

**Today's FM Radio Industry  
And Important Developments For Its Future**

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**TODAY'S FM RADIO INDUSTRY**  
**AND IMPORTANT DEVELOPMENTS FOR ITS FUTURE\***

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\* The views reflected in this paper are those of the authors and are not meant in any way as an official presentation or interpretation of National Association of Broadcasters' positions.

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## INTRODUCTION

### Overview

As with any birth, the birth of commercial FM radio was a traumatic and somewhat messy process destined to change the lives of those closest to it. From the first patent in 1905 to the more than 4,400 commercial FM radio stations (plus an additional 1,400 non-commercial FM stations) now serving the U.S.<sup>1</sup>, the impact of FM radio on society is difficult to quantify. It is fitting to honor at this point in history, fifty years after the beginning of commercial FM radio, Mr. Edwin Armstrong, the man who made practical the application of frequency modulation.

Fifty years of commercial FM service in the U.S. is an important milestone for two reasons. First, from its first struggles for a breath of airwaves (i.e., an FCC allocation in the electromagnetic spectrum), to a mature and vital industry, the history of FM radio is an interesting tale of how society manages technological change through public policy and law, economic self interest, entrepreneurial zeal and ultimately, market acceptance or rejection.

In this chapter, we will pay tribute to some of the early developments in the creation of the commercial FM radio service. We will then move on to an analysis of the industry as it exists today and explain the important forces which are most likely to affect the future of FM radio. To accurately characterize the FM industry, this analysis will focus on four key areas of the FM radio industry: finance and economics, programming, audiences and technology.

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<sup>1</sup> "Summary of Broadcasting & Cable." (April 8, 1991). *Broadcasting*, p. 79.

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### Early Developments in the History of the Commercial FM Radio Service

FM radio is now firmly entrenched in its middle age. However, it is important to remember that AM radio was the first radio industry to develop and thrive. Unlike many other countries in the world, FM radio has rapidly overtaken AM as the dominant radio service in the United States. Even in those countries where AM is still the dominant service, FM is quickly gaining. What is it about FM radio that has put it so far ahead in this country?

According to Sydney Head, when Edwin Armstrong improved the technique of FM radio in 1933 based on a patent first issued in 1905, he made possible the practical application of this technology which then triggered, "the biggest and bitterest behind-the-scenes fight in radio's career."<sup>2</sup> In addition to the various courtroom battles regarding basic inventions, there was the all important battle for a radio service -- securing an allocation in the spectrum. In this endeavor, FM radio had a number of significant challengers, including another upstart service, television.

The Federal Communications Commission allocated 13 channels to FM radio in 1939, compared to 19 channels for television. A year later it moved the FM allocation to a different portion of the spectrum (42-50 MHz) and authorized commercial operation. By 1942 there were 30 FM stations on the air, when the wartime freeze on assignments was put into place.

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<sup>2</sup> Head, S. W. (1976). *Broadcasting in America: A Survey of Television and Radio*, 3rd edition. Boston, MA: Houghton Mifflin Company, p. 149.

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In 1945, based on "controversial engineering evidence," the FM service was again moved to a new location in the spectrum, its current home, 88-108 MHz. Among other things, this last reallocation made obsolete the half million receivers built for the lower band.<sup>3</sup>

The dominant broadcast service in the country at this time was AM broadcasting. Actually, the dominance of AM was retained until well into the 1970s. Many of the first FM licensees were AM broadcasters seeking to investigate this new medium. While the public acceptance of FM was not assured, from a business viewpoint, surely it made sense to acquire FM licenses as an investment opportunity and also as a hedge against competitive threats.

By 1948, the number of FM licenses reached a peak (over 1,000) but then quickly subsided, due among other things to poor market acceptance of a technology that appeared to offer no significant advantages over its AM competitor. Most FM stations operated by AM broadcasters merely simulcast the programming of its sister station. There were fewer receivers capable of receiving FM than AM stations. Although the technical quality of FM radio was superior to AM, since the receivers being manufactured were not designed to capture this benefit, the market responded unfavorably to FM.

In a struggle for this new service to find a niche where it could survive and thrive, a number of opportunities were identified and pursued. For example, applications such as broadcast facsimile generated some excitement in the 1940s when some visionary thought a

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<sup>3</sup> Head, S. W., & Sterling, C. H. (1986). *Broadcasting in America: A Survey of Television, Radio, and New Technologies*. Boston, MA: Houghton Mifflin, pp. 152-153.

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market for home print-outs of newspapers would be viable (it was not). Two other significant technical and policy developments were the FCC's granting of Subsidiary Communications Authorizations to FM stations, which permitted the broadcasting of supplementary services (e.g., background music, and other services not intended for the mass audience); and the authorization of multiplexing stereophonic sound in 1961.<sup>4</sup>

Thus, at its inception FM was a controversial service which had to fight for its place in the spectrum allocation scheme against other services, particularly television. Its fit into the marketplace was not initially clear -- would it be merely a replication of what was already offered over AM, or offer innovative services such as broadcast facsimile leading to electronic delivery of home newspapers? As we start a new decade, we find ourselves asking similar questions about a new technology, still under development which promises to be a bigger and more significant innovation than FM radio, and that is digital audio broadcasting (DAB).

