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Federal Communications Commission

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DEC 14 1990

Satellite CD Radio, Inc.
Application for Digital
Audio Radio Service
Satellite System

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)

File Nos.

49/50 - DSS - P/LA - 90
58/59 - DSS - Amend - 90

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Federal Communications Commission
Office of the Secretary

DEC 17 1990

Domestic Facilities Division
Satellite Radio Branch

**SATELLITE CD RADIO, INC.'S
REPLY COMMENTS AND
OPPOSITION TO PETITIONS TO DENY**

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**SATELLITE CD RADIO, INC.'S
REPLY COMMENTS AND
OPPOSITION TO PETITIONS TO DENY**

Satellite CD Radio, Inc. ("CD Radio"), by its attorneys, hereby responds to the comments and petitions to deny filed in connection with its application for a satellite digital radio service.

Introduction and Summary

The issue presented by the public notice announcing that CD Radio's application had been tendered for filing is whether CD Radio is legally, technically, and financially qualified to be considered as an applicant for a new digital radio service, should the Commission decide to create such a service.

Only a few of the opposing parties questioned CD Radio's qualifications to be a licensee. AFTRCC claims that CD Radio, Inc. is legally unqualified because it is alien-controlled and would violate Section 310 of the Act if permittees of the new satellite service are regulated as common carriers. This is simply not true; even if Section 310 applied, CD Radio, Inc. would satisfy its requirements. Moreover, CD Radio's proposed new service should not be regulated as a common carrier service. In this regard, CD Radio supports the view the director of the

University of Colorado's Graduate Telecommunications Program, who filed a statement supporting a non-common carrier regulatory structure for satellite radio.

The National Association of Broadcasters ("NAB") contends that CD Radio's technical showing is defective. This complaint is unfounded as is evidenced by the results of the November meeting of JIWP 10-11/1 in Sydney, Australia, where experts in satellite broadcast technology from around the world accepted CD Radio's system design and characteristics without qualification. Moreover, several other commenting parties in this proceeding attested to the technical soundness of CD Radio, Inc.'s proposal. Support came from a cross-section of the space industry: Arianespace, Inc. (a launch service provider); from Space Systems/Loral, (a spacecraft manufacturer); and from Stanford Telecom, (a satellite systems engineering firm).

The Association for Broadcast Engineering Standards ("ABES") argues that, procedurally, CD Radio's application cannot be accepted for filing until a decision is first made in a rulemaking proceeding on whether to create a digital radio service. However, the Commission has, on numerous occasions, processed applications to provide a new satellite service at the same time that it conducted a rulemaking to establish the service. At a minimum, it should do the same here. Indeed, because of the proximity of WARC-92 and the long lead times necessary to construct a satellite, CD Radio urges that it be issued a construction permit conditioned upon the outcome of the

rulemaking, provided CD Radio will assume the risk if no spectrum is allocated.

Most of the arguments presented by opposing parties really are arguments why the Commission should not establish a new satellite radio service. As such, they are issues which properly should be addressed in the rulemaking proceeding on creation of a digital satellite and terrestrial CD-quality radio service (RM-7400), not in connection with CD Radio's application. In fact, at least two of the commenting parties (AFTRCC and AMSC) simply incorporated by reference their comments in RM-7400 as the basis for their opposition to CD Radio's application.

The Commission does not have to resolve such issues before acting on CD Radio's application. As stated above, the Commission can and should process CD Radio's application and issue it a construction permit conditioned upon the eventual creation of a satellite radio service, so that CD Radio can get started. Nevertheless, in the interest of fully addressing all the issues that have been raised in connection with CD Radio's application, CD Radio responds herein to these objections.

Thus, Aerospace and Flight Test Radio Coordinating Council ("AFTRCC"), representing the aeronautical telemetry users in the band 1425-1530 MHz, opposes CD Radio's proposal to use that band for its system, because AFTRCC believes that it is impossible for aeronautical telemetry users to share the band with CD Radio's proposed service. While CD Radio continues to believe

that some measure of sharing is feasible on a geographic separation basis, it also believes that in the event sharing is not feasible, aeronautical telemetry users should be reaccommodated in the 2390-2450 MHz band to permit the establishment of a new digital radio service in the 1500 MHz band.

On the other hand, some representatives of the mobile satellite service ("MSS") community (American Mobile Satellite Corporation, Motorola, and Comsat), while fully supporting CD Radio's claim that some of the spectrum currently allocated to the aeronautical telemetry community at 1425-1530 MHz can be allocated for a new satellite service, claim that the spectrum that CD Radio has requested should be given to MSS operators instead -- in part so that MSS operators could provide a similar satellite radio service. CD Radio, however, believes that such an allocation would prevent the establishment of a CD-quality satellite radio service without nearly satisfying the alleged needs of MSS. To the extent MSS operators need additional spectrum, it should be found in other bands.

A group of terrestrial broadcasters, led by the NAB, opposes the creation of a new, higher-quality competitive broadcast service. However, CD Radio, Inc., believes that the creation of a satellite radio service would serve as a competitive spur to the development of CD-quality terrestrial radio services, while satisfying consumer demands which no terrestrial service will be able to provide.

I. Claims That CD Radio Is Not Qualified To
Be A Commission Licensee Are Without Merit

A. CD Radio Is Legally Qualified.

1. CD Radio satisfies the alien ownership provisions of Section 310. AFTRCC claims that CD Radio is controlled by aliens to an extent which would be prohibited by Section 310, if CD Radio is regulated as a common carrier or as a broadcaster. This is simply incorrect. By an amendment dated July 17, 1990, CD Radio explained its stock structure to the Commission. CD Radio is not, as petitioners argue, indirectly owned and controlled by a French national. As explained in Exhibit VIII of Appendix 2 of the amendment, Jean-Jacques Poutrel, A French national, owns 100% of the stock of New Era Corp. New Era Corp., a Delaware Corp., owns 25% of Era-Mar, Inc. Era-Mar, Inc. owns 100 percent of the stock of CD Radio. The other 75 percent of the stock of Era-Mar, Inc. is owned by MARCOR, a District of Columbia corporation. Martin A. Rothblatt, a U.S. citizen, owns 100 percent of the stock of MARCOR. All of the directors of Era-Mar, Inc., are U.S. citizens.

Mr. Poutrel, the only shareholder who is not a U.S. citizen, only owns 25 percent of the parent company of CD Radio. Under Section 310(b)(4) of the Communications Act of 1934, an alien may own up to 25 percent of the parent company of a broadcast or common carrier licensee. 47 U.S.C. Sec. 310(b)(4) (1988). Therefore, even if petitioners' claim that CD Radio

would have to be licensed as a common carrier were true, then CD Radio would still be in compliance with the foreign ownership restrictions of the Communications Act.

In addition to his 25 percent stock ownership in Era-Mar, Inc., Mr. Poutrel holds warrants to purchase an additional 25 percent of the stock on a fully diluted basis. Exercise of these warrants would give him 50 percent of the stock in Era-Mar, Inc. However, the warrants contain a stipulation that they cannot be exercised if to do so would violate the Communications Act of 1934. The Commission has previously held the mere existence of an option to obtain more stock in a licensee's parent corporation does not violate the alien ownership restrictions, especially when that option contains restrictions reciting that it is only valid insofar as it complies with the Communications Act. Data Transmission Co., 44 F.C.C.2d 935, 936 (1974) (convertible debentures held by alien stockholder did not violate alien ownership restrictions). Therefore, the stock warrants held by Mr. Poutrel do not violate Section 310(b)(4) in any way. 1/

2. CD Radio should be regulated as a private carrier.

Given that CD Radio does not have an alien ownership problem, there is no merit to AFTRCC's claim that CD Radio is seeking private carrier status in order to circumvent Section 310(b) of

1/ The Communications Act does not forbid the exercise of the warrants. It merely requires Commission approval before they can be executed. 47 U.S.C. Section 310(b)(4) (1988).

the Act. See AFTRCC Petition at 32. As explained in its Petition, CD Radio is seeking private carrier status because the imposition of common carrier obligations, in particular the obligation to serve the public indiscriminately, would seriously undermine its ability to provide a marketable service. In other words, the satellite operator must be able to rely on market judgment in selecting the mix of CD radio channel operators.

Both Radio Satellite Corporation ("RSC") and AFTRCC argue against treating CD Radio as a private carrier. AFTRCC argues that since CD Radio would be a monopoly service provider, it is unlikely that it will need to exercise content control by selecting the right mix of programmers in order to be viable. AFTRCC Petition at 35. However, this argument rests on the mistaken assumption that CD Radio will have a monopoly.^{2/} In fact, CD Radio will face competition in every market segment that it seeks to serve.^{3/} First, the segment of the market

^{2/} RSC and AFTRCC also state that in the one case where the FCC did award a monopoly satellite license, the mobile-satellite service (MSS), it expressly imposed Title II obligations on the licensee. However, the MSS cannot be compared with the broadcasting satellite service (BSS); the latter is unique in that who the customers are does matter. With MSS, the identity of one customer has no bearing on other customers. In the case of BSS, however, the identity of one customer may have a direct impact on how profitable other customers' use of the satellite will be.

^{3/} In this regard, RSC's and AFTRCC's attempt to distinguish the Transponder Sales decision is unavailing. These parties note that private carriage was permitted in that case on the basis of competition in the comsat marketplace. As noted above, CD Radio would, in fact, face significant competition. Moreover, it should be noted that the sale or long-term lease of digital satellite radio channels by CD

desiring CD-quality service will also be served terrestrial digital broadcasters,^{4/} cable digital radio systems and non-radio media such as CD and DAT players. Second, in terms of provision of national or regional service, CD Radio will face competition from existing national terrestrial radio networks. It should be noted that national advertising dollars would also continue to flow to existing local radio stations.^{5/} Third, there will be competition in the provision of narrowcast programming from public radio networks and shortwave radio stations. Fourth, underserved markets already have some AM and FM radio stations which will compete for audiences with CD Radio. Fifth, the local mobile market (i.e., commuters simply

Radio would be very similar to the sale of cablecasting channels by fixed satellite licensees operating on a private carrier basis.

- ^{4/} AFTRCC attempts to downplay the significance of competition from CD radio systems licensed to terrestrial broadcasters by noting that 60 out of the 70 MHz for which CD Radio seeks reallocation would be dedicated to the satellite service. However, it is misleading to compare the relative amounts of spectrum which would be dedicated to satellite versus terrestrial service. Although 60 MHz would be allocated to the satellite service, only 20 MHz would be used for downlinks in a given region. The other 40 MHz would be used for terrestrial repeaters and possibly sharing with a terrestrial digital radio service. Thus, if the relative capacity of satellite and terrestrial services are to be compared, the proper comparison is between 20 MHz for the satellite service and 10 MHz or more for the terrestrial service.
- ^{5/} If its application is granted, Radio Satellite Corporation, which proposes to provide non CD-quality regional and national satellite radio services via AMSC's MSS system, would provide additional competition for national advertising as well as for consumers seeking national programming.

seeking better quality/coverage radio service) is also served by existing AM and FM radio stations and will also be served by terrestrial digital broadcasters. Finally, that segment of the market seeking regional/national, CD-quality radio service will also be served by national CD-quality terrestrial networks.^{6/}

Thus, since CD Radio will not be a monopoly service provider, it is critical that its ability to compete effectively not be hampered by artificial regulatory constraints. Obviously, consumers will not be willing to purchase CD radio receivers if the available programming does not respond to their needs or if the service does not offer diverse programming. Moreover, as CD Radio noted in its Petition for Rulemaking, it would be at a significant competitive disadvantage vis-a-vis its competitors if it were subject to common carrier regulation because, unlike its competitors who would not be subject to such regulation, CD Radio would have no control over the mix of programming provided over its system, it could be forced to disclose potentially sensitive information about its operations without having access to similar information about its competitors, and it could be forced to comply with potentially

^{6/} AFTRCC states that CD Radio's claim that it will face competition is inconsistent with its statements that its service fills an unmet need and is "dramatically innovative." AFTRCC Petition at 34 n. 49. These are not inconsistent claims because while CD Radio will provide a unique service, every element of the service it provides, taken individually, faces competition. In addition, other competitors will be emerging at the same time to respond to the demand identified by CD Radio (i.e., terrestrial digital broadcasters).

burdensome regulations.^{7/}

AFTRCC also attempts to discredit CD Radio's statement about needing to select the right mix of programmers by contending that this is inconsistent with CD Radio's attempt to avoid broadcast classification by claiming that it would exercise no control over the content of the CD radio satellite transmissions. However, while CD Radio will select the programmers, it will not exercise any control over the content of their programming.

Moreover, if one accepts, arguendo, AFTRCC's argument that CD Radio would be exercising control over the content of the programming, CD Radio could not be regulated as a common carrier because, by definition, it would not be serving the public indiscriminately. ^{8/} This does not mean that CD Radio must

^{7/} As explained in its Petition for Rulemaking, satellite radio service need not be subject to common carrier regulation because it satisfies all of the elements set forth in the NARUC I case for determining whether a service may be provided on a private carrier basis. First, because competitive services are available, the satellite system operator should be under no "legal compulsion" to serve the public indiscriminately. Second, there is no reason to expect the satellite operator to hold itself out as providing service indiscriminately because of the need to select the programmers. Finally, the fact that channels will be sold, resulting in a stable client base with long term contractual relationships, and the fact that customer compatibility will be of concern are also indicative of private carriage under NARUC I.

