broadcasting, its area of regulatory oversight.

By agreeing on interlaced and progressive scanning for displays, the Alliance could well create a de facto interlaced HDTV

standard due to the market power of Alliance manufacturers and other European and Japanese television display manufacturers with already perfected HDTV interlaced displays ready for manufacture and their eagerness to get these receivers to viewers. Patent holders and manufacturers of interlaced receivers and studio equipment would be the major beneficiaries of the higher costs that viewers, consumers, broadcasters and National Information Infrastructure users will likely pay for dated, interlaced transmission technology.

Virtually all manufacturers of HDTV interlaced studio equipment and displays are European and Japanese corporations. In many cases, they maintain factories in the United States to manufacture television receivers. As a result, Alliance promotion of interlaced scanning transmission and displays could protract assembly jobs in the U.S. for interlaced receivers at significant costs to other equally important interests. In this regard, Thomson's participation in the Alliance fits a strategy to contest the American televsion receiver market at the same time it pursues MAC technologies in Europe. (Klebnikov)

Grandfathering-in interlaced receivers is additionally significant because it forecloses opportunities for American display and software enterprises and stymies commercialization by American firms of advanced imaging systems developed for the military during the cold war. Given the market power of Thomson,

Philips and Matsushita, among others, there is no incentive for an American firms to vend interlaced displays. In all probability, the market for interlaced HDTV displays would flourish uncontested. Interlaced receivers would also depress demand for interactive software, which displays best on progressive receivers, inhibiting growth of a strong U.S. sector, which would flourish further with greater numbers of progressive displays in use. Civilian commercialization of military technologies is critical for economic growth with the end of the cold war. Any number of firms with advanced imaging systems, developed initially for defense and space applications, would find greater civilian markets for their imaging systems if progressive displays were the standard.

For cameras, a newly devised camera by Koll-Morgen, a manufacturer of telescopes for the navy, and Liberty Television, a production company, provides a selection of formats at different speeds. The innovative design is unlike conventional cameras and was derived from high technology for the defense sector.

For segments of the computer industry, motion picture and television engineering industries, where there is a strong US presence, the Alliance's proposed merged HDTV system is already obsolete. Segments of the computer industry, motion picture and television engineering industries would have preferred a

progressive scanning system initially, digital identifying codes (headers and descriptors) at the beginning of image, voice and data streams, and greater flexibility to upgrade resolution while maintaining backward compatibility. All these features exist at this time and are not incorporated into the proposed merged system as fully as these interests recommend. However, at a press conference announcing the Alliance, a participant did indicate that headers and descriptors would be incorporated into the merged system during development and testing.

The technical specifications of interoperablity, progressive scanning, digital identifying codes (headers and descriptors), and flexibility to upgrade resolution while maintaining backward compatibility are all demonstrable strengths of American enterprises. Commercialization of these capacities in advanced or high definition television will create growth in imaging and multimedia, computers and workstations, telecommunications, the National Information Infrastructure and contribute significantly to job growth, a positive trade balance and future economic growth. By contrast, employment in display assembly and manufacturing is but one component of innovations, externalities and employment in these industries and sectors.

Policy Considerations

Due to these policy issues, several policy considerations repay attention.

Congress, the Commission and the Advisory Committee should assure an open, collaborative process, including participation from non-broadcast interests, as HDTV standard setting reaches its end game. Competitiveness has run its course and is yielded innovation in digital technologies.

Congress should encourage the Commission and the Advisory Committee to place premium consideration on interoperability. At this point, the Alliance agreement on progressive scanning and square pixels represents only a willingness in principle to include elements that are necessary to make HDTV interoperable while still holding on to interlaced scanning, which vitiates interoperability. "Wide application of such [interoperable] systems in broadcast ATV will generate economies of scale that will reduce or eliminate the high coast of converting signals across disparate environments. If the Commission establishes a standard broadcast image framework that will allow many communities to share the benefits and economies of scale of sub-component systems, such a system will be widely adopted," states Apple Computer scientist Michael Liebhold.