While Mr. Armstrong might be comforted somewhat to see what was largely his invention become the country's highly successful dominant purveyor of audio services, we are sure he would also have an opinion about how our society should deal with the management of opportunities and risks associated with the introduction and adoption of innovative telecommunication technologies. The benefits we all now associate with FM might have been realized substantially sooner had we done a better job of introducing the technology of FM radio.

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<sup>4</sup> Head, p. 150.

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FM's introduction notwithstanding, there is always the countervailing concern of upsetting the applecart by displacing a successfully functioning industry in favor of something more innovative which may or may not yield equivalent or enhanced dividends. In the case of FM radio, it was largely a conflict between the investment of public and private resources into the development of FM radio or another new service, broadcast television; and a conflict between FM radio and the established interests of the AM radio industry.

### **FINANCE AND ECONOMICS OF THE FM RADIO INDUSTRY**

This chapter will now turn now to the present FM radio industry. In this section, the emphasis will be on describing the financial and operational characteristics of the industry which has grown out of Major Armstrong's invention.

#### **Station Sales**

Are FM stations a good investment? A number of factors are relevant to valuing a radio station property, as with any other holding. However, there are also some unique characteristics of radio station properties. For example, the major value of an FM station is an intangible asset which is not depreciable. Carried on the books as "goodwill," this is

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basically a measure of a station's ability to attract audiences. The tangible assets are typically only a minor fraction of the total value of an FM radio station.

David E. Schutz of Hoffman Schutz Media Capital, Inc. completed an analysis of trends in radio station sales in the period 1988-1990.<sup>5</sup> The value of a particular radio station is affected by prices recently paid for other similarly situated stations, by the nature of the station's technical facilities (including the type of FCC license), the character and growth prospects of the local market, availability of seller financing, minority tax certificates, size and composition of the station audience, and many other factors. As Schutz points out in his analysis:

The past 30 months have witnessed many changes in the marketplace for radio stations. Elimination of the capital gains tax and uncertainties in the financial markets, combined with an overall softness in broadcast advertising revenues, have slowed the volume of station sales and caused the restructuring and/or forced sale of some stations.<sup>6</sup>

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<sup>5</sup> Schutz, D. E. (1990). *Trends in Radio Station Sales: 1988-1990*. Washington, DC: National Association of Broadcasters.

<sup>6</sup> Schutz, p. iii.



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### Number and Dollar Volume of FM and AM/FM Station Sales 1988-1990

In Figures 1-2 the number of FM station sales and their dollar volume are presented. In the past several years, the top three FM-only station sales have been KMJQ-FM in Houston, TX (\$65 million), KIQQ-FM in Los Angeles, CA (\$56 million) and KFAC-FM in Los Angeles (\$55 million). These facilities range from a 107.7 MHz/100 kW/1,320' (KMJQ) operation to a 100.3 MHz/5 kW/3,005' operation (KIQQ). Of the top 100 FM-only station sales, the 100th ranked sale, WBWB-FM in Bloomington, IN was last sold in January 1988 for \$3.5 million.

**[PLACE FIGURE 1 (NUMBER OF FM-ONLY SALES BY QUARTER 1ST QTR. 1988 - 2ND QTR. 1990 AND FIGURE 2 (DOLLAR VOLUME OF FM-ONLY SALES 1ST QTR. 1988 - 2ND QTR. 1990 HERE!)]**

### Appreciation in Station Values

Over 1,800 radio stations were sold between January 1988 and June 1990. Based on an analysis of a subsample of 476 stations which were not new sign-ons, had been held less than eleven years, were not part of partial ownership changes, multiple station sales or AM/FM acquisitions, estimates regarding appreciation were obtained by Schutz.<sup>7</sup>

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<sup>7</sup> Schutz, p. G-1.

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In Table 1, it shows that about three-quarters (i.e., 93 of 125) of the FM-only stations sold in this time period were resold at a price higher than their last acquisition price. About a fifth (22.6%) were resold at a lower price, the remainder were resold at the same price. Thus, for FM-only stations, the average station was resold at an appreciated rate, an average annual compounded appreciation of + 13.2% (the median annual compounded change is + 11.3%).

**Table 1**  
**Appreciation in Station Values 1988-1990**

	Station Types			
	AM-Only	FM-Only	AM/FM	All Stat.
Resold at Higher Price (#)	73	93	111	277
Resold at Lower Price (#)	109	27	48	184
Resold at Same Price (#)	6	5	4	15
Average Annual (Compounded) Change	-2.9%	13.2%	8.7%	5.3%
Median Annual (Compounded) Change	-2.6%	11.3%	9.0%	4.6%
<i>Source: Trends in Radio Station Sales: 1988-1990.</i>				

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This compares favorably to all stations, which averaged an annual compounded appreciation of +5.3% (+4.6% median value) and a loss of -2.9% (-2.6% median) for AM-only stations. Among FM-only stations, KMJQ-FM in Houston, TX was purchased in April 1986 for \$13 million and sold again in May 1988 for \$65 million for a \$52 million (+118.3% annually compounded) gain. On the other end of the scale, KEZL-FM in Fowler, CA was purchased in February 1988 for \$2.2 million and sold in June 1990 for \$186,825, a loss of over \$2 million (-65.2% annual compounded loss).