^{8/} To the extent that CD Radio is deemed to be exercising control over the communications channels in the rendition of its service, then it cannot be subject to common carrier regulation. See Notice of Proposed Rule Making, Allocating Spectrum for, and Establishing Other Rules and Policies Pertaining to, a Radiodetermination Satellite Service, Gen.

therefore be regulated as a broadcaster. Regulating CD Radio as a broadcaster would impose an unnecessary layer of Title III regulation since most of the purchasers of CD radio satellite channels will be existing AM and FM broadcasters who will already be subject to the full panoply of broadcast regulation. Finally, any concerns about the selection process itself do not rise to the level of requiring either Title II or Title III regulation because CD Radio will have every incentive to select a mix of programmers that responds to the needs of the public and to offer service at competitive rates.

B. CD Radio Is Financially Qualified.

Emmis Broadcasting Corporation ("Emmis") challenges CD Radio's financial qualifications by arguing that since the Commission has not yet established relevant financial qualifications for this service, CD Radio cannot demonstrate that it is financially qualified. Emmis further notes that while CD Radio has provided a financial plan, it has not demonstrated the availability of funds to meet its total estimated capital cost requirements and has not indicated the specific lenders, commitments to provide the funding, or the ability of lenders or investors to provide the funds. Emmis Petition at 3-4.

Not surprisingly, Emmis cites no rule or policy which requires the particular financial showing that it describes in

its petition because there is no such requirement. The Commission has traditionally followed a liberal policy with respect to initial financial showings for new satellite service proposals. See, e.g., Direct Broadcast Satellites, Report and Order, Gen. Dkt. No. 80-603, 90 F.C.C.2d 676, 719 (1982); Radiodetermination Satellite Service, Second Report and Order, Gen. Dkt. No. 84-690, 104 F.C.C.2d 650, 663-664 (1986). Unlike broadcast service applications, there is no strict financial threshold which a new satellite service application must meet in order to be accepted for filing. The Commission's policy with respect to new satellite services recognizes that satellite systems are very capital intensive. Furthermore, as explained infra in the following section, the Commission has traditionally established licensing procedures, including financial requirements, concurrent with the processing of satellite applications. Therefore, the nature of CD Radio's financial showing does not provide a basis for dismissing its application.^{9/}

C. CD Radio Is Technically Qualified.

NAB contends that CD Radio's application and petition display a series of serious defects and uncertainties, and that

^{9/} In fact, CD Radio's application evidences a carefully designed financing structure and explains that funding will be obtained through a mix of debt and equity capital, with financing being leveraged upon pre-sales contracts with CD Radio customers. It also states that early stage financing will come from Private Placement Financing and Corporate Partnerships.

the June, July and October amendments of CD Radio. "underscore the haste which characterized the preparation of the petition and application." 10/ Comments of NAB at 7. In support of this claim, NAB cites the arguments it made in its Comments in RM-7400. In a Technical Appendix to its Reply Comments and Response in RM-7400, dated September 14, 1990, CD Radio responded substantively and convincingly to all the claims of supposed defects made by NAB and others. (A copy of that Appendix is attached hereto and is hereby incorporated by reference). In its current Comments, NAB does not rebut any of CD Radio's detailed technical responses to NAB's claim of "serious defects," but merely reprints, unchanged, its original claims as an appendix to its comments.

The only new technical arguments that NAB makes are in connection with CD Radio's amendments to its application. Comments of NAB at 8. The NAB alleges that a new defect in the amendment is a "new system of frequency and time diversity to combat the effects of multipath propagation." However, CD Radio's amended modulation and coding method was submitted to a CCIR meeting preparing a technical basis for WARC-92. At this November meeting of "JIWP 10-11/1," just concluded, experts in satellite broadcasting theory and technology from around the world decided unanimously to give a description of CD Radio's proposed system equal treatment along with older methods, less

10/ Only the October, 1990 amendment described any significant technical changes to the proposed system.

advanced methods, in its report. No defects or shortcomings in CD Radio's proposed method were sustained, or even proposed, during the detailed technical discussions that were held during this week-long meeting of experts. This unqualified international acceptance is even more remarkable considering that most of these experts were proponents of a previously developed and competing European system (the European DAB Project) which relies on a different modulation and coding scheme.

At this meeting, representatives of CD Radio responded convincingly and persuasively to specific questions regarding the characteristics and performance of its proposed system, and its feasibility and practicality. CD Radio would be pleased to respond to the specific questions from NAB, but it did not include any in its comments.

Finally, NAB mischaracterizes the four receiver types described in CD Radio's original application as ones of "increasing complexity as the sole method to combat...interference [caused by multipath]." In fact, CD Radio's application described four different kinds of receivers for four very different receiving situations: home, portable in high-signal urban areas, portable in low-signal urban areas, and those for vehicular use. The NAB, an organization which is undoubtedly knowledgeable of the wide diversity in the design, performance, capabilities, and features of radio receivers now in operation and available in today's market place, should not

find CD Radio's four, generic receiver types excessive, unusual or indicative of some serious shortcoming in the design or concept of this system. The fact that one can buy a hand-held transistor radio for \$20 and a home stereo installation for \$2,000 illustrates the wide range of receiver performance and price that has long been available to the public for receiving radio broadcasts.

On the contrary, the fact that four different receiver types can be used in different situations, and that different methods of modulation or signal coding can be employed, demonstrate the inherent flexibility of Satellite Sound Broadcasting. As CD Radio indicated in its original application, the precise system characteristics -- including modulation and coding, permissible receiver designs, etc. -- will be chosen by the operators, or consortium designated by the Commission (Application, page 36.) 11/

This inherent flexibility in digital broadcasting also permits different administrations around the world to make a trade-off between program quality, the number of available channels, and the cost of providing the space segment. These

11/ Indeed, if the Commission were obliged to approve only those modulation and broadcasting methods that had been the first of many proposed, and had not been amended since the date of the initial application, and had been the subject of demonstrations (in contrast to competing methods for which hardware did not exist at the time of the FCC's decision), today's color television sets would be using rotating disks, 20-feet in diameter, driven by large electrical motors.

inter-related factors can be selected so that the resulting broadcasting service is suited to the requirements of individual countries. For example, bit rates as low as 48 kb/s can be used to establish a broadcasting service providing less than CD-quality program quality which would be adequate for news and information programming. This flexibility will prove advantageous at WARC-92 because other countries will be more likely to agree to a spectrum allocation that can be used by each country in a way that suits its specific requirements. Transmissions of different bit rates and different modulation and coding methods can share the same spectrum allocation effectively.

II. Claims That CD Radio's Application Cannot Be Processed And Granted Until A Rulemaking Establishing a New BSS (Sound) Service is Completed Are Without Merit

The NAB, ABES, CBS, Emmis, the Joint Parties, and AFTRCC all argue, in one form or another, that the Commission should not consider CD Radio's application during the pendency of the Commission's inquiry on digital radio services. Several of these parties further argue that the CD Radio application should be dismissed because no spectrum allocation for BSS (Sound) has yet been made and the Commission has not yet authorized the

service.^{12/}

These arguments lack merit. As will be shown below, the Commission has traditionally processed satellite applications in parallel with the rulemaking that authorized the new service contemplated by that satellite application. Moreover, expedited processing is essential in the instant case to assure the viability and prompt institution of the new digital radio service.

A. Parallel Consideration of a Satellite Application and a Concurrent Rulemaking is Well-Established

The Commission has previously recognized the benefits of conducting rulemaking proceedings in parallel with the acceptance and processing of satellite system applications and has traditionally adopted this approach with such applications.^{13/} For example, in its Notice of Proposed Rule Making in General Docket No. 84-1234, 50 Fed. Reg. 8149 (February 28, 1985), the Commission not only proposed to allocate spectrum for MSS and to establish licensing procedures and regulatory and technical policies for MSS but also decided to accept and process applications for an MSS system. The Commission reasoned that the rulemaking proceeding and the applications, considered together,

^{12/} ABES notes that it imposes no objection to CD Radio's application to the extent that CD Radio proposes to use communication satellites merely to interconnect terrestrial DAB transmitters. However, this is not CD Radio's intent.

^{13/} The Commission has broad discretion to adopt procedures that "will best conduce to the proper dispatch of business and to the ends of justice." 47 U.S.C. § 154(j); Satellite Communications, 104 F.C.C.2d 650, 652 (1986).

would enable it "to determine the extent of any necessary regulation of this service." Id. at 8160.

Similarly, the Commission's Notice of Proposed Rule Making (49 Fed. Reg. 36512 (September 18, 1984)) proposing to allocate frequencies for a radiodetermination satellite service (RDSS) and to establish associated licensing policies and procedures was accompanied by a public notice accepting Geostar Corporation's application for filing and inviting the submission of other applications. FCC 84-320, Report No. DS-305. In its Second Report and Order in this proceeding, the Commission explained that it had "crafted parallel rulemaking and licensing proceedings in an effort to expedite the introduction of this new technology and service to the public and to ensure that any rules and policies adopted would reflect concrete proposals for these innovative systems." Satellite Communications, 104 F.C.C.2d 650, 652 (1986).

Similar benefits would be realized through parallel rulemaking and licensing proceedings in the instant case. As with MSS, an understanding of CD Radio's precise proposal, as expressed in its application, is crucial to an understanding of what types of regulation of its proposed system would be required. Further, as in Satellite Communications, it is important to the development of appropriate rules and policies for the new service proposed by CD Radio that the Commission have an understanding of the concrete implementation of this innovative system. In order to understand the service proposed,

it is necessary to review CD Radio's license application. In order to evaluate the wisdom of allocating spectrum as requested, the Commission must examine precisely how that spectrum will be used. Additionally, sequential processing would be wasteful of the Commission's valuable time and scarce resources. It would be administratively inefficient to examine CD Radio proposal twice, as sequential processing would require.

Other examples of situations in which the Commission has followed a parallel licensing and rulemaking include the Commission's acceptance for filing and processing of applications for authority to establish international satellite systems separate from Intelsat prior to completion of the rulemaking proceeding establishing that such a service would be permitted. International Communications, 101 F.C.C.2d 1046, 1163 (1985), on recon., FCC 86-144, released April 17, 1986, On Further recon., 1 FCC Rcd 439 (1986). On the same day that it adopted an order in the rulemaking proceeding, the Commission also granted three applications and deferred action on three others. Id.; International Satellite, Inc., 101 F.C.C.2d 1201 (1985); Orion Satellite Corp., 101 F.C.C.2d 1302 (1985); Pan American Satellite Corp., 101 F.C.C.2d 1318 (1985); RCA American Communications, Inc., 101 F.C.C.2d 1342 (1985); Cygnus Satellite Corp., 101 F.C.C.2d 989 (1985).

Likewise, during the pendency of its rulemaking to permit international aeronautical mobile satellite services via INMARSAT, the Commission accepted applications for filing.

Communications Satellite Corporation, 4 FCC Rcd 2488 (1989). Similarly, in the domestic fixed satellite service, the Commission concluded a rulemaking proceeding which reduced orbital spacings to 2° and simultaneously granted a new group of satellite authorizations. Domestic Fixed Satellite Service, 93 F.C.C.2d 1260 (1983). After establishing the subsequent processing group of applicants and completing a detailed review of these pending applications, the Commission concluded that a rulemaking was necessary to clarify its financial qualification and satellite utilization requirements. Licensing Space Stations in the Domestic Fixed Satellite Service, Notice of Proposed Rulemaking, 101 F.C.C.2d 223 (1985). At the same time, applicants were given the opportunity to supplement their applications to ensure that they contained all required information. Subsequently, the Commission, on the same date, both adopted final rules and authorized satellite proposals submitted by those entities which demonstrated compliance with the applicable qualification standards. Domestic Fixed Satellite Service Space Station Licensing, 58 R.R.2d 1267, 1268 (1985), recon. denied, 61 R.R.2d 992 (1986). Thus, it is clear that parallel processing of a license application and rulemaking to consider authorization of a service is a well-established Commission approach and is well within its discretion to follow.

Moreover, the United States Court of Appeals for the D.C. Circuit has approved this type of procedure. The Court noted that the Commission "is free to choose to announce rules of

general applicability in the context of an individual licensing proceeding." National Ass'n of Broadcasters v. F.C.C., 740 F.2d 1190, 1222 (D.C. Cir. 1984). In approving the Commission's decision to accept applications in the Direct Broadcast Satellite service while conducting a rule making proceeding examining the creation of such a service, the Court noted:

First, the Commission stated that a concrete, demonstrated U.S. commitment to DBS would bolster United States' claims for adequate DBS frequencies and orbital slots at WARC-83. Second, given the long lead time necessary for satellite construction and launch, procedural delay might have frustrated realization of the "substantial public interest in expeditious development of direct broadcast satellite technology" that has already been recognized by this court."

Id. (citation omitted). The Court concluded that the Commission's procedure had not denied any interested party the opportunity to be heard.