In the immediate short term, such a policy would require that Congress, the FCC and the Advisory Committee not place premium consideration upon the commercialization of terrestrial HDTV for the 1996 Summer Olympics in Atlanta. In the absence of unity on progressive scanning, such a course would virtually assure

deployment of interlaced HDTV. International events have at best a mixed record speeding communications innovation and commercialization. In 1936, Hitler placed great emphasis on development and display of television for the Berlin Olympics to demonstrate Nazi Germany's technological and racial hegemony. As a result, Nazi Germany rushed to develop an electro-mechanical television system as an electronic one became technologically possible. In preparation for the aborted 1940 Olympics, the Japanese planned to use a 441 line, interlaced system that became obsolete. In 1939, RCA made a great show of televising the World's Fair with a 441 line, interlaced system. When the New Deal FCC insisted on better image quality in the public interest, the National Television Systems Committee developed the 525 line, interlaced NTSC system still in use. Admittedly, the 1964 Tokyo Olympics boosted color receiver sales and put Japan on the path toward developing HDTV. Subsequent Olympics, World Cup and other international events provide opportunities for broadcast equipment manufacturers to showcase new products. However, the importance of these events and size of these markets, coupled with the likely interlaced inefficiencies, pales in contrast to multi-trillion information and imaging markets demanding interoperability and converging broadcasting, telecommunications and computers.

Congress may wish to re-visit the All Channel Receiver Act and mandate progressive HDTV receiver and displays so that a

population of interlaced receivers does not freeze technological development. Enacted in July, 1962 the All Channel Receiver Act, enabled the Commission to require that television receivers sold or imported into US would receive "all frequencies allocated by the Commission."[4] This enabled the opening of UHF so that there would be more choice for viewers by legally requiring domestic receiver manufacturers and importers to produce receivers that would present UHF signals. Adoption of comparable legislation for HDTV would create a level playing field for display manufacturers for high definition television in the same way that the All Channel Receiver Act created a level playing field for NTSC receiver manufacturers by requiring all to build receivers equipped for VHF and UHF. The ideal policy goal is to manufacture displays that provide the best image quality on variety of receivers without requiring low end receivers to have as extensive a decoder as an expensive one. (Schreiber)

To assure maximum spectrum efficiency, policy making should place greater emphasis on single frequency networks employing orthogonal frequency-division multiplexing. These transmission technologies promise greater programming capacity using less spectrum than either of the Alliance's interlaced or progressive transmission systems.

The Advisory Committee will wish to assure that terrestrial HDTV should reach equivalent service areas without interfering with

NTSC transmissions or degrading abruptly at fringe reception points. Channel coding with its inherent resistance to multipath transmission repays attention.

Congress should not ask more of the MPEG-HDTV compression algorithm than industry peace. Even if the MPEG-HDTV wins adoption by international standard setting bodies, such adoption will not, and given the likely economics for current incumbents in display manufacturing, cannot re-establish U.S. hegemony in consumer electronics.

By focusing technology policy for high definition television in these ways, the United States can assure maximum benefits of standardization of terrestrial, broadcast HDTV. As AT&T's Vail, RCA's Sarnoff and IBM's Watson foresaw long ago, value is in the network. Telephones, television and computers flourished according to that straightforward specification. With HDTV, networks now require interoperability (progressive scanning and square pixels at a minimum) for maximum participation by manufacturers, programmers, viewers and consumers. Technically bound, discrete telephone, television and computer networks no longer can produce value comparable to interoperable telecommunications, cable and broadcasting networks combining and merging voice, image and data, because they cannot provide comparable network reach or flexibility. Particularly with

digital technologies, where identifying codes enable precise billing for specific consumer needs, interoperability promises the most robust participation.