The distribution of annual gains or losses for FM-only stations is a further indication of the FM radio industry's health. The net gains or losses for stations sold between the first quarter of 1988 and the second quarter of 1990 is illustrated in Figure 3. As seen in the figure, the majority of stations appreciated for a net gain during that time period, with many stations appreciating at between 5% - 15%.

**[PLACE FIGURE 3 (DISTRIBUTION OF ANNUAL GAINS (LOSSES) FM STATIONS, 1ST QTR. 1988 - 2ND QTR. 1990) HERE!!]**

### **Sales in Rated Markets**

The price paid for an FM station varies greatly. One important aspect of station cost relates to the market size in which the station is located. Figure 4 outlines the sales of stations located in Arbitron rated markets arranged by 1990 market rankings. The figure illustrates

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the average price paid for FM-only stations between January 1988 and June 1990. For the purposes of this graphic, stations with a reported audience in the market, or those with a 1 mv/m signal over the central city have been included. Many smaller stations, normally lowered postwar suburban stations, failed to meet this criteria and as a result may not have been included. Stations that were sold for \$1 were excluded since these stock transactions would distort the results.

**[PLACE FIGURE 4 (AVERAGE PRICES BY MARKET SIZE) HERE!]**

### **Appreciation Rates By Region**

Another factor involved in determining the cost of FM stations is derived from the region or location of the station. Just as the market in which a station is contained influences the price of a station (as discussed above), so too does the region in which a station is located play an important role. This can be illustrated by examining the appreciation rates of stations categorized by the region of the country in which the station's coverage pattern is located. As seen in Figure 5 and 6, the Eastern and Central regions of the U.S. have the highest station appreciation rates.

**[PLACE FIGURE 5 (ANNUAL APPRECIATION RATES BY REGION, ALL STATIONS, 1ST QTR. 1988 - 2ND QTR. 1990) AND FIGURE 6 (ANNUAL APPRECIATION RATES BY REGION, ALL STATIONS, 1ST QTR. 1988 - 2ND QTR. 1990) HERE!!]**

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### FM Station Financial Performance

**Cash Flow Margins:** According to the *1990 NAB/BCFM Radio Financial Report*<sup>8</sup>, the average FM station in the U.S. has total net revenues of \$1,536,622 against expenses of \$1,457,622 for a pre-tax profit of \$78,507. The cash flow for the average station is \$378,758, or a margin of 24.7% (i.e., cash flow as percent of total net revenues).<sup>9</sup> By way of comparison, the median FM station has a cash flow of \$72,181 and a net profit of \$5,900. There is a strong positive skew in the financial performance of FM stations. The bottom quartile (i.e., 25th percentile) station *loses* \$125,754, while the top quartile (i.e., 75th percentile) station has a net pre-tax *profit* of \$150,000.

In Table 2, the cash flow margins for FM stations in different market sizes (as measured by population) are presented. The cash flow margins range from 17.5% in the smallest market category (less than 25,000 population) up to 32.2% for the largest market category. There is no clear trend in cash flow margins across market sizes.

**Profit Margins:** Table 2 also present profit margins (i.e., pre-tax profit as a percentage of total net revenues) for FM stations. The average FM station has a profit margin of 5.1%. This ranges from -13% for FM stations in the smallest market rank (less than 25,000) and

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<sup>8</sup> *1990 NAB/BCFM Radio Financial Report*. (1990). Washington, DC: National Association of Broadcasters and Broadcast Cable Financial Management Association.

<sup>9</sup> "Cash Flow" is defined as pre-tax profits plus depreciation and amortization and interest.

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**Table 2**  
**Average FM Station Cash Flow and Profit Margins**

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FM STATION TYPE	CASH FLOW MARGIN	PROFIT MARGIN
Nationwide	24.7%	5.1%
Market Population		
Over 2.5 Million	32.2	21.7
1 M to 2.5 M	20.0	-1.9
500 K to 1 M	18.6	-13.0
250 K to 500 K	25.2	-2.4
100 K to 250 K	23.5	5.4
50 K to 100 K	18.9	-0.0
25 K to 50 K	21.4	2.2
Under 25 K	17.5	-13.0

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Source: 1990 NAB/BCFM Radio Financial Report

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medium markets (500 thousand to 1 million population) up to 21.7% for FM stations in the largest markets (over 2.5 million population). Again, there is no clear pattern other than large market stations are obviously the healthiest. Broadcasting is a fixed cost business, which benefits large market stations. In other words, once the fixed costs are covered, there are few variable expenses associated with additional sales so these revenues go right to the bottom line.

### Efficiency of Station Operations

One measure of a station's efficiency is the cost of doing sales. For the average FM station, sales expenses are 16.5% of total time sales. For the largest market stations, this averages 13.1%, for the smallest market station, this averages 23%. Again, the effect of broadcasting as a fixed cost business can be seen.