Considerations similar to those expressed in the DBS proceeding apply in the instant proceeding. As then, the United States must now prepare for an international conference which will allocate frequencies. Further, procedural delay would frustrate the public interest in the expeditious implementation of a high quality, wide coverage radio service. Therefore, the Commission should process CD Radio, Inc.'s application in parallel with any other proceedings to authorize and allocate spectrum for the service.

B. Expedited Processing, Parallel With Any Rulemaking Proceeding, Should be Followed By The Commission In This Case

The public interest would be served by expedited processing

of CD Radio's application, in parallel with any inquiry or rulemaking to allocate spectrum for the new service, rather than dismissal of its application or delay in considering its application.^{14/}

Delay in final approval of CD Radio's application will impede the initiation of this new service, which will develop the commercial potential of space. Obviously, expedited processing would bring a new service to the public as quickly as possible, thus creating a public benefit.^{15/} Satellites require a long lead time to construct, at least three years, and delay in authorizing the service would only delay the public's ability to enjoy it.

Furthermore, delay could endanger the service as it would impede CD Radio's ability to finance the proposed construction. The introduction of any new technology carries with it a certain amount of risk which increases an innovator's difficulty in finding financing. Any considerable processing delay adds additional uncertainties and risks which may cause the financial

^{14/} ABES argues that the Common Carrier Bureau should not process the CD Radio application separate from the Mass Media Bureau's consideration of the fundamental issues surrounding digital audio radio service. However, because CD Radio is not proposing to be a broadcaster itself, but merely to operate a satellite system and lease channels, that its application appears to come under the jurisdiction of the Common Carrier Bureau. In any event, ultimately, it will be the full Commission which will determine the issues relating both to CD Radio's application and to the establishment of a new service.

^{15/} See 47 U.S.C. § 157 (1988).

community to take a negative view of the project. The potential for conditions to change in the interim between the filing of an application and final grant increases as the delay increases, and thus any commitment to finance a project becomes more speculative. Therefore, in order to ensure that the service offering is feasible at the time that the Commission grants authority to construct, it is important that the Commission act as quickly as possible.

Additionally, delay in granting approval of CD Radio, Inc.'s proposal will impair the chances that this proposed spectrum usage will be adopted by the 1992 WARC. The United States is now formulating its position for the WARC, which will occur in early 1992, not a long time off. In order to be successful in having its views adopted at the WARC, it will be necessary for the United States to brief other nations' delegations prior to the beginning of the conference. The time available for such efforts between now and 1992 is limited. Therefore, the frequency requirements for the United States must be set as soon as possible.

It also is essential that the Commission act promptly to allocate the requested frequency so that CD Radio's satellite audio broadcasting system can be under construction by the time of the WARC. Taking action on CD Radio, Inc.'s proposal will allow the United States to determine the extent of its spectrum requirements more confidently and to approach the conference with a firm position. Further, identification of a viable

existing candidate to furnish the service will aid the U.S. in obtaining spectrum at WARC for the new service. Also, the candidate will be able to lobby at WARC for the allocation, furnishing additional resources and manpower to aid the U.S. in accomplishing its goal of obtaining new spectrum for the service, which it might not have the incentive to do if it does not have the permit in hand.

The Commission does not have to wait until the conclusion of a domestic rulemaking proceeding to grant CD Radio a conditional permit. In this case, the Commission should not wait, but should issue a permit, conditional both on the outcome of any domestic rulemaking and of the 1992 WARC, even before it concludes any rulemaking on the new service and before spectrum is allocated at the 1992 WARC. Even if the frequencies are not known, a lot can be done. The satellite can be designed and procurement of long lead items could begin. Preparations for the 1992 WARC could begin. Business considerations, discussed above, require expedited action. Further, there will be no prejudice to any third party by the conditional grant of CD Radio's application since CD Radio will assume the risk that any such grant may be revoked based on the outcome of the rulemaking or of the 1992 WARC.^{16/}

Failure to take the step of parallel processing CD Radio's

^{16/} In order to accomplish the expedited processing of CD Radio's application, CD Radio urges the Commission that it should immediately invite competing applications.

application will discourage other entrepreneurial initiatives in the future. For all these reasons, therefore, CD Radio's application should be processed promptly and granted expeditiously.

III. Arguments Against the Establishment of a BSS (Sound) Service are Without Merit

A. Spectrum Should Be Allocated In The 1425-1530 MHz Band For A New Digital Radio Service

AFTRCC's petition to deny CD Radio, Inc.'s application incorporates by reference the arguments AFTRCC made in its 1990 opposition to CD Radio's petition for rulemaking.

AFTRCC's first argument is that the 1425-1530 MHz band is currently used for the very important purpose of providing aeronautical telemetry services, and that aeronautical telemetry cannot share the band with CD Radio's proposed new satellite radio service. ^{17/} AFTRCC also questions the need for more entertainment services by radio.

CD Radio does not disagree that aeronautical telemetry services are very important and that spectrum should continue to be allocated for their use. The fundamental flaw in AFTRCC's reasoning, however, is its conclusion that CD Radio's application must be denied in order to permit aeronautical

^{17/} AFTRCC also claims that aeronautical telemetry could not share the band with MSS operators. See, AFTRCC's August 20, 1990, reply to AMSC and Comsat in RM-7400.

telemetry to continue to operate. In fact, this is not an either/or choice: both services can be accommodated. For a number of reasons, a portion of the band from 1425-1530 MHz can be allocated to BSS (Sound) without serious adverse consequences to the provision of aeronautical telemetry service.

Although CD Radio continues to believe that some sharing is possible between a satellite radio service and aeronautical telemetry in the 1425-1530 MHz band, if sharing is not feasible, as AFTRCC claims, then aeronautical telemetry could and should relinquish a portion of the 1435-1530 MHz band.

This approach is feasible for a number of reasons. First, aeronautical telemetry would not need to relinquish the entire 105 MHz of spectrum from 1425-1530 MHz. Under CD Radio's proposal, 70 MHz of this band would be allocated to a new satellite radio service. Under the Commission's proposal in the Second Notice of Inquiry, only 32 MHz of this band would be allocated for BSS (Sound). In either case, a substantial amount of spectrum in the 1425-1530 MHz band would continue to be available, as before, for the exclusive use of aeronautical telemetry.

In addition, at AFTRCC's request, aeronautical telemetry was allocated an additional 80 MHz of spectrum in the band 2310-2390 MHz since 1979. More than a decade later, aeronautical telemetry hardly uses this band. Obviously, the growth in the demand for aeronautical telemetry services has not been such as to require aeronautical telemetry to make full use of both the

2310-2390 MHz bands and the 1425-1530 MHz band. Clearly, aeronautical telemetry could relinquish a portion of the band from 1425-1530 MHz and expand into the 2310-2390 MHz band without a net loss of aeronautical telemetering capabilities. Since AFTRCC itself requested this allocation for aeronautical telemetry, it can hardly argue that it is unsuitable for such use. 18/

Finally, it appears that a new expansion band for aeronautical telemetry use could be created by allocating spectrum to aeronautical telemetry in the 2390-2450 MHz band. Unlike satellite radio, the directivity of aeronautical telemetry receive antennas, coupled with the ability to restrict or control the use of ISM equipment on airfields where aeronautical telemetry equipment is used, makes it feasible for aeronautical telemetry users to share some of the 2390-2450 MHz band with ISM equipment users.

The reaccommodation of aeronautical telemetry users from a segment of the 1425-1530 MHz band could be accomplished over a reasonable period of time in order to minimize the impact on aeronautical telemetry while still permitting a BSS (Sound) operator to begin operations as soon as it is ready to do so. CD Radio proposes a procedure similar to that which the

18/ The bands above 2.3 GHz are not suitable for a satellite radio service because the omnidirectional antennas this service requires, if operating above 2310 MHz, could not adequately reject interference from ISM equipment operations in the 2400-2500 MHz band.

Commission adopted when it allocated the 12.2-12.7 GHz band for DBS. In that situation, the Commission permitted existing Fixed Service operations in the 12.2-12.7 GHz band to continue to operate for at least five years after it decided to allocate the 12.2-12.7 GHz band to DBS on a primary basis, and thereafter on a sufferance basis, i.e., until a DBS service becomes operational on frequencies in the band which would receive interference from Fixed Service operators. However, no new Fixed Service operations were authorized in the 12.2-12.7 GHz band. This procedure has given Fixed Service operators in the 12.2-12.7 GHz band time to depreciate their equipment, and, as new equipment is purchased, to move their operations to other bands, including 18 GHz.

It is CD Radio's understanding that aeronautical telemetry is frequency-agile over the 1425-1530 MHz band and/or could be relatively easily modified to operate in the portions of this band which were not allocated to BSS (Sound). This would make the transition out of a portion of the 1425-1530 MHz easier for aeronautical telemetry than it has been for the Fixed Service in the 12 GHz band.

B. There is No Basis For AFTRCC's Claim That Single-Use Satellite Services Are Inherently Non-Viable

AFTRCC and the NAB argue that the history of single-service satellite systems established the folly of establishing allocations for such purposes, citing the examples of DBS and

RDSS. There are several responses to make to this argument.

In the first place, while CD Radio proposes to provide capacity for radio broadcasting, it is obvious that the radio channels are a transmission medium which can be used for ancillary communications, or non-ancillary alternative services subject, if necessary, to FCC authorization. For example, the channels could be used for a wide variety of point-to-multipoint services, including paging, utility monitoring, or weather advisories.

Thus, for example, General Motors Research Corporation, at page 5 of its November 13, 1990 Comments on the Digital Audio Radio (DAR) Notice of Inquiry (General Docket No. 90-357) noted that

"the digital nature of DAR can, with proper foresight, also be used to meet other information needs of the modern driver. DAR sub-channels will likely prove to be a valuable way to disseminate update information to users of the 'Intelligent Vehicle Highway Systems' (IVHS)."

As General Motors Research Corporation pointed out, the satellite radio channels are inherently capable of point-to-multipoint information dissemination of many kinds.

AFTRCC claims that single-use satellites are inherently non-viable based on the FCC's experience with DBS and RDSS services. Aside from the obvious fact that DBS and RDSS services are different services than BSS (Sound), whose success or failure has no relevance to BSS (Sound), AFTRCC's claim that these two services have been failures is simply incorrect.

DBS is a service which is just beginning to come into its own. Japan and Europe both have operational DBS systems. Technological advances in the last few years have greatly reduced the size and therefore the cost and complexity of installing DBS home satellite dishes. The selection of an HDTV standard in the U.S. will provide impetus to the development of DBS because DBS satellites are the best means of delivering HDTV programming to the home.

One reason DBS has been slow to develop is that it has been opposed by terrestrial broadcasters who believed it represented a threat to existing television station revenues. Recently, however, spurred by the developments described above and a fear that cable television operators were seeking to use DBS systems to extend the reach of their cable systems to low-density areas, NBC has joined forces with Hughes and Cablevision to form a powerful consortium ("Sky Cable") to launch a DBS satellite system. Another broadcaster, Hubbard Broadcasting, Inc., which owns the DBS permittee United States Satellite Broadcasting Company, Inc., is implementing a DBS system. In fact, all told there are so many applicants for DBS permits that the Commission's major difficulty has been to find orbital positions and channels for them all without recourse to comparative hearings.

Although it was established after DBS, the RDSS service has advanced further. One company, Geostar Positioning Corporation, operates an RDSS system. In addition, over 700 million francs

have been invested in a European counterpart to Geostar, named Locstar. Geostar has demonstrated the value of the RDSS service to the public. Its RDSS system provides valuable service to thousands of trucks. The system has saved lives and improved the operational efficiencies of many companies. Whether or not Geostar is so far financially unsuccessful, as AFTRCC claims, is irrelevant. The real question is whether the service is in the public interest. CD Radio submits that it is.

19/

C. CD Radio's Proposal Is Spectrum Efficient.

The NAB and AFTRCC argue that CD Radio's proposal is spectrum inefficient. This is incorrect. In fact, in terms of the number of people reached per unit of bandwidth, satellite radio is far more efficient than any terrestrial radio service.

CD Radio envisions a satellite radio system with three satellite beams, each covering one-third of Conus. If 60 MHz of spectrum is allocated to BSS (Sound), each beam would utilize a different 20 MHz of spectrum. Within each beam, terrestrial repeaters would use another 20 MHz (of the 40 MHz not used in that beam) to serve areas where satellite signal penetration is

19/ Although published reports indicate that Geostar is encountering financial difficulties, the same reports have identified a number of Fortune 500 companies as interested acquirers of Geostar, which suggests that it is perceived as having promise. Moreover, two new entrants, Ellipsat and Motorola, have both applied to share the use of the RDSS spectrum with Geostar.

limited by buildings or other obstacles. 20/ However, these repeaters will only be needed in some geographic areas. In most of the country, the 40 MHz of spectrum not utilized by the satellites could be shared with another service. AFTRCC's refusal to consider sharing with a BSS (Sound) allocation does not mean that other services could not share the band with a BSS (Sound) service.

AFTRCC is also incorrect in asserting that all CD Radio's channels would have to provide CD-quality sound. One of the beauties of CD Radio's technical proposal is that lower-quality digital radio channels suitable for news, information, entertainment and educational programming, and, using less bandwidth, could be transmitted if desired. 21/ However, CD Radio's study of the market reveals that in the U.S., consumer demand is for a higher-quality radio service, comparable to the quality offered by compact discs.