SOURCES

Cynthia Beltz, High Tech Maneuvers: Industrial Policy Lessons of HDTV (AEI Press, 1991)

Testimony of Dr. Robert B. Cohen, Economic Consultant, and Fellow Economic Strategy Institute, Washington, D.C., before the House Subcommitee on Telecommunications and Finance, 103rd Congress, May 27, 1993.

Council of Telecommunications Ministers Press Statement, 10 May 1993, and Press Statement 10085/93 Press 213) (CTM).

Elizabeth Corcoran, "Picture Perfect," Scientific American, Volume 266, Number 2, February, 1992, p. 94.

Rhonda Crane, The Politics of International Standards (Norwood, New Jersey: Ablex Publishing, 1979).

Kenneth P. Davies, "Digital Television Broadcasting Dreams, Decisions, and Destinites," SMPTE Journal, January, 1993, p. 32-36.

T.Fujio, J. Ishida, T. Komoto and T. Nishizawa, "High Definition TV System-Signal Standard and Transmission," SMPTE Journal Volume 89, 1980.

Takashi Fujio, "High Definition Wide Screen Television System for the Future-Present State of the Study of HD-TV Systems in Japan," IEEE Transactions on Broadcasting, Vol. BC-26, No. 4, December, 1980.

Takashi Fujio, "High Definition Television Systems: Desirable Standards, Signal Forms, and Transmission Systems," IEEE Transactions on Communications, Vol. Com-29, No. 12, December, 1981.

T. Hamasaki, T. Fujio, and T. Ohtani, "Subjective Evaluation Test for High-Definition TV Pictures Ising Simulated Color Slides," NHK Technical REport, Vol. 16, No. 10 (1973).

Paul Klebnikov, "Les Folies HDTV," Forbes, July 19, 1993, Volume 152, Number 2, p. 65.

Testimony of Mike Liebhold, Senior Scientist, Media Architecture Research, Apple Computer, Inc. before the House Subcommittee on Technology, Environment and Aviation, 103rd Congress, June 24, 1993.

National Cable Television Association, Twenty First Century Television, (Washington, D. C: NCTA, 1992).

Michael Niblock, The Future of High Definition Television in Europe, (Manchester, U.k.: The European Institute for Media, 1990).

T. Ohtani, T. Fujio, T. Hamasaki, "Subjective Evaluaiton of Picture Quality for future High Definition Television," NHK Technical Journal, Vol. 28, No. 4, 1976.

Michel Oudin, "European HDTV Operations (1250/50 Production/HDMAC Broadcast) in the Winter and Summer Olympic Games," SMPTE Journal, June, 1993.

Yuichi Ninomiya and B. Prasada, "Some Qualitative Results of temporal masking in Television Pictures," Proceedings 1979 Picture Coding Symposium, Ipswich, England, 1979.

Yuichi Ninomiya and Yoshimichi Ohstsuka, "A Motion Compensated Interframe Coding Scheme for Television Pictures," IEEE Transactions on Communictions, Volume Com-30, No. 1, January, 1982.

Yuichi Ninomiya, Yoshimichi Ohtsuka and Yoshinori Izumi, "A Single Channel HDTV Broadcast System - The Muse," NHK Laboratories Note, Serial No. 304, September, 1984.

Yuichi Ninomiya, Yoshimichi Ohstuka, Yoshinori Izumi, Seiichi Gohsi, and Yuichi Iwadate, NHK Science and Technical Research Laboratories, "An HDTV Broadcastig System Utilizing a Bandwidth Compression Technique-MUSE," IEEE Transactions on Broadcasting, Volume BC-33, No.4, December, 1987.

Ulrich Reimers, "Advanced Television Systems-The Situation in Germany and Central Europe," SMPTE Journal, May, 1993, p.398-402.

William F. Schreiber Letter to FCC Chairman Joseph Quello, June 1, 1993.

William Shawcross, Murdoch, (New York, New York: Simon and Schuster, 1992).

Gary Stix, "Domesticating Cyberspace," Scientific American, Volume 269, Number 3, August, 1993, p.100.