### FM Radio Advertising

In spite of the increasingly competitive advertising environment, FM radio's share of total advertising expenditures has remained remarkably constant over the years.<sup>10</sup> This strong showing is due to FM radio's ability to reach a very large and diverse audience. However, today's advertisers have a wide array of media alternatives to FM radio in which to place their sales messages. Within the last decade, the FM radio industry has witnessed the resurgence of AM radio, the rise of cable and direct mail, a growing number of new specialty magazines and a trend by advertisers toward placing advertising spots on various video cassette features. The next decade will bring more intense competition from other media, especially

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<sup>10</sup> For an in-depth discussion of radio advertising issues see: Helregel, B. (1991). "Total Advertising Revenues and Radio's Share." In A. J. McLean (ed.) *RadiOutlook II: New Forces Shaping the Industry*. Washington DC: National Association of Broadcasters.

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on a local and regional level where 75-80% of radio's advertising business is realized.<sup>11</sup> Many radio stations have been surprised to find that they are now going up against local cable systems to compete for advertising dollars. In fact, many cable operators are incorporating radio's sales strategies into their own sales plans. Local television operators are also increasing their drive to wean away traditional radio advertisers.

### **Radio Advertising Trends**

Since AM radio was the first electronic mass medium, it had a difficult time convincing advertisers to commit dollars to the medium. Once these radio pioneers were able to persuade advertisers to commit dollars, business increased. AM radio helped to pave the way for FM radio's introduction, although FM radio at first also had a difficult time establishing advertisers.

With the advent of television and other advertising media, radio started to have a smaller share of an increasingly larger advertising pie. During the 1950s and 1960s radio's share dropped, reaching a low point of 5.7% in 1956. In the late 1960s and early 1970s radio's share increased to 7.0%, thanks in part to the rise of FM radio. Since that time radio's share

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<sup>11</sup> All historical advertising figures are from Robert J. Coen, Vice President, McCann Erickson, 485 Lexington Avenue, New York, NY, 10017, (212) 984-3420.



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has remained within three or four tenths of that value. Figure 7 shows the shares of the various media over the last 55 years.

**[PLACE FIGURE 7 (ADVERTISING SHARES OF VARIOUS MEDIA) HERE!]**

While radio's advertising share has remained fairly constant, it is important to note that the total advertising industry has grown tremendously in past years. Consequently, the total amount of advertising dollars going to radio has shown considerable growth. Figure 8 displays that growth since 1960 for the total industry and for the three sources of revenues.

**[PLACE FIGURE 8 (TOTAL RADIO ADVERTISING 1960-1990) HERE!]**

It is clear that most of the FM radio industry's growth has originated in local advertising sources. Where local advertising comprised 65.8% of total radio station advertising expenditures in 1960, in 1990 that share rose to 75.5%. The other primary source that has shown remarkable growth in the most recent years in radio network advertising. This type of advertising has seen an average annual growth rate of 11% from 1980 through 1990. The growth in these three revenue sources for the 1980s and 1990 and the predicted growth for 1991 is shown in Figure 9.

**[PLACE FIGURE 9 (TOTAL RADIO ADVERTISING 1980-1991) HERE!!]**

Radio's strong showing in the advertising market can be partially attributed to its loyal following among the general public. When it comes to radio, media professionals point to what they consider to be the medium's greatest strength -- its impact as a powerful "local" medium. Since radio is predominantly locally dependent, much of its growth depends on a

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healthy retail sales market. It has been estimated that the radio industry will increasingly rely on local advertising revenues, and local advertising growth shows strong potential.

The total radio advertising pie can be divided into various categories. In 1989, radio's share of advertising was 6.8% and varied only slightly throughout the 1980s (as discussed above) from a high of 7% in 1982 to a low of 6.6% in 1987-1988. Radio's reliance on local advertising can be seen from the fact that 76.8% of its \$8.420 billion revenue comes from this source. The remainder of advertising revenue comes from national and regional advertisers.<sup>12</sup> As seen in Figure 10, the average FM station gets 77.5% of its \$1,743,099 from local advertising sources.<sup>13</sup> Local radio advertising is expected to increase 4.0% in 1991. While national advertising will increase 5.5% in 1991, network advertising should increase about 4.0%.

**[PLACE FIGURE 10 (1989 FM NATIONAL AVERAGES) HERE!]**

### The Future of Radio Advertising

In their analysis of the communications industry Veronis, Suhler & Associates make some bullish predictions for radio revenues. This firm predicted that the average compounded

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<sup>12</sup> *Radio Facts for Advertisers*. (1990). New York, NY: Radio Advertising Bureau, p. 44.

<sup>13</sup> Helregel, B., & McLean, A. J. (1990). *1990 NAB/BCFM Radio Employee Compensation and Fringe Benefits Report*. Washington, DC: National Association of Broadcasters, p. 67.