Finally, AFTRCC misunderstands the nature of the Emergency Access Channel. This channel would not be dedicated solely to emergency uses. Rather, it would be used as any other channel, except that, during times of emergency, its regular programming would be preempted. Listeners on other channels could be

20/ Terrestrial digital radio stations which do not repeat satellite signals would provide their own programming. AFTRCC's claim that such terrestrial channels must also be figured into the basis for its calculation is thus without merit.

21/ This might be the case in third-world countries, for example.

automatically switched to the emergency channel to ensure they receive the emergency message.

D. CD Radio Has Demonstrated That There Is A Need For Satellite-Delivered Digital Radio Service.

AFTRCC claims that CD Radio has not shown a need for satellite-delivered digital radio service because the appendix to its Petition for Rulemaking styled "Analysis of the Market for CD Radio" does not establish demand through primary research. Significantly, AFTRCC does not dispute the veracity of the statements made in that appendix, merely that they have not been established through primary research. Even in this regard, AFTRCC is mistaken. CD Radio has, in fact, established demand through primary market research. CD Radio recently commissioned Yankelovich, Skelly and White/Clancy, Shulman to conduct a proprietary market study of the market potential in the U.S. for a satellite-based, CD-quality radio service. The results from that study demonstrated, among other things, that there is a clear public demand for a CD-quality radio service because consumers do experience, and are bothered by, problems with their current conventional FM car stereos and are looking for higher sound quality and better signal consistency.^{22/} The

^{22/} The comments filed in response to the Commission's Notice of Inquiry in General Docket No. 90-357, 5 FCC Rcd 5237 (1990) ("Digital Audio Radio Proceeding") also demonstrate the importance of CD-quality to the public. See, e.g., Comments of Los Angeles Philharmonic Association; Comments of American Stage Festival; Comments of Philadelphia Orchestra; Comments of General Motors Research Corporation; Comments of North American Philips Corporation; Comments of MARCOR, Inc.; Comments of Public Service Satellite

Yankelovich study also showed that consumers want continuous coverage of their favorite stations and that market demand for wide-area coverage CD radio was more than double the norm for consumer products priced between \$50 and \$500.

AFTRCC also argues that even if CD Radio had conducted a proper market research study (which it has), it has failed to show consumer demand for a satellite-delivered CD-quality radio service. The broadcasters who petitioned or commented on CD Radio's application also question the need for a satellite service. However, regardless of what services are or will be provided by terrestrial broadcasters, there is still a need for a satellite-delivered digital radio service because a satellite system offers certain public benefits which terrestrial radio services (even terrestrial digital radio services) cannot provide.

One such public benefit is improved coverage. The signal coverage of terrestrial radio stations are and will always be limited. These limitations preclude the travelling public from listening to their favorite radio stations or, at least, to their favorite type of programming format, regardless of where they may be. In contrast, the wide coverage area of satellite beam would make it possible to receive an uninterrupted signal

Consortium; Comments of Space Systems/LORAL; Comments of Berger Bros. Camera & Video Exchange; Comments of The Right Roc Group; Comments of The Peabody Institute of The Johns Hopkins University; Comments of Eastman School of Music; Comments of Ricks College.

from coast to coast. As noted above, the Yankelovich study confirmed the fact that consumers want continuous coverage of their favorite stations. Further, the comments filed in response to the Commission's Notice of Inquiry in Gen. Docket No. 90-357 show that a number of segments of the public have a particular need for uninterrupted radio coverage, including truck drivers,^{23/} rural Americans,^{24/} retired persons travelling the U.S.,^{25/} and long-distance urban commuters.^{26/}

Another public benefit that may be derived only from a satellite-based radio system is "narrowcasting." As the comments demonstrate, in addition to more traditional radio programming, the public wants to receive "niche" programming (e.g., opera, foreign language programming). Terrestrial stations could offer this type of programming, but they do not now, to any significant extent. Significantly, because terrestrial stations do not provide narrowcast programming for economic reasons (i.e., the audience within the coverage area of any given terrestrial station is too small for narrowcasting to

^{23/} See, e.g., Comments of Crawford Broadcasting Co.; Comments of Breaker 19 Truckers Association; Comments of South Dakota Trucking Association.

^{24/} See, e.g., Comments of the Texas Association of Counties.

^{25/} See, e.g., Comments of Recreation Vehicle Industry Association.

^{26/} See, e.g., General Motors Research Corporation at 4. See also Wall Street Journal, October 25, 1990, p. A1 (documenting the growing numbers of Americans that must drive well beyond local radio station coverage to get to work).

be economically viable), digital terrestrial radio stations would be in no better position to offer such programming. However, such specialized, narrowcast programming could be provided, quite profitably, by a satellite radio system because its broad coverage area would enable it to reach an audience that is widely scattered, but in the aggregate is large enough to support such programming. In this connection, a number of commenters in Gen. Docket No. 90-357 expressed a need for satellite coverage in order to provide an economical base for specialized interests such as opera and classical music,27/ minority programming,28/ educational programming,29/ programming for the disabled,30/ and foreign language programming.31/

A third and final public benefit unique to satellite radio is the ability to serve remote, sparsely populated areas of the country. As CD Radio recently showed in another proceeding, significant portions of the country are "underserved" and in

27/ See Comments of San Francisco Opera; Comments of The Pittsburgh Symphony Society; Comments of Connecticut Grand Opera; Comments of the National Assembly of Local Arts Agencies; Comments of Tulsa Performing Arts Center Trust; Comments of Seattle Opera; Comments of The Canterbury Choral Society; Comments of Westport Country Playhouse; Comments of Eastman School of Music; Comments of Paul Mellon Arts Center.

28/ Comments of WHUR-FM.

29/ Comments of Comments of WHUR-FM; Comments of American Stage Festival.

30/ Comments of Catherine Park; Comments of WHUR-FM.

31/ Comments of Toastmasters International.

some cases "unserved" by FCC standards.^{32/} This was corroborated by a number of the comments filed in Gen. Docket No. 90-357.^{33/} Whereas terrestrial radio stations, even digital terrestrial stations, cannot and will not be able to afford to serve these areas, a satellite system can deliver digital audio radio service to such areas just as easily and economically as it can serve the nation's largest cities.^{34/}

E. Localism.

The broadcasting parties once again contend that grant of CD Radio's application would contravene Commission policies favoring localism. In an appendix to its Reply Comments and Response in RM-7400, filed September 14, 1990, CD Radio demonstrated that such "localism" arguments are totally devoid

^{32/} Comments of CD Radio in response to the Second Notice of Inquiry in Gen. Dkt. No. 89-554, filed December 3, 1990, at 11-14 ("WARC-92 Comments").

^{33/} See, e.g., Comments of Maine Farm Bureau Association; Comments of Delaware Farm Bureau; Comments of Pennsylvania Farmers Association; Comments of Wyoming Farm Bureau; Comments of City of Montrose; Comments of National Campground Owners Association; Comments of MARCOR at 3; Comments of Space Systems/LORAL at 2.

^{34/} Satellite-delivered DAR can be of particular benefit to the public radio community because, as NPR notes, "a satellite-based service could provide new radio service for communities which are now unserved or underserved by public radio. For example, many communities in the west are so small that there is an insufficient economic base to support a locally-based public radio translator, let alone a full-service public radio station. In some urban areas, the spectrum congestion in the NCE-FM band precludes the development of new public radio outlets designed to serve diverse audiences."

of merit from both a legal and a policy standpoint. A copy of that appendix is attached hereto and is hereby incorporated by reference. No party convincingly rebuts that showing. Further, as CD Radio has repeatedly emphasized, its proposal is entirely consistent with localism since it includes a 10 MHz allocation that would be used for local terrestrial digital channels licensed exclusively to existing broadcasters.

F. MSS Services Should Not Be Allocated Additional Spectrum In The 1425-1530 MHz Band.

A group of Mobile Satellite Service (MSS) operators, or would-be operators, including Comsat, AMSC, and Iridium, argue that while aeronautical telemetry users in the 1425-1530 MHz band should either share spectrum with a satellite service or relinquish it to a satellite service, the spectrum should be shared or reallocated with MSS. CD Radio disagrees. For the following reasons, the 1425-1530 MHz band should not be reallocated to MSS, but to BSS (Sound).

1. Sharing with mobile aeronautical telemetry in the 1425-1530 MHz band is not significantly easier for MSS services. AMSC, whose submission in this proceeding consisted of a letter referring back to pleadings it filed in the rulemaking proceeding, claims that MSS can share spectrum with mobile aeronautical telemetry services better than BSS (Sound) can. In fact, however, there is no significant difference between the ability of MSS and BSS (Sound) to share with mobile aeronautical telemetry.

While individual, 5 kHz, MSS signals will cause less interference to wideband Mobile Aeronautical Telemetry ("MAT") transmissions, the interference from a multiplicity of such transmissions occupying the same 300 kHz bandwidth as a single BSS (Sound) transmission will be cumulative.

The difference in PFD over the 300 kHz of a BSS channel, and the cumulative effect of 60 MSS transmissions is only about 7 dB. It is likely that operation MSS systems will be loaded to approximately that level for much of the time. Presumably, MSS satellites will be sized to operate as close to capacity as possible to be cost-effective and to make efficient use of spectrum. Therefore, it cannot be assumed that the difference in cumulative PFD during operation will be appreciably greater than 7 dB in favor of MSS (that is, that there will be fewer than 60 channels operating in any 300 kHz bandwidth for appreciable periods). That difference should be contrasted with the 15 dB of additional discrimination that would be required to prevent interference to MAT, according to the calculations of AFTRCC. Therefore, BSS and MSS both present unresolved sharing difficulties to MAT in the view of AFTRCC.

Given this expected loading of MSS satellites, little advantage can be taken of time-sharing to lessen the likelihood of interference in areas of intense use by MAT.

Much of the discrimination on which AMSC relies to reduce interference levels between MAT and MSS is assumed to come from the use of narrow satellite beams. While AMSC may employ such

beams, not all MSS systems that would operate in this band, should it be allocated, would employ spot beams. In fact, use of much wider, global beams can be expected in MSS systems for the next 10 to 15 years. Several satellite systems that would likely take advantage of such a new frequency allocation (e.g. Inmarsat, Volna, etc.) can be expected to have global beams that would cover portions of the United States where there would also be a high level of MAT activity (e.g., Seattle, Santa Monica, St. Louis, and Kansas City).

2. The establishment of a BSS (Sound) service would better serve the public interest than a small increase in the amount of MSS spectrum. BSS (Sound) has no allocation at present. Yet it would offer a significant new service, the need for which has been discussed in detail above. BSS (Sound) is also a service which will be established in Regions 1 and 3 and which the U.S. will be foreclosed from providing if no Region 2 allocation is made. Conversely, both Inmarsat (whose cause Comsat is advocating) and AMSC already have been assigned spectrum to provide MSS service, and Motorola has identified the RDSS band as its first choice for spectrum for its Iridium system. To all these MSS operators, the 1425-1530 MHz band would merely provide expansion frequencies for more of the same service that they already provide, will provide, or hope to provide in other bands. Moreover, if one is to believe MSS operators' claims that they need 350 MHz of spectrum (not counting feeder links), the 70 MHz requested for BSS (Sound)

would not even begin to satisfy their needs. In short, the establishment of a new BSS (Sound) service is more important than a marginal increase in expansion capacity for MSS -- many of whose operators have not yet even begin to use the spectrum they already have been allotted.

3. The 1425-1530 MHz band should be used to meet the needs of BSS (Sound) not MSS operators. CD Radio has demonstrated that, of the three bands the Commission has proposed as possible locations for BSS (Sound), only the 1425-1530 MHz band is suitable. By contrast, MSS operators have identified six possible bands where additional MSS spectrum might be found. Considering that there appears to be no practical alternative for BSS (Sound) while there appear to be several potential alternatives for MSS services, CD Radio does not believe MSS should be allocated spectrum at 1425-1530 MHz.

4. MSS operators have not demonstrated a need for the spectrum they request. It is significant that AMSC, which has not yet even begun to construct a system in the band it has been allocated, is already demanding more spectrum from the maritime mobile band and now seeks additional spectrum in the aeronautical telemetry band. Clearly AMSC cannot demonstrate that it needs any more spectrum yet, and its effort in this regard is unabashed spectrum-grabbing, pure and simple. Similarly, Motorola has only just filed its application to use the RDSS frequencies for its Iridium system, but it is already demanding additional spectrum for expansion purposes. If it

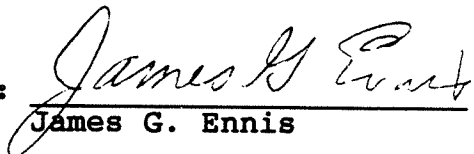
needs more spectrum, Motorola should first look to other current MSS bands before seeking spectrum elsewhere. But again, Motorola does not in any way substantiate its claim that it needs additional spectrum for its service.

Taken as a whole, the 350 MHz of additional spectrum requested by MSS operators clearly reflects the intent of Comsat, AMSC and Iridium to seek excessive amounts of spectrum without any demonstration of the need for such huge amounts of spectrum or consideration of what is reasonable in light of the needs of other services.

Conclusion

For the foregoing reasons, the petitions to deny CD Radio's application should not be granted. CD Radio's application should be expeditiously processed and granted.