ENDNOTES

1. The author wishes to thank the Ameritech Foundation and the Japan Foundation for support researching high definition television and broadband technologies and wishes to thank Dr. Lee McKnight and Professor W. Russell Neuman for their insights. Any errors are my own.

2. Federal Communications Commission, Second Report and Order/Further Notice of Proposed Rule Making, Mass Media Docket 87-268, April 9, 1992, p.48, note 207. According to the Oxford English Dictionary, "interoperable" came into English with Britain's Skynet satellite in 1969. "Skynet is inter-operable with the IDSCP system and is intended to be inter-operable with its successors now in view." Nature, November 29, 1969; see also Science Journal, March 13, 1970, "In other respects the two nations' forces are working in parallel and Skynet [the Royal Navy's military satellite communications system] is compatible and interoperable with the US Defence Communication Satellite System." Oxford English Dictionary, Volume II, H-N, (Oxford, UK: Oxford at the Clarendon Press, 1976), p. 340.

3. Duggan statement cited in Communications Daily, Vol 12, No. 100, May 25, 1993, page 1.

4.Public Law 87-529, enacted July 10, 1962.

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

October 18, 1993

To: ACATS Technical Subgroup
From: R Sanderson
Subject: Joint Experts Group on Interoperability Report

PER THIS EARLIER (FAX) COMMUNICATION --- ENCLOSED IS COPY OF THE FULL INTEROPERABILITY REPORT, INCLUDING COPIES OF RELATED, SUBMITTED DOCUMENTS.

Attached is the Report on Interoperability by the Joint Experts Group on Interoperability. As you probably know, principal input to this report was derived from an interoperability review held October 6/7. In this review, the Grand Alliance presented an excellent summary of their response to the previously established, PS-WP/4 Interoperability Recommendations. An Interoperability Panel of invited experts representing a very broad array of stakeholder interests in the US ATV process. The Joint Experts Group authored the final report, which in turn is the basis for the report that will be delivered in the Technical Subgroup meeting October 21.

In order to give you as much opportunity to review this report we are FAXing the Executive Summary and selected Attachments today. We are also sending a complete copy of the report (which includes copies of documents submitted within the interoperability review) to your office address by express delivery tomorrow morning.

Should you have any question or wish to discuss this report prior to the October 21 meeting please contact either Mike Liebhold or me.

Regards, Bob Sanderson.

cc: M Liebhold

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EXECUTIVE SUMMARY
Joint Experts Group on Interoperability
Interoperability Review of Grand Alliance Proposal
October 6-7, 1993

The Interoperability Review of the Grand Alliance (GA) system proposal was held on October 6 and 7 in Washington, DC. The review was proceeded by an optional presentation at the ATTC covering "training" (illustration of impairments in digital ATV systems), "interlace vs. progressive", "transconversion", "quality". The ATTC presentation was repeated also on the evening of October 6 by request.

Starting point for the review was the Grand Alliance Interoperability Report detailing the GA response to previously defined PS-WP/4 Interoperability Recommendations, delivered by Glenn Reitmeier. The presentation was excellent, demonstrating majority alignment of the GA system proposal with PS-WP/4 interoperability recommendations.

Attachment I lists the Joint Experts Group on Interoperability that authored this report and the Interoperability Review Panel that was invited to participate in the Review and has reviewed and provided input to this report. Attendees in the Review are listed in Attachment II. Attachment III is a more detailed Summary Report of the Review. Review participants and others listed in Attachment IV gave presentations and provided written inputs that are included in this attachment.

Objectives of the Review meeting were stated to be:

1. conduct an interoperability review of the Grand Alliance system proposal in the context of the FCC action to establish a US standard for terrestrial, advanced television broadcast,

2. gather constructive, actionable input for the GA on interoperability

3. report the interoperability review assessment to the ACATS Technical Subgroup (Joint Experts Group on Interoperability to author the report with input/review by Interoperability Panel).