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annual growth rate between 1989-1994 will be 8.0% for all radio stations.<sup>14</sup> Total radio advertising, which equaled \$8.4 billion in 1989, is expected to increase to \$12.3 billion by 1994. Increased sales for many of radio's key advertisers should stimulate a majority of this expected increase in radio advertising.

### Radio's Big Advertisers

A major reason that the future looks promising for radio is the healthy outlook for many of radio's biggest advertisers.<sup>15</sup> Who are these advertisers? In a comprehensive analysis of local advertising, the Radio Advertising Bureau (RAB) surveyed their members to discover the percentages of local advertising revenue generated by different types of businesses. Table 3 lists the top 10 businesses and their share of expenditures.

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<sup>14</sup> Veronis, Suhler & Associates, Inc. (1990). *The Veronis, Suhler & Associates Communications Industry Report*. New York, NY: Author.

<sup>15</sup> Helregel, p. 125.

**Table 3**  
**Top 10 Local Radio Advertisers**

<b>Rank</b>	<b>Type of Business</b>	<b>Percent of Total Advertising</b>
1	Auto Dealers	10.7
2	Department Stores	8.4
3	Banks	8.0
4	Clothing Stores	7.7
5	Restaurants	7.0
6	Supermarkets	6.7
7	Furniture Stores	6.4
8	Bottlers	5.9
9	Appliance Stores	4.9
10	Savings & Loans	4.2

*Source: Radio Advertising Bureau, Radio Facts, New York, NY, 1990.*

## FM RADIO PROGRAMMING

### Major Formats

In this section, we will focus on describing formats used by stations, and not on various programming strategies utilized by stations (an excellent analysis of overall programming strategies is available elsewhere).<sup>16</sup> Table 4 displays the major FM formats now in use. More than a quarter (28.5%) of all FM stations identify themselves as Adult Contemporary stations. The next most popular formats are Country (22.7%) and CHR/Top 40 (15.8%) and then the numbers quickly drop as stations diversify into a large number of different formats. In some major markets there will be format duplication where competition is based on minor format differences, promotion and on-air talent. With so many stations, a strategy is to pick an audience niche and serve it well.

According to a survey of program directors around the U.S., there are at least four major problems stations face in attracting and keeping listeners:<sup>17</sup>

1. Too much media choice: too many radio stations from which to choose.
2. Declining loyalty: listeners are less loyal to particular stations.

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<sup>16</sup> See e.g., Eastman, S. T., Head, S. W., & Klein, L. (1981). *Broadcast Programming: Strategies for Winning Television and Radio Audiences*. Belmont, CA: Wadsworth Publishing Company.

<sup>17</sup> Parikhal, J., & Oakes, D. (1989). *Programming Radio to Win in the New America*. Washington, DC: National Association of Broadcasters, p. 13.

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**Table 4**  
**Major FM Formats**

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FORMAT	% FM STATIONS	% AM/FM STATIONS
Adult Contemporary	28.5%	24.0%
Country	22.7	22.4
CHR/Top 40	15.8	8.0
AOR	6.2	3.1
Easy Listening	5.4	3.1
Oldies	4.5	6.5
Religion/Gospel	3.8	8.1
Classic Rock	2.5	1.4
Middle of the Road	2.2	5.2
Urban Contemporary	2.2	1.7
Spanish	1.0	2.2

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Source: Radio Information Center

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3. More time sensitivity: disposable time for radio is increasingly scarce.

4. Information overload: too much information to process.

As an outcome of these basic problems, program directors indicate that:<sup>18</sup>

- listeners feel too many stations sound the same
- listeners have problems identifying stations
- it is harder to market your station
- it is harder to make listeners aware of new programming features

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<sup>18</sup> Parikh & Oakes, p. 14.

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- radio is being used more as background

### Target Audiences

The biggest audience segments targeted by FM stations are 25-34 year olds, targeted by 86% of FM stations, followed by 35-44 (74%). The next largest target segments are those 45-54 (49%) and 18-24 (40%). Only 14% of FM stations target teens, 17% target those 55-64, and 12% target those 65+. <sup>19</sup> In 1980, the 25-54 demographic displaced the 18-49 group as the most requested by advertisers. <sup>20</sup>

A chief concern of all FM stations relates to the methods that a station can employ to retain the audience that they have targeted interested and tuned in to their station. <sup>21</sup> The increasing congestion of stations combined with the increasing "niche" formatting of stations is making FM radio increasingly competitive. However, radio experts agree that several fundamental features must be present for every format's success: <sup>22</sup>

- Constant concentration on the sound of the station
- Music lists that are tightly formatted

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<sup>19</sup> Abel, J. D., Ducey, R. V., & Fratrick, M. R. (1988). *RadiOutlook: Forces Shaping the Radio Industry*. Washington, DC: National Association of Broadcasters, p. 88.

<sup>20</sup> McCormick, M. (April, 1986). "Format for Change." *Marketing & Media Decisions*, p. 85.

<sup>21</sup> "Following the Formats," (September 24, 1990). *Broadcasting*, pp. 66-67.

<sup>22</sup> "Following the Formats," p. 66.