Respectfully submitted,
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satellite sound broadcasting use by the United States in a May 1986 contribution to CCIR JIWP 10-11/1. That contribution became the basis for "Advanced System I" described in CCIR Report 955. The Dolby ADM was selected for Advanced System I on the basis of the lower bit rate achievable at an acceptable degradation in the subjective quality of the program material when compared to straight PCM (See Annex II to CCIR Report 953-1 (MOD F) for a full explanation of the degradation). A bit rate of approximately 400 kbps per stereophonic program channel was required. GIC apparently has increased the bit rate of a stereo ADM to about 700 kbps in order to reduce the coloration of the audio noted in the tests reported in Report 953-1 (MOD F) to imperceptible levels. Satellite CD Radio does not see the logic behind tripling the bit rate and transmitter power requirement when there will be no improvement in performance.

As a secondary consideration, Satellite CD Radio also uses rate 1/2 ($R=1/2$) convolutional coding and interleaving to mitigate the effects of multipath fading. Coding doubles the rate of the digital data stream and imposes the need to include a Viterbi maximum likelihood decoder in receivers designed to operate in low signal strength areas. It so happens that the upper limit of the bit rate for a low cost Viterbi decoder (available from STel) is 256 kbps. Consequently, adopting the GIC proposal to triple the data rate would require the use of a more expensive Viterbi decoder in addition to requiring triple the bandwidth and transmitter power.

In light of the above, it should be clear that Satellite CD Radio chose the Dolby AC-2 audio processing technique on the basis of:

compact disc quality at 1/3 the bit rate of the GIC ADM decoder;

greater spectrum efficiency;

greater transmitter (space and terrestrial) power efficiency;

availability of lower cost Viterbi decoder chip; and,

digital (in contrast to analog) implementation offers assurance of significant cost reductions through economies of scale.

2.1 Terrestrial Repeaters Assure High-Quality Reception in Urban Areas

GIC acknowledges the need for terrestrial repeaters to fill in weak signal areas, "although it is not clear that the overly simplistic proposal of Satellite CD Radio would be adequate to

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December 14, 1990

TECHNICAL EXHIBIT 1

Technical Reply Comments
in Docket RM-7400

Technical Appendix

prepared by

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and
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1. National Association of Broadcasters (NAB)

1.1 Frequency Reuse Factor

NAB questions the claim of a frequency reuse factor of three (3) made by Satellite CD Radio. Satellite CD Radio did not mean to state or imply that frequencies used by the satellite for BSS (Sound) transmissions (that is, in the space-to-Earth direction) could be used three times over within the same geographic area. Rather, our proposed pattern of spectrum utilization permits frequencies to be reused by satellites in every third service area. In this plan, the total BSS (Sound) allocation would be divided into three equal segments or sub-bands, designated F1, F2 and F3, as described in the Application and Petition.

This "satellite cellular" concept is the space parallel to the terrestrial pattern of frequency usage that has proved successful for mobile telephone systems operating in contiguous service areas across the country and in neighboring administrations.

Actually, frequencies could be repeated in every other service area and still keep interference from the sound broadcasting satellites to BSS receivers within acceptable limits. However, a repeat pattern of three was proposed for two overriding reasons: repeating frequencies every third service area permits the pattern of frequency reuse to be extended without limit to other administrations in the Western Hemisphere (ITU Region 2), and if the allocation proposed by Satellite CD Radio should be adopted in all three ITU Regions, in service areas of other administrations around the world. A second important reason for repeating frequencies no more frequently than every three service areas is to leave two-thirds of the entire allocation available in every service area for shared use by terrestrial repeaters and the existing users, Mobile (Aeronautical Telemetry).

Even though an "every third service area" pattern of frequency reuse would be established in principle, individual administrations could still employ any or all of the allocation for terrestrial services, and that use could be changed in future years by individual administrations without requiring ITU action.

The overall frequency reuse by both satellite and terrestrial

transmitters is much higher than co-channel use in every third service area. Within a service area, the two-thirds of the band not used for satellite transmissions can be used over and over by terrestrial repeaters and by aeronautical telemetry. In administrations choosing to use more of the band for terrestrial broadcasting, the frequencies allocated in those countries for terrestrial use can be repeated several times within each service area.

Thus the NAB claim that satellite broadcasting is less spectrum efficient than a terrestrial broadcasting system¹ is not correct. The Satellite CD Radio system design is based on a frequency reuse (or frequency repeat) factor of 3. Thus, only 3 channels are required to provide one sound program covering the contiguous United States.

1.2 There Are No Technological "Show-Stoppers"

Claims that the satellite service is totally untested and unevaluated² does not apply to the technology. Various elements have been individually developed and tested. For example, the Dolby AC-2 audio processing components, the adaptive equalizer and the Viterbi decoder required by the receivers are all available as described in the Technical Appendix to Satellite CD Radio Application for a Private Digital Satellite Sound Broadcasting System, filed May 18, 1990. While there is a degree of complexity that exceeds that of conventional AM and FM receivers, there are no technological "show stoppers" connected with our satellite sound broadcasting system design.

1.3 Modulation and Compression Techniques Are Mature

Assertions that the Satellite CD Radio proposals concerning modulation and compression techniques are largely in the theoretical stage are false.³ The Dolby AC-2 audio processing equipment is available now as a commercial product as referenced in the Technical Appendix to our May 18, 1990 Application.

Offset quadrature phase shift keying (OQPSK) combined with convolutional coding is a proven technology used by NASA for both near-Earth and deep-space missions. Satellite CD Radio has proposed the same convolutional code that NASA has adopted as a

¹p 4 "... space satellite delivery would be far less spectrum efficient than potential terrestrial delivery of a digital broadcast signal to the consumer."

²p 6 "The proposed satellite service is totally untested and unevaluated."

³p 9 "Moreover, the Satellite CD Radio proposals regarding modulation and compression techniques are largely in the theoretical stage."

standard ($R=1/2$, $K=7$). The adaptive equalizer has been reduced to a chip that is part of a communication system being manufactured and delivered by STel. This aspect was also discussed in the Technical Appendix to our May 18, 1990 Application. Interleaving combined with a cover sequence for synchronization is a technology developed in the 1970's and deployed operationally by NASA in their Tracking and Data Relay Satellite System. Finally, as mentioned in the Technical Appendix to our Application, the Viterbi decoder is a commercial product offered by STel and others. In light of the extensive development of the technology, the deployment of some elements in operational systems and the availability of still other elements as commercial products, it is impossible to conclude that the modulation and compression techniques are largely in the theoretical stage.

1.4 Dolby AC-2 Delivers CD Quality

The NAB has observed that two of the parameters associated with the audio processing technique, the frequency response and distortion, fall short of CD quality.⁴ Dolby is in the process of extending the frequency response of the AC-2 processing technique to 20 kHz to conform to the CD standard. This increased frequency response will be achieved at no increase in bit rate.

The value quoted for distortion is based on what would be measured with a notch distortion meter in response to a sine wave test signal. It does not accurately reflect the harmonic distortion or the subjective distortion as perceived by the ear.

1.5 Per Channel Emission Characteristics of Repeaters and Transmitters Are Identical

The NAB takes issue with our statement that the repeaters and transmitters are virtually identical.⁵ Our statement about the equality of power is accurate. We mean that the e.i.r.p. of each terrestrial repeater carrier (i.e., each of the 66 channels repeated in and around urban areas) will be essentially the same as the e.i.r.p. of the independent terrestrial broadcasting channels.

1.6 Shaped Beam Satellite Antennas Are Feasible

The NAB attempts to cast doubt on the feasibility of a satellite transmitting antenna with a diameter of the order of 7-9

⁴ p 9, Footnote 19 "... AC-2 system parameters significantly fall short of typical CD specs in frequency response and distortion performance."

⁵ p 11 "... repeaters and the transmitters is virtually identical."

meters.⁶ This technology is well in hand. A 9 meter diameter unfurlable reflector antenna was flown on the sixth in the series of NASA's Application Technology Satellites (ATS-6) sixteen years ago in 1974.⁷ This satellite was used for TV broadcasting experiments in the United States before being positioned in view of India where it was used for one year in a joint experiment with India to broadcast TV programs to 2400 villages rural villages.⁸ The operating frequency used for this experiment was 860 Mhz and the e.i.r.p. was 52 dBW. It should also be noted that the Ekran series of satellites operated by the USSR employ a 96 element phased array to produce an e.i.r.p. in excess of 56 dBW in the 700-760 MHz band.

The question of satellite transmitting antenna technology has also been addressed by the CCIR in Report 955.⁹ Annex I to the Report summarizes the work in progress to develop three types of high performance, space-qualified antennas with diameters ranging from 5 meters to 55 meters. These antennas are characterized by their supporting structure, which are the hoop/column, tetrahedral truss and the wrap-rib (it is noted that the ATS-6 antenna employed the wrap-rib supporting structure). Annex I to the Report also indicates that "A flight test of a high-performance, low-side lobe, 20 meter wrap-rib prototype antenna system on the Shuttle or on another suitable vehicle is being studied as a means to significantly reduce the risk and uncertainty associated with the operational use of an antenna ..."¹⁰

The NAB also contends that the particular shaped beam satellite transmitting antenna still needs to be developed.¹¹ This is quite true. There is no off-the-shelf 1500 MHz feed design to bolt to an antenna, and then to a satellite and launch. However, the design concepts and techniques to build a space qualified satellite transmitting antenna are mature as demonstrated by

⁶p 11 "... suggests the use of a 7-9 meter diameter antenna..."

⁷ R.B. Marsten, "ATS-6 Significance," IEEE Transactions on Aerospace and Electronics Systems, Vol. AES-11, No. 6, pp. 984-993, November 1975.

⁸ J.E. Miller, "ATS-6 Satellite Instructional Television Experiment," IEEE Transactions on Aerospace and Electronics Systems, Vol. AES-11, No. 6, pp. 1033-1037, November 1975.

⁹ "Satellite Sound Broadcasting with Portable Receivers and Receivers in Automobiles," CCIR Report 955-1 (MOD F), 15 January 1990, Doc 10-11S/1011, XVII Plenary Assembly, Dusseldorf, 1990.

¹⁰(see R.E. Freeland "Mobile Communication Satellite Antenna Flight Experiment Definition," 38th Congress, International Astronautical Federation, Paper IAF-87-314, Brighton, England, October 1987.)

¹¹p 11

numerous Fixed-Satellite Service (domestic as well as international satellites) systems operating in the 4/6 and 12/14 GHz bands. Mobile-Satellite Service systems now under construction will also contribute relevant design experience. Finally, we have assurance from spacecraft manufacturers that shaping the beams of satellite transmitting antenna is within today's state-of-the-art.

1.7 ITU PFD Limits

NAB notes that the proposed Satellite CD Radio link budget "apparently exceeds" a PFD limit for the 5 MHz wide band 1525-1530 MHz established by the ITU. We agree with NAB that any exceedance of an established ITU limit would only be apparent and not actual.

The PFD limit in the band 1525-1530 MHz cited by NAB applies only in ITU Regions 1 & 3, and not in Region 2, the Western Hemisphere. Assuming that the proposals of Satellite CD Radio for a worldwide allocation of the band 1470-1530 MHz are adopted at the 1992 WARC, and that that conference does not make any consequential change in the permissible PFD in that band segment in Regions 1 & 3, countries in those regions would still be able to use 92% -- 55 MHz out of the total of 60 MHz -- for space or terrestrial broadcasting, while limiting only the remaining 5 MHz to terrestrial uses. Of course, as the use of satellite sound broadcasting increases throughout the world over the years, future conferences could increase or remove the limit from that small band segment, or make other allocations for BSS (sound).

1.8 Frequency Reuse Factor

NAB questions the meaning of our statement that the equipment used for the terrestrial repeaters and transmitters would be "virtually identical." In fact, Satellite CD Radio was referring to the similarity of the typical per channel radiated power, transmitting antenna gain, height and coverage area, used for both terrestrial repeaters and transmitters, as well as a common signal format, modulation and coding method.

1.9 Sharing Is Feasible

NAB misstates Satellite CD's views on the feasibility of sharing. Satellite CD Radio most emphatically does not "acknowledge that its satellite service needs totally new spectrum and that it cannot share with existing communications systems." Satellite CD's analysis of sharing demonstrates that sharing is most assuredly feasible with reasonable interference and sharing criteria.

1.10 Satellite CD Radio System Is Designed to Operate in All Types of Environments

The NAB contends that the system described by Satellite CD Radio¹² "... does not appear to have an inherent ability to reduce or eliminate the effects of multipath or terrain/building shadowing." The Satellite CD Radio system is designed to operate with cost-effective receivers in environments that range from the additive white Gaussian noise (AWGN) channel (typical of the home receiver with an outdoor antenna), to a classic Rayleigh fading channel (typical of a vehicular receiver operating in an rural environment), to the delay dispersive selective fading channel (typical of a vehicular receiver operating in an urban environment). The effects of Rayleigh fading are mitigated by the use of interleaving in the time domain as described on page 8 of Appendix 5 to Satellite CD Radio Supplement to the Petition for Rulemaking filed on 22 June 1990.