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- Disk jockeys that are well-versed in the station's image
- Strict adherence to the creation of a uniform station sound

### Format Popularity

The radio audience preference for various formats in comparison to the actual number of FM formats actually programmed by stations is interesting to note. This is to be expected, however, for the most popular formats will no doubt have the most stations programming these formats.

In the 25 - 54 demographic, the Oldies format has emerged as the most-listed-to format in America.<sup>23</sup> Fully 28% of persons aged 15 - 64 said that they listened to some form of Oldies based radio stations, followed by 25% who stated that they listened to Top 40 most frequently and 23% who responded that they spent the most time listening to Country formatted stations. Figure 11 illustrates these points, with the total percentages adding up to more than 100% due to respondents to the survey indicating that they listened to more than one format most frequently.

**[PLACE FIGURE 11 (RADIO FORMATS) HERE!!]**

It is interesting to see that the most popular format, Oldies, is only present in 6.5% of all AM/FM stations. The audience preference for this format combined with the relatively

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<sup>23</sup> "Study Shows Oldies Most Popular Format," (December 3, 1990). *Broadcasting*, p. 57.



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small number of stations programming this format seemingly makes the audience for these few stations relatively large.

### **Format Financial Performance**

Miller, Kaplan, Arase & Company is a Los Angeles based public accounting firm specializing in broadcast financial advisory and tax services and produces a special report analyzing the revenue share/audience share ratios of different formats.<sup>24</sup> In Table 5, the so called "power ratio" is computed by dividing the mean 12+ average quarter hour audience share for Summer 1988 through Spring 1989 divided by 1.1 (an average of 90% of a given market's revenue is reported to the accounting, this adjustment compensates for this). This power ratio indicates how well a format converts audience share into revenue share.

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<sup>24</sup> Rivin, G. N. (Spring, 1990). *Power Ratio Trends by Format*. North Hollywood, CA: Miller, Kaplan, Arase & Co.

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**Table 5**  
**Power Ratios for Top FM Formats**

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FORMAT	1989 RATIO	1988 RATIO
Adult Contemporary	1.31	1.41
Country	1.34	1.49
CHR/Top 40	1.00	1.07
AOR	1.07	1.13
Easy Listening	0.60	0.85

Source: Miller, Kaplan, Arase & Co., Spring 1990  
(12+ share/([1.1 \* market revenue share])

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### FM RADIO AUDIENCES

#### AM Versus FM Audience Size and Character

The "radio audience" is virtually everyone. The two syndicated ratings services (The Arbitron Company and Birch/Scarborough) measure radio audiences based on samples of respondents aged 12 years and older. In a typical week, 95.6% of those 12+ listen to radio for an average of 3 hours 19 minutes. Men 18-34 are the heaviest radio listeners (3 hours 45

## Today's FM Radio Industry and Important Developments for Its Future

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minutes average per week), the lightest listeners are men 50+ (2 hours 38 minutes). Radio listening increases in larger households for the average radio listener, from 2 hours 58 minutes in 1-2 person households to 3 hours 11 minutes in 5+ person households.<sup>25</sup>

The size of the FM audience, relative to the AM audience has grown steadily. In Figure 12, the FM share of radio listening from 1972 through 1989 is illustrated. In 1972, 25% of persons listened to the FM band. By 1989, the number of persons listening to the FM band had increased to 77%. AM cumes have also dropped, but not as precipitously. In 1982, 65% of the radio audience had tuned to an AM station at least once sometime in the measurement week. By 1989, this figure dropped to 44% of the radio audience. Clearly, FM radio has made tremendous gains in attracting the radio audience.

**[PLACE FIGURE 12 (FM SHARE OF RADIO LISTENING) HERE!]**

### The Growth of FM Radio Stations

FM radio continues to be a vibrant and flourishing industry. This is exemplified in the growth of FM radio stations over the years. In the past 10 years there has been an average of 122 FM (both commercial and non-commercial) stations added each year. The greatest recent influx of FM stations came when Docket 80-90 helped push the total number of FM stations added between December 1987 and December 1988 to 187, while the smallest increase in the

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<sup>25</sup> *Radio Facts for Advertisers*, p. 9.

## Today's FM Radio Industry and Important Developments for Its Future

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past 10 years came when only 91 stations were added each year between December 1981 to December 1982 and December 1982 to December 1983. This docket's provision of station allocation standards continues to influence the number of drop-in stations that will be on air today and in the future.

As Figure 13 indicates, NAB projects a 6.0% growth rate for commercial FM and a growth of 2.0% of non-commercial FM radio stations by 1993. By 1995, NAB projects a further 4.0% growth for commercial FM stations and a continued 2.0% increase by non-commercial FM stations. This results in a projected total of 6,352 FM stations by December 1995.

**[PLACE FIGURE 13 (FM RADIO STATIONS, 1990, 1993, 1995) HERE!]**

### **What America Thinks About FM Radio**

In June 1988, NAB commissioned The Research Group to conduct a national study of radio listeners.<sup>26</sup> The study was to determine what listeners think about AM and FM radio, the positives and negatives. While the focus of the study was on AM radio, valuable things were also determined about the public's perception of FM radio. The interesting thing was

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<sup>26</sup> Moyes, W. (The Research Group). (February/March, 1989). "What America Thinks About AM Radio," *NAB Research and Planning Memorandum*. Washington, DC: National Association of Broadcasters.