The adaptive equalizer is used in urban environments to mitigate the effects of delay spread. The use of the adaptive equalizer in combination with the high power repeaters/transmitters ensures the availability of high quality signal in urban areas. The adaptive equalizer adds the dispersed signal in an optimum way to take full advantage of the inherent diversity of the delay dispersive channel.

Satellite CD Radio solves the terrain/building shadowing problem by using high power repeaters/transmitters and by using low gain vehicular receiving antennas that receive the scattered component of the signal as well as the line-of-sight component of the signal.

1.11 Quad-Spatial Diversity Is an Option

The NAB questions the viability of quad-spatial diversity for use on all except a very few high-end model receivers.¹³ Satellite CD Radio in its Supplement filed on June 22, 1990 replaced quad-diversity with interleaving as a means of simplifying the receiver. Quad-diversity is however retained as a future option.

1.12 L-Band Is Suitable for Satellite Sound Broadcasting and Complementary Terrestrial Sound Broadcasting

The NAB believes that L-band is very unsatisfactory, and perhaps unusable, for terrestrial [broadcasting] service.¹⁴ It is true that shadow losses are somewhat higher and that the effective area of simple receiving antennas is smaller at the higher frequencies. But the separation distance between diversity antennas is smaller. In the FM band (around 100 MHz), diversity

¹²at page 13

¹³p 13-14 "... complex four-antenna space diversity ..."

¹⁴p 17 "While L band it is very unsatisfactory, and perhaps unusable, for terrestrial service."

antennas must be separated by more than 5 feet to ensure diversity improvement. However, at L-band (1500 MHz) the antenna separation need only be 4 inches -- a distance that could mask the use of space diversity to the car owner.

The NAB should be aware that frequencies above 1000 MHz are viewed as being quite usable for services similar to the broadcasting service. Specifically, bands below 3 GHz are quite satisfactory and very usable as witnessed by the proposals for spectrum to implement the Future Public Land Mobile Telecommunication System (FPLMTS).

2. General Instrument Corp. (GIC)

2.1 Dolby AC-2 Is The Best Choice

GIC asserts in several places that the Satellite CD Radio proposal "... is technically flawed because it relies on the use of the new Dolby AC-2 sound coding method."¹⁵ It is their position that it "... is a relatively complex and expensive approach for this particular use in the consumer market."¹⁶ They would prefer to use the Dolby adaptive delta modulation (ADM) coding system.

Satellite CD Radio has selected the Dolby AC-2 digital audio processing technique based on its superior performance at an acceptable cost. The complexity of the audio processing technique is embodied in the digital chip needed to execute the algorithm. As numerous examples will attest, complexity, especially in a digital chip, is not necessarily precluded from the consumer market. The CD player is a prime example of complexity reduced to practicality. It employs laser(s) to mechanically track and detect digital signals encoded as 0.6 μm diameter pits embedded 0.12 μm deep in a plastic disc. The laser must optically track a spiral pattern of pits that is separated by 1.6 μm . The CD player also uses digital chips to deinterleave, decode a FEC Reed-Solomon code, interpolate, use adjacent samples, or mute if uncorrectable errors are detected in the digital data stream. This is formidable technology to include in a consumer item. The fact that the signal processing is predominantly digital is one element that has permitted this level of complexity to be available to the consumer as a reliable product at prices on the order of \$150.

Satellite CD Radio notes that Dolby ADM was first proposed for

¹⁵p 2 "... technically flawed because it relies on the use of new Dolby AC-2 sound coding method."

¹⁶p 7 "... Dolby AC-2 sound coding method. This is a relatively complex and expensive approach for the consumer market."

satisfy that goal."¹⁷

The specific implementation of terrestrial repeaters proposed by Satellite CD Radio derives from the objective to ensure the availability of uncompromised, high quality CD-Radio service in heavily shadowed urban areas. The easiest way to overcome shadowing loss is by using high power repeaters operating on a set of complementary frequencies.

The Satellite CD Radio approach is in contrast to the low power, cochannel repeater approach used in the European DABS system. That system requires repeater spacings that do not exceed about 16 km. Power levels must be carefully set to minimize "overreach" problems. At the same time, there is no assurance that the desired availability will be achieved in the coverage area.

3. Electronic Industries Association, Consumer Electronic Group (EIA/CEG)

3.1 All-Channel Requirement

EIA/CEG claims that Satellite CD's suggestion of "'all-channel' reception requirements" is "ill-considered" and that they would be as "burdensome and unnecessary as they would be unlawful."

We submit that the All-Channel Act, adopted by The Congress in 1962 and subsequently embodied in the Commission's report and Order of September, 1962 was one of the most fruitful events for the U.S. Television industry since the first electron beam impinged on a screen coated with electroluminescent phosphors.

Figure 1 shows the number of television receivers manufactured for the U.S. market, and in the number in use in American homes from 1950 to 1982. The dates of the Commission's Report & Order setting forth the "All-Channel" regulations and the date by which compliance with those regulations was required are superimposed.

The immediate and overall effect of the FCC's "All-Channel" receiver mandate is clear. Far from discouraging or restricting growth, the requirement for All-Channel receivers triggered off an unprecedented expansion of sales and installations. It took the "Oil Embargo" in the third quarter of 1973, the ensuing "Energy Crisis" and its consequent adverse impact on the American economy and consumer spending to interrupt a ten-year period of essentially increasing sales and use of television sets following the passage of the All-Channel Act.

¹⁷p. 3 "... need for terrestrial repeaters not clear that the overly simplistic proposal of Satellite CD Radio would be adequate to satisfy that goal."

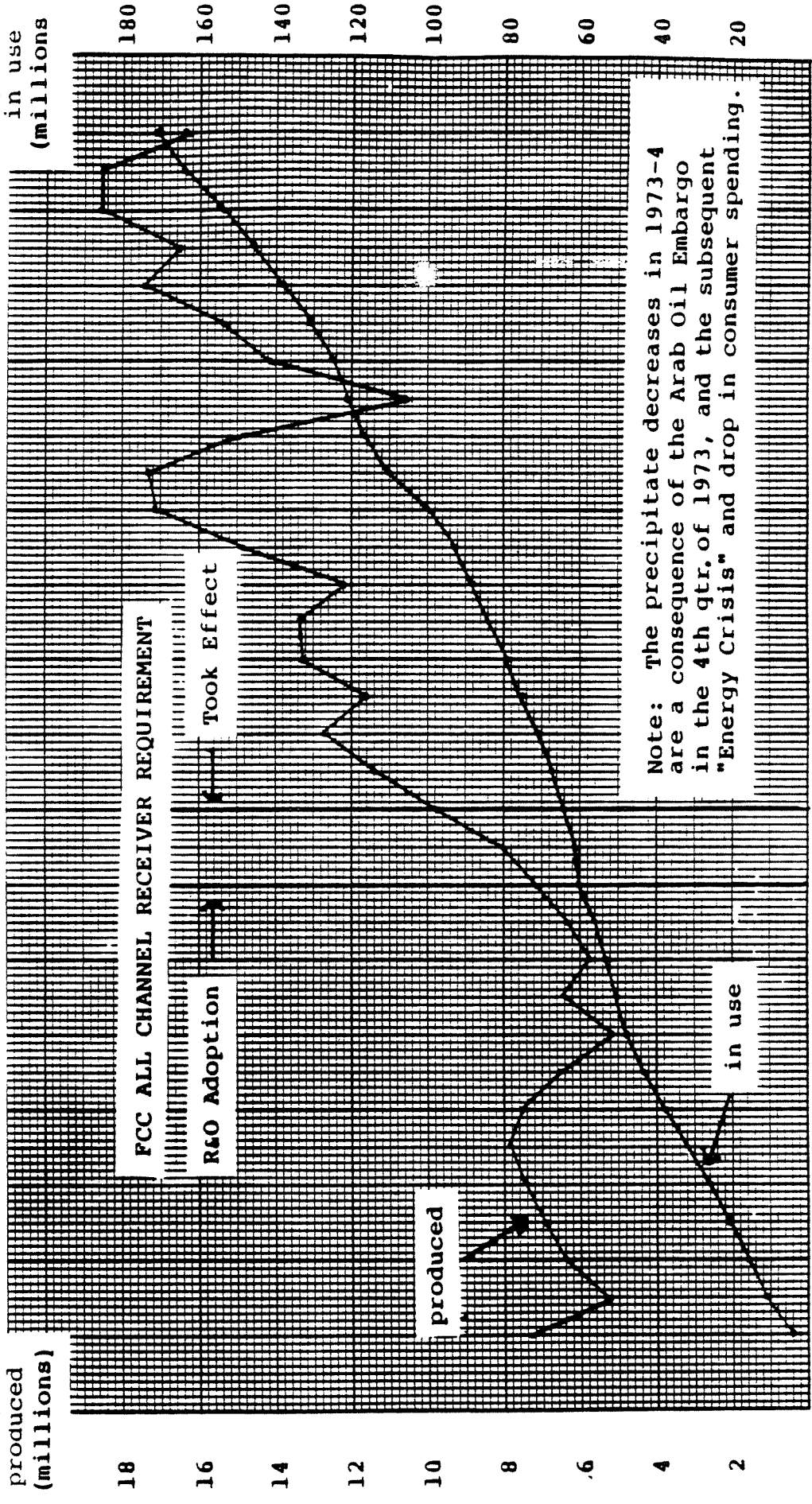
TELEVISION RECEIVERS PRODUCED FOR THE U.S. MARKET ^{1/}
 (left scale)

and

TELEVISION RECEIVERS IN USE IN THE U.S. ^{2/}
 (right scale)

Number of television receivers in use (millions)

Number of television receivers produced (millions)



Note: The precipitate decreases in 1973-4 are a consequence of the Arab Oil Embargo in the 4th qtr. of 1973, and the subsequent "Energy Crisis" and drop in consumer spending.

^{1/} Source: "Electronic Media", Christopher H. Sterling, 1984 (data provided by Broadcasting Yearbook and Electronic Industries Association),

^{2/} Source: "Electronic Media", Christopher H. Sterling, 1984 as reprinted from

Figure 1.

To consider the question of the desirability of common standards apart from an All-Channel reception capability, consider the success of certain products and services for which single formats have been adopted, and those without a common, unifying technical standard. The success of such diverse systems as the Universal Product Code (the "Bar Code" of retail merchandisers), facsimile machines, NTSC itself and Compact Discs, are attributable in large measure to the timely adoption of uniform standards.

On the other hand, stereophonic AM radio has languished, primarily because of the uncertainty by broadcasters and the public which must purchase receivers, over which of several competing non-standardized formats will triumph -- or even survive.

The broadcasting and manufacturing industries of the United States should have the good fortune to have regulations similar to the "burdensome" All-Channel receiver requirement "imposed" again at some future date.

4. Aerospace & Flight Test Radio Coordinating Council (AFTRCC)

4.1 Aeronautical Telemetry not only Non-Urban

AFTRCC misquotes (page 16) the statements of Satellite CD Radio giving our understanding of where the band 1429-1530 MHz is now used for flight test telemetry. We did not say that "flight testing occurs only over 'remote, sparsely settled areas of the country.'" What we did say was most aeronautical telemetry operations occur at the test ranges of the military services" and that most of these facilities are in remote, sparsely settled parts of the country." And that "Telemetry systems are also used at the factories of aircraft manufacturers...and by other contractors to the military services."

We made our proposals for sharing frequencies with aeronautical telemetry with full knowledge that some of those operations would be in or near population centers where terrestrial repeaters and transmitters would also be in desired. It was for that reason that we proposed that 25 MHz of the existing band be retained for exclusive use by aeronautical telemetry. Those telemetry operations in or near urban areas which cannot be accommodated in that band segment can also utilize the 80 MHz wide band, 2310-2390 MHz allocated by the 1979 WARC for expansion of aeronautical telemetry operations.

4.2 Actual use of the Band for Aeronautical Telemetry

The map in Exhibit 4 purports to illustrate the 1990 utilization of the 1435-1530 MHz band throughout the United States. However, no indication is given of the level of use, or the number of minutes of operation per day or per week, or the number of

simultaneous operations, or the total bandwidth thereof.

While it might be difficult to schedule additional telemetry operations in or near Seattle, St. Louis or Santa Monica with fewer frequencies, we doubt that current testing requirements completely occupy the entire band, around the clock, all year long in many of the other locations indicated, with no supporting text or justification, on this nearly illegible map. AFTRCC has provided no specifics on the number of telemetry channels in use at any time and any given test range. Similarly, no statistics are given on the use of the expansion band, 2310-2390 MHz). It is our understanding that, although this expansion band was allocated for telemetry systems by the 1979 WARC, it was not allocated by the United States for this purpose until 1984. Today, 11 years after the international allocation was made, only a handful of systems are operating in the band. The claim that the lower band is filled to overflowing, is belied by the glacial pace of exploitation of this "expansion" band. But even if this "expansion" band becomes occupied, a band adjacent to it, now allocated for radiolocation, 2390-2450 MHz, could be re-allocated as yet another band for aeronautical telemetry. The advantages of this band include its contiguity to the existing expansion band, and the fact that the FAA is reducing -- if not eliminating -- its use of that band for radar systems.

4.3 Interference Analysis

AFTRCC claims for itself a greater level of protection than given in the Government Master File. There, as reproduced in the June 22, 1990 Supplement to the Petition of Satellite CD Radio, typical receiver sensitivity is given as -90 dBm and necessary bandwidths from 500 kHz to 1 MHz. We used that sensitivity, a 500 kHz bandwidth and a carrier-to-noise at extreme range of 10 dB in our sharing analysis. AFTRCC seeks protection for receivers having a noise floor 15 dB lower than that.

AFTRCC claims protection for 10 meter diameter antennas having a first sidelobe level of +20 dBi. Assuming 65% efficiency, the main beam gain of such an antenna will be around 43 dBi and have a half-power beamwidth of 1.3 degrees. However, the maximum of that first sidelobe will occur at about 2 degrees, hardly much more off beam center than the main beam. In other words, as we assumed in our interference analysis, if the main beam of the telemetry receiver does not point at, or near, the direction of the satellite, antenna discrimination will provide protection against interference. That is the typical situation when the flight test vehicle is at or near extreme range. When the flight test vehicle is at much closer range, it is possible that the main beam of telemetry receiver may point at or near the satellite. But at such times, the flight test vehicle is much closer to the telemetry receiver, providing it with a much higher signal level. The difference between the desired telemetry signal

when the flight test vehicle is at extreme range (and therefore at low angles of elevation) and when it is overhead at 30,000 feet (about 9 km) is in excess of 30 dB. That difference can compensate for the increased gain of the telemetry receiving antenna in the fleeting instances when it is pointed in the direction of the satellite.

4.4 Spectrum Efficient Methods

AFTRCC finds many objections to the use of forward error correction ("FEC"), but does not challenge the fundamental observation of Satellite CD Radio that aeronautical telemetry is not using contemporary, robust modulation and coding techniques that are essential in an era of increasing spectrum demand and congestion. In such an era, the race belongs not to the swift, but to the interference-resistant user. Today, the use of robust modulation methods is not a nicety: it is a necessity.

Coding increases the redundancy of the baseband signal, thereby increasing its immunity to interference. As demonstrated by Tillotson and his co-authors, referring to terrestrial systems some 17 years ago, considerable bandwidth expansion is required to make optimum use of the radio frequency spectrum¹⁸. Convolutional coding is one of the practical bandwidth expansion techniques.

One-half rate convolutional encoding, which can be transmitted in the same bandwidth as an uncoded signal if higher order modulation techniques are used, provides a coding gain of 5 dB. That gain can be used to permit a commensurate increase in interference, which would permit the co-channel reuse of frequencies at smaller separation distances. In other words, aeronautical telemetry could transmit the same amount of information, with the same bit error rate, using the same per channel bandwidth, with co-channel users at significantly closer distances. That would result in using significantly less of the spectrum resource.

Bandwidth expansion techniques are not restricted to digital systems. Wideband FM is an example of that principle applied to analogue modulation. Within limits, increasing the modulation index of an FM signal can provide increased immunity to interfering signals, thereby permitting closer spacing between co-channel systems.

AFTRCC offers several explanations for not employing spectrum efficient techniques and technology, including the comments that

¹⁸L.C. Tillotson, et. al., "Efficient Use of the Radio Spectrum and Bandwidth Expansion," Proc. IEEE, Vol. 61, No. 4, April, 1973, pp 445-452.

they would represent an "increase in system complexity," and a consequent "increase in the size of airborne equipment." AFTRCC also claims that there is sometimes a "requirement for high-speed, real-time data which is most efficiently transmitted using analogue techniques." None of those reasons is valid in 1990.

5. American Mobile Satellite Corporation (AMSC)

AMSC repeats many of the arguments of AFTRCC regarding the interference that would supposedly be caused by satellite sound broadcasting transmissions to telemetry receivers. The comments above are also applicable to the concerns expressed by AMSC.

TELECOMMUNICATIONS SYSTEMS

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CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING ENGINEERING INFORMATION SUBMITTED IN THESE REPLY COMMENTS

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in these Reply Comments, that I am familiar with Parts 2, 25 and 73 and 87 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this application, and that it is complete and accurate to the best of my knowledge.

by: Richard G. Gould
Richard G. Gould
Registered Professional Engineer

dated: September 14, 1990

LEGAL EXHIBIT 2

Spacecasting & Localism

TO: Ben C. Fisher, Esq.
Chairman, Informal Working
Group-2
1992 World Administrative
Radio Conference Industry
Advisory Committee

FROM: Satellite CD Radio, Inc. 1/

DATE: July 30, 1990

Re: **POLICY AND LEGAL IMPLICATIONS OF A U.S.
SATELLITE SOUND BROADCASTING SERVICE**

=====

INTRODUCTION

This position paper responds to Appendix C of the July 30 First Interim Report of Ad Hoc Subgroup B, prepared by the National Association of Broadcasters ("NAB"). In its document, the NAB argues that, for two reasons, new CD-quality sound broadcasting services should only be implemented through a terrestrially-based system, and not through a satellite system.

1/ Prepared by James G. Ennis, Esq. and Mania K. Baghdadi, Esq., of Fletcher, Heald & Hildreth, International Counsel to Satellite CD Radio, Inc.

In the NAB's view, only local terrestrial radio channels can implement the United States' policies of localism and the "promotion of diversity of locally-based programming". The NAB argues that since satellite sound broadcasting would provide a national service, it will not provide programming to meet the needs of local communities. The NAB also argues that adoption of a satellite-based system would cause the profits of existing radio broadcasters in the United States to decline, threatening the viability of the average station.

As a preliminary matter, the Advisory Committee should recognize that if it were to adopt the NAB's arguments as the basis for a recommendation by the Advisory Committee, it would lead to the anomalous result that the U.S. would not receive any allocation for a new digital audio radio service, either satellite-based or terrestrial-based, at WARC-92. The purpose of the Advisory Committee is to recommend to the FCC positions the U.S. should take on various issues on the agenda for WARC-92. The agenda for WARC-92 does not provide for consideration of a new digital audio radio allocation exclusively for terrestrial broadcasters. The only way a new allocation for terrestrial broadcasting can be considered at WARC-92 is as an adjunct to a satellite sound broadcasting system. Therefore, if the Federal Communications Commission ("Commission" or "FCC") were to adopt a U.S. position opposing the establishment of a satellite sound broadcasting system, there would be no

opportunity to propose at WARC-92 a new stand-alone terrestrial radio service in its place.

More fundamentally, however, the NAB's arguments simply have no merit. Thus, the NAB is incorrect in asserting that U.S. policies favor local broadcast services to the exclusion of national programming services. Section 307(b) of the Communications Act does not preclude the Federal Communications Commission from authorizing such national radio services. In any event, under Satellite CD Radio's proposal, such national satellite radio channels would complement a new local radio service provided by terrestrial broadcasters. New terrestrial transmission facilities would provide new sources for local entertainment, news and information programming.

NAB's second argument, that satellite sound broadcasting would negatively impact the revenues of existing broadcasters in the United States, is speculative and equally incorrect. Existing broadcasters have repeatedly invoked the theory of ruinous competition, in response to those who have sought to provide new competitive broadcast services to the public, in an attempt to prevent such competition. They have repeatedly argued that such new services would threaten the viability of the services they provide to the public. These fears have proven to be unfounded. The new services have not destroyed old services but have merely assumed their niche among the various media services available to the public.

These predictions are particularly likely to be incorrect in this case because existing broadcasters will have the opportunity to participate in the provision of new CD-quality sound broadcasting services. Satellite CD Radio's proposal contemplates both a satellite and terrestrial component, and offers broadcasters ample opportunities to participate in both components, i.e., in the provision of both national and local CD-quality radio services. Thus, terrestrial broadcasters will not be excluded from access to national advertising, which such new services might attract.

In the last analysis, however, the FCC is charged with concern for the public interest, which clearly lies in authorizing provision of these new and enhanced services to benefit the public, rather than with protecting the profits of existing broadcasters.

**I. The WARC-92 Agenda Contemplates
An Allocation For A New Terrestrial
Sound Broadcasting Service Only
As An Adjunct To A Satellite
Sound Broadcasting Service.**

WARC-92 will not make an allocation for a new terrestrially-based radio broadcasting system unless it allocates spectrum for a satellite sound broadcasting service. The Administrative Council of the International Telecommunication Union's agenda for WARC-92 includes

"the consideration of the allocation of frequency

bands to the broadcasting-satellite service and the associated feeder links: (a) for the broadcasting-satellite service (sound) in the range 500-3000 MHz, as indicated in Resolution 520(ORB-88), including the accommodation of complementary terrestrial sound broadcasting uses within this allocation" 2/ (Emphasis added.)

Thus, as the Administrative Council's agenda makes clear, the terrestrial allocation is intended only as a complement to the satellite sound broadcasting system. In other words, unless there is an international allocation for satellite sound broadcasting, there will be no international allocation for terrestrial radio broadcasting services, and the public will be deprived of the opportunity to obtain the high-quality audio services promised by this new technology.

**II. Satellite Sound Broadcasting Service
is Consistent with Section 307(b)
of the Communications Act**

Satellite Sound Broadcasting contemplates direct broadcasting to listeners of high-quality audio signals. The NAB argues that such a service would not provide programming to meet the needs of local communities in the United States. In essence, the NAB is arguing that such a service would conflict with the Commission's responsibility under Section 307(b) of the Communications Act to "make such distribution of licenses, frequencies, hours of operation, and of power among the several

2/ Resolution of the Administrative Council of the International Telecommunication Union (45th Session, Geneva), Document No. 7042-E, dated June 20, 1990.

States and communities as to provide a fair, efficient, and equitable distribution of radio service to each of the same." Such concerns are groundless.

A few years ago, the Commission soundly rejected a similar argument that direct broadcasting satellite services would contravene the policy of localism in broadcasting and that therefore this technology should not be authorized. In the Direct Broadcast Satellite (DBS) proceeding, various parties, including television broadcasters, commercial television networks, and the National Association of Broadcasters, contended that authorization of a DBS system would conflict with the FCC's responsibility to maintain local broadcasting services and that the Communications Act requires broadcasters to serve local communities rather than broad geographic areas. ^{3/}

In authorizing DBS services, the Commission flatly rejected those claims. The Commission held that the Communications Act provides it the discretion to authorize non-local broadcast services. It based that authorization on Section 1 of the Act, 47 USC § 1, which directs the Commission to regulate interstate "communication by wire and radio so as to make available, so far as possible, to all the people of the United States a rapid, efficient, Nation-wide, and world-wide wire and radio communica-

^{3/} See, e.g., Notice of Proposed Policy Statement and Rulemaking in General Docket No. 80-603, 86 FCC 2d 719, 735-36 (1981); Report and Order in General Docket No. 80-603, 90 FCC 2d 676, 685 (1982).

tion service with adequate facilities at reasonable charges..." Further, to implement this directive, Congress gave the Commission authority to classify stations, prescribe the nature of the service to be rendered by each station class, fix station locations, establish areas or zones to be served by any station, and make such rules and regulations as may be necessary to carry out the provisions of the Communications Act. See 47 USC §§ 303(a), (b), (d), (h), and (r). These provisions have repeatedly been construed as expressing Congressional intent to afford the Commission wide discretion in deciding how best to utilize the nation's airwaves to attain statutory goals. 4/ Thus, the Commission found that nothing in this broad Congressional mandate requires that the Commission license broadcast stations only to individual cities or communities. 5/ Further, it held that the concept of localism as a fundamental underpinning of the Commission's broadcast regulation "was established by Commission choice, not by statutory command." 6/

Moreover, not only does Section 307(b) of the Communica-

4/ See FCC v. Pottsville Broadcasting Co., 309 US 134 (1940); National Broadcasting Co. v. United States, 319 US 190 (1943).

5/ See Notice of Proposed Policy Statement and Rulemaking in General Docket No. 80-603, 86 FCC 2d 719, 736-37 (1981); Report and Order in General Docket No. 80-603, 90 FCC 2d 676, 686 (1982).

6/ Notice of Proposed Policy Statement and Rulemaking in General Docket No. 80-603, supra, 86 FCC 2d at 737.

tions Act not preclude the Commission from establishing a direct satellite broadcasting service providing national or regional service, but the Commission held, in the DBS context, that it was required by the Communications Act to study and authorize new technologies to serve the public interest. Thus, Section 303(g) of the Communications Act requires the Commission to: "[s]tudy new uses for radio, provide for experimental uses of frequencies, and generally encourage the larger and more effective use of radio in the public interest" Accordingly, the Commission's refusal to consider and authorize construction of new communication services like DBS, and satellite sound broadcasting, which is its audio counterpart, merely because satellite technology allows service to large land areas, would violate the clear directive of the Communications Act. ^{7/}

The Court of Appeals upheld the Commission in these determinations. National Association of Broadcasters v. FCC, 740 F. 2d 1190 (D.C. Cir. 1984). The Court noted arguments that the FCC could not, consistent with Section 307(b) of the Communications Act, approve a technology that will provide regional or national, instead of local, broadcast services. It, however, rejected that "luddite" notion, holding that the

^{7/} See Notice of Proposed Policy Statement and Rulemaking in General Docket No. 80-603, 86 FCC 2d 719, 737 (1981); Report and Order in General Docket No. 80-603, 90 FCC 2d 676, 686 (1982).