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**Table 6**  
**Perceived Benefits of AM Radio**

PERCEIVED BENEFIT	PERCENTAGE CITING
Frequent weather reports and forecasts.	58%
Frequent news updates.	57
News with a local and area emphasis.	50
Good reception in hilly or distant areas where FM breaks up.	41
More <i>in-depth</i> news coverage than FM.	41
Traffic information.	41

Source: NAB/The Research Group, June 1988

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that the most often benefit of AM radio was cited by 58% of the sample, while the benefit of FM radio *least* cited still was mentioned by 75% of the sample. The items in Tables 6 (AM) and 7 (FM) are based on focus groups conducted around the country prior to fielding the sample survey.

The benefits of FM radio are primarily programming in orientation, although there are references to FM fidelity and stereophonic features. By way of contrast, with AM radio, only one benefit deals with a technical factor (FM signal break-up). The message here seems to be that the public wants a good quality signal but mainly is attracted by the programming.

## Today's FM Radio Industry and Important Developments for Its Future

**Table 7**  
**Perceived Benefits of FM Radio**

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PERCEIVED BENEFIT	PERCENTAGE CITING
They play the kind of music you like best.	86%
They play more music with less talk.	80
You are familiar with what kind of music can be found at various places on the FM dial.	79
FM radio stations have clear, rich, full signals with no fuzziness.	75
There are a lot of FM radio stations that have the type of programming you like.	75
The music comes in on two speakers -- both left and right -- instead of just one.	75

Source: NAB/The Research Group, June 1988

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Industry experience shows that when an enterprising AM station identifies an unserved niche in the radio audience, it will attract an FM competitor once the audience segment grows large enough. This is due to the extreme competitiveness of the industry. For example, in New York, the top 10 radio stations are separated by only 1.8 share points.<sup>27</sup> This phenomenon is known as "ratings compression," i.e., the distance between the ratings of competitive stations is compressing. While the overall shares may be compressing, there are still qualitative differences in the character of the audience (i.e., demographic, psychographic, buyergraphic, etc., differences). This qualitative assessment of the audience will become more commercially

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<sup>27</sup> "Broadcasters Chart N.Y. Rating Compression," (October 22, 1990). *Broadcasting*, p. 61.

important in this decade. Media planners often utilize qualitative data in their work, while media buyers have yet to adopt this habit.<sup>28</sup>

### Future Regulatory Issues

There is quite a large amount of legislative action in the current session of Congress that could potentially affect FM radio. The regulatory issues likely to effect FM radio generally fall into one of three categories: programming and advertising issues; spectrum allocation issues; and technical and interference issues.<sup>29</sup>

In the programming and advertising category, the possibility of restrictions on beer and wine advertising was renewed in the 100th congress when a bill was introduced which would require health warnings on all advertisements for alcoholic beverages. This legislation has been referred to House and Senate committees, with further hearings expected this year. Investigation into so-called obscene and indecent programming is also being examined by the FCC, Congress and the courts. In the fall of 1988, Senator Jesse Helms (R-NC) led Congress in passing a law mandating a 24-hour ban of indecent programming. In July 1990, the FCC

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<sup>28</sup> Goldberg, M. A. (October, 1990). *Radio Into The Next Century: A Report on the Radio Futures Conference of the Electronic Media Rating Council*. New York, NY: EMRC.

<sup>29</sup> Information in this section is culled from *Broadcast Regulation: A Review of 1990 and a Preview of 1991*. (1991). Washington, DC: National Association of Broadcasters.

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implemented a report which concluded that the 24-hour ban on the broadcast of indecent material is constitutional and should be enforced. However, as this chapter goes to press, the indecency ban has come under fire in the U.S Court of Appeals. The ban is currently being challenged on First Amendment grounds, with the outcome yet to be determined.

Spectrum and Allocation issues that currently affect FM radio include the implementation of DAB (discussed in detail later in this chapter). The two current issues effecting DAB concern the August, 1990 broad inquiry proceeding into digital audio broadcasting launched by the FCC and the October, 1990 Copyright Office inquiry into the potential effects of home taping off DAB on copyright owners of the taped materials. A further question concerns FM allocations changes, station upgrades, station reclassifications and FM direction antennas. Though subject now to reconsideration, the Commission changed its rules to authorize the use of directional antenna (DA) systems, to reduce the distance separations between an FM station's transmitter site and adjacent and co-channel stations and allotments, which permits, in certain circumstances, short-spacing. It also has adopted proposals on voluntary "downgrading" of FM stations. The Commission concluded a rule making to afford a system of Class A station upgrading as well. A separate order in this Class A rule making has created a new Class C3 FM facility to which many Class A stations are able to upgrade. An earlier rule making removed several procedural obstacles to stations upgrading through amending the FM Table of Allotments.