Commission had sufficient authority and discretion under Sections 1 and 303(g) of the Act to authorize new technologies which would provide non-local services. NAB v. FCC, 740 F. 2d 1190, 1197-98 (D.C. Cir. 1984). According to the Court, "not every communications service approved by the Commission need be tied to a local community." Id.

It is clear, under the Commission's and Court's decisions in the DBS context, that the authorization of a satellite sound broadcasting service would not violate Section 307(b) of the Communications Act, and would, instead, further the Commission's obligation to authorize new technologies which can provide new and enhanced services to the public. Satellite sound broadcasting has the capacity to provide the highest quality audio services and to provide those services to all portions of the United States, including underserved rural areas. It can provide greatly improved sound quality reception in automobiles, and provide a remedy for the fade-ins and fade-outs of radio signals as travelers commute over large distances. The Commission has, in a variety of contexts, long recognized the importance of increasing the number and variety of media outlets by encouraging the development of new and enhanced modes of communications services. ^{8/} Most recently, the Commission has

^{8/} See, e.g., Low Power Television Service, 51 RR 2d 476 (1982) (LPTV); Fourth Report and Order in Docket No. 21502, 95 FCC 2d 457, 468 (1983) (STV); Third Report and Order in Docket No. 21502, 90 FCC 2d 341, 345, 358 (1982) (STV);

issued a Notice of Inquiry as to whether it should consider national licensing in the expanded AM Band, which might "better foster new and innovative services, which enhance diversity for the public, consistent with the overall purpose of Section 307(b)." Fourth Notice of Inquiry in MM Docket No. 84-467, 3 FCC Rcd. 4497, 4500 (1988). 9/ Thus, notions of localism should not provide a bar to consideration of Satellite Sound Broadcasting, a promising technology which can provide residents of the United States with universal access to 100 channels of compact disk quality radio programming (66 provided by satellite and 34 provided terrestrially). 10/

Further, contrary to the arguments of the NAB, localism would be enhanced under the proposal advanced by Satellite CD

Fourth Report and Order, 15 FCC 2d 466 (1968) (STV); First Report and Order in BC Docket No. 82-536, 53 RR 2d 1519 (1983), recon. denied, 55 RR 2d 1607 (1984) (Subsidiary Communications Authorizations); Report and Order in BC Docket No. 80-90, 94 FCC 2d 152, 159 (1983), on recon., 49 Fed. Reg. 10260 (March 20, 1984) (omnibus FM allotments); Report and Order in BC Docket No. 81-741, 53 RR 2d 1309 (1983), on recon., 101 FCC 2d 827 (1985), reversed in part and remanded on other grounds, Telecommunications Research & Action Center v. FCC, 801 F. 2d 501 (D.C. Cir. 1986), rehearing denied, en banc, 806 F. 2d 1115 (D.C. Cir. 1986), cert. denied, 482 U.S. 919 (1987) (teletext); Report and Order in MM Docket No. 84-168, 101 FCC 2d 973 (1985) (teletext).

9/ Indeed, the Commission has also previously provided for regional service via AM clear channels.

10/ Existing radio and television stations do not provide only local programming but rather a mix of local, syndicated and national or regional network programming.

Radio. Satellite CD Radio's proposal provides both for satellite sound broadcasting services, which would provide national or regional programming services, and for channels for terrestrial broadcasters, who could provide the new CD-quality audio services on a local basis, providing local entertainment and information programming.

For these reasons, it is clear that the Satellite CD Radio proposal would neither violate Section 307(b) of the Communications Act nor disrupt the traditionally locally-based broadcasting system in the United States. Rather, under Satellite CD Radio's proposal the existing local broadcast system would be supplemented with new high quality programming, provided nationally, regionally, and locally by a mix of satellite and terrestrial-based broadcasters.

III. Satellite CD Radio's Proposal Offers Broadcasters an Opportunity to Participate in the Provision of National and Local Radio Services

A. The Proposal Includes Local Terrestrial Services

The NAB assumes that a choice must be made between authorization of new sound broadcasting services via satellite or terrestrial methods. That is clearly not the case. Indeed, Satellite CD Radio's proposal includes as an important element the involvement of broadcasters in a local terrestrial sound

broadcasting system, and the allocation of frequencies for that purpose. Under Satellite CD Radio's proposal, a new, local terrestrial CD-quality radio service would be authorized, whose licensees would be current AM and FM broadcasters. The new service would provide approximately 34 channels per market for a stand-alone terrestrial service. This would permit most broadcasters who were interested in providing the new service to obtain a channel to do so. The terrestrial service would be competitive with and independent of the satellite service Satellite CD Radio proposes. Existing radio broadcasters would deliver local entertainment and information programming through these terrestrial transmission facilities. This approach would provide local terrestrial broadcasters with an effective transition to high-quality, 21st-century digital technology. This approach furthers the Commission's goals of localism and encouraging new technologies. Thus, the CD radio system is designed to complement, not displace, existing terrestrial broadcasters.

B. Satellite CD Radio Proposes That the Satellite be Owned by a Consortium, and Broadcasters are Welcome to Apply

Under Satellite CD Radio's proposal, broadcasters would be entitled to participate in the provision of national satellite services. Satellite CD Radio proposes that a consortium be the licensee of the new system. That consortium would be composed

of all competing applicants to provide the satellite services, and broadcasters would be entitled to apply to be members of the licensee consortium. Broadcasters which apply and become members of the consortium would share in the business opportunities presented by Satellite CD Radio's proposal and would share in providing the new national and regional radio services.

C. Broadcasters Can Purchase One of the Channels to Provide a National Radio Service

Under the Satellite CD Radio proposal, channels on its satellite system would be sold to third parties. The satellite operator/licensee would exercise no control over the content of the satellite transmissions. The purchaser of the channel would program the channels. Satellite CD Radio expects that the vast majority of satellite channel purchasers will be existing AM and FM terrestrial broadcasters which seek superstation status. Thus, existing terrestrial broadcasters will not be excluded from the provision of the national radio services which are contemplated by the satellite sound broadcasting proposal.

IV. Economic Impact on Existing Broadcasters in the United States

A. The Adverse Economic Impact Argument Has Been Rejected in the DBS Context

The NAB argues that Satellite Sound Broadcasting direct-to-

listeners might siphon off national advertising revenues from existing broadcasters, reducing their profit margin, and threatening the viability of those broadcasters. This is not the first time that such a contention has been made by existing broadcast interests to attempt to prevent the market entry of new and competing technologies. In the United States, the Commission has consistently rejected such an anticompetitive approach, holding instead that its mandate is to serve the interests of the public in new and enhanced services rather than protect the economic interests of existing licensees.

When the Commission was considering whether to authorize DBS services, existing broadcasters argued that competition from DBS would reduce the audiences of advertiser-supported over-the-air television stations, which would reduce the stations' profit and their ability to provide public service or locally originated programming, resulting in the reduced availability of local news, information and other programming. ^{11/} The Commission rejected those concerns, noting that it would:

"consider the economic effect of a new service on existing broadcasters only if there is strong evidence that a significant net reduction in service to the public will result. The Commission cannot reject a new service solely because its entry would reduce the revenues or profits of existing licensees."

^{11/} See, e.g., Notice of Proposed Policy Statement and Rulemaking in General Docket No. 80-603, 86 FCC 2d 719, 737-38 (1981); Report and Order in General Docket No. 80-603, 90 FCC 2d 676, 686-87 (1982).

Report and Order in General Docket No. 80-603, 90 FCC 2d 676, 689 (1982). ^{12/} And, in the DBS and other contexts, the Courts have affirmed that it is not the Commission's responsibility to protect the profits of existing broadcasters but to foster the interest of the public in receiving new and competitive services. See, e.g., NAB v. FCC, 740 F. 2d 1190, 1198 (D.C. Cir. 1984) (the Communications Act "does not entrench any particular system of broadcasting: existing systems, like existing licenses, have no entitlement that permits them to deflect competitive pressure from innovative and effective technology."); FCC v. Sanders Bros. Radio Station, 309 U.S. 470, 475 (1940) ("Plainly it is not the purpose of the Act to protect a licensee against competition but to protect the public. Congress intended to leave competition in the business of broadcasting where it found it, to permit a licensee who was not interfering electrically with other broadcasters to survive or to succumb according to his ability to make his programs attractive to the public.")

The NAB has made no showing that there will be a loss of service should the Satellite CD Radio proposal, which contemplates both terrestrial and satellite-based services, be adopted. Indeed, as discussed above, existing terrestrial

^{12/} Accord, Satellite Television Corp., 91 FCC 2d 953, 976-77 (1982), aff'd, 740 F.2d 1190 (D.C. Cir. 1984).

broadcasters will have ample opportunities to participate in the provision of national services. Further, rather than national advertising revenues remaining static, it seems apparent that they will continue to grow, as they have grown over the past few years, 13/ and will probably increase at an even greater rate as the new services cause new national advertisers to use radio as an alternative to television and to complement and supplement their use of television as an advertising medium. Thus, the NAB's argument of adverse economic impact should be rejected, as it was in the DBS context. 14/

**B. The Commission Has Discredited
the Ruinous Competition Theory**

Recently, the Commission has abolished its Carroll doctrine and UHF Impact Policy, making clear that it will no longer consider whether economic injury will be caused to existing broadcast stations based on the introduction of new stations. See Report and Order in MM Docket No. 87-68, 3 FCC Rcd. 638 (1988), on recon., 4 FCC Rcd. 2276 (1989). In so doing, the

13/ According to the Radio Advertising Bureau, national advertising revenues for 1987 to 1989 grew about 8% each year, from \$1,315,000,000 in 1987 to \$1,530,000,000 in 1989.

14/ Indeed, the adverse economic impact argument has been rejected not only in the DBS context but also in other contexts such as cable television, see Malrite TV of New York v. FCC, 652 F. 2d 1140, 1149-50 (2nd Cir. 1981), cert. denied, 454 U.S. 1143 (1982), and pay TV, see Connecticut Committee Against Pay TV v. FCC, 301 F. 2d 835, 837 (D.C. Cir. 1962), cert. denied, 371 U.S. 816 (1962).

Commission noted that its policy was not to protect individual broadcast licensees from entrants providing new non-broadcast communications services and new media forms. According to the Commission, it has "consistently pursued regulatory policies intended to provide opportunities for development of alternative mass media technologies on the basis that an unrestricted, competitive environment generally leads to better service to the public than governmentally mandated market structures and service requirements." Id. at 640. Accordingly, it is the interest of the public in receiving these new services rather than the interests of existing broadcasters in retaining the status quo that should be considered. 15/

While the Commission's decision to eliminate the Carroll doctrine and UHF Impact Policy applies by its terms only to licensing and allotment decisions, 16/ the reasoning behind it applies to the instant case. Thus, the Commission determined that the "underlying premise of the Carroll doctrine, the theory of ruinous competition, i.e., that increased competition in broadcasting can be destructive to the public interest, is not valid in the broadcast field." Report and Order in MM Docket No. 87-68, supra, 3 FCC Rcd at 640. The Commission noted that

15/ Indeed, because there would be terrestrial channels available if the new service was created, existing broadcasters will not be foreclosed from the new technology.

16/ See Memorandum Opinion and Order in MM Docket No. 87-68, 4 FCC Rcd 2276 (1989).

the economic theory of ruinous competition had been discredited by economists, and the structure of the broadcasting industry, moreover, bears little resemblance to the type of industry structure where it was believed that ruinous competition could occur. Id. Further, the Commission rejected the notion that the revenue base is static and might not support competition. It noted that new stations might exploit an untapped segment of the market, with the result that the revenue base could rise, resulting in an increase of service without harming existing broadcasters. Id.

This reasoning is particularly applicable in the instant case. Satellite sound broadcasting could tap national advertisers who have not used radio before because of the logistical problems of advertising placement on numerous individual outlets and the limited reach. Thus, it would tap new revenues, without harming existing broadcasters. Indeed, as discussed above, the NAB has provided no concrete evidence to demonstrate that existing broadcasters will be harmed sufficiently to result in a loss of service to the public. Rather, the NAB analysis assumes a static revenue base, which has already been shown to be an invalid assumption.

Finally, the argument that Satellite Sound Broadcasting will threaten the viability of existing broadcasters is speculative and, moreover, flies in the face of experience. Over the years, whenever a new service has appeared on the broadcast

scene, existing licensees have sought to block entry of that service by claiming ruinous competition. That has been the case with, for example, subscription television service and cable television service. These pessimistic forecasts have, however, failed to materialize, and history has borne out the Commission's policy of fostering competition in services and allowing entry of new and enhanced competing services.

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DECLARATION

I, Richard G. Gould, under penalty of perjury, do declare as follows: (1) that I am a technically qualified satellite radio engineer; (2) that I have read the foregoing "Reply Comments and Opposition to Petitions to Deny" in connection with the Application of Satellite CD Radio, Inc.; and (3) that the facts contained therein are true and correct to the best of my knowledge and belief.



Richard G. Gould
Registered Professional Engineer

December 14, 1990

CERTIFICATE OF SERVICE

I, Catherine Mills, a secretary in the law firm of Fletcher, Heald & Hildreth, certify that on December 14, 1990, a copy of the foregoing document and the exhibits thereto was mailed first-class, U.S. postage prepaid to:

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