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FM translator and low power FM issues continued to be an issue recently. The FCC adopted a Report and Order aimed at restoring the FM translator service to its original purpose of providing only secondary service to areas which have unsatisfactory radio service and not for use solely to relay the signal of a primary station to a more distant translator. On the noncommercial FM translator front, the FCC has amended its rules to permit noncommercial educational FM translators to use alternative signal delivery technologies such as satellites and microwave links, in delivering programming from the co-owned primary station.

In terms of technical and interference issues that effect FM broadcasting, the main concern deals with aeronautical radio. In 1986, the FCC terminated a proceeding exploring technical standards and protection criteria vis-a-vis the interference potential between FM broadcasting and aeronautical radio services. Such termination ostensibly was taken to avoid ex parte problems as the Commission prepared for international meetings on the matter. However, in recent years there have been hundreds of FM broadcasts applications deferred due to Federal Aviation Administration objections based on concerns over FM interference to aircraft navigation radios. Thus, from NAB's perspective, it appears that this FAA regulatory program must be reviewed.

### FM RADIO AND RELATED TECHNOLOGY

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While the average American thinks of FM radio as a source of information and entertainment, the spectrum broadcasters inhabit with this service has become substantially more productive, both in terms of value-added services provided and as a source of additional FM station revenues. These services include subcarriers (i.e., SCA services) and perhaps the Radio Data System (RDS).

### FM Subcarriers

Throughout the last decade, the FM radio subcarrier market closely followed the rapidly shifting trends occurring in most telecommunications sectors. In 1982 the FCC deregulation of the industry permitted innovative use of FM subcarrier technology at a time when the demand for new modes of data delivery was sharply increasing. However, later in the decade numerous competitors entered the market leading to a softening in demand for FM subcarriers. Subcarrier services encountered escalating competition from new and different delivery modes including cellular radio, private satellite VSAT networks, and private telephone business networks.<sup>30</sup>

FM subcarriers, commonly referred to as SCA's (a holdover acronym for Subsidiary Carrier Authorization from the pre-deregulated FCC) are used to provide music and voice

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<sup>30</sup> De Sonne, M. (1991). "Technology Trends." In A. J. McLean (ed.) *RadiOutlook II: New Forces Shaping the Industry*. Washington, DC: National Association of Broadcasters.

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programming, paging, data communications and telemetry.<sup>31</sup> Currently, 29% of all FM stations utilize subcarriers (Figure 14). Approximately 3% of all FM stations are using their subcarrier channels for this wide range of applications. Most stations with subcarriers use only one subcarrier channel (73%), but over a quarter (27%) are transmitting two subcarrier channels.<sup>32</sup> As shown in Figure 15, of stations that use subcarriers, 32% are transmitting music services, 22% are carrying some kind of voice service; paging/messaging services are carried by 15% of stations, and computer data is carried by 25% of stations. A substantial percentage of stations (37%) are using their subcarrier resources for internal station telemetry purposes which include such functions as transmitter monitoring.

**[PLACE FIGURE 14 (SUBCARRIER USAGE, FM RADIO STATIONS) AND FIGURE 15 (SUBCARRIER SERVICES, FM RADIO STATIONS USING SUBCARRIERS) HERE!!]**

### Technical Innovations Affecting SCA's

Increasingly, the subcarrier market is being altered by the changing technology that allows for the expanded use of non-traditional frequencies for SCA channels.<sup>33</sup> In the past,

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<sup>31</sup> Kean, J. (October, 1990). "FM Subcarriers in the 1990s," *Broadcast Engineering*, pp. 80-119.

<sup>32</sup> Fitzmaurice, M. (1990). *1990 Broadcast Technology Report*. Washington DC: National Association of Broadcasters.

<sup>33</sup> De Sonne, p. 57.

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traditional subcarrier services were operated on frequency channels that centered on 67 kHz. Deregulation allowed for a second subcarrier channel to be centered on 92 kHz. This second channel soon became commonly used by FM stations. Today, SCA services are increasingly being offered on the 57 kHz carrier, or some other previously non-standard carrier channels. Interestingly, the utilization of the 57 kHz carrier was originated as a European subcarrier service with a considerable hardware product accessible for operation at this frequency. The shift away from traditional SCA channels is due, in part, to new business services linked to generator hardware which has been built to operate at non-traditional frequencies.

Tests of another non-standard carrier (76 kHz) have been conducted by industry manufacturers and several university FM stations (WUOM, WBSU). The experiments yielded important results suggesting that 76 kHz is probably "the" optimal SCA carrier frequency for delivery of a second, high quality audio programming service.

A further development of SCA technology is the push by equipment manufacturers to market generators and receivers that would be capable of managing high-speed digital data rates. This technology-driven development is being spearheaded by such companies as Indesys Data Broadcast Network and Bonneville's Radio Data System. These companies are the leading edge of the higher data rate transmission businesses, and they are most likely to become more prominent in the SCA market in the future.

Some SCA services, such as modulation techniques suited to higher data rates and corresponding wider bandwidth channels, are likely to become more prevalent as SCA-based

## Today's FM Radio Industry and Important Developments for Its Future

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services.<sup>34</sup> An increase in data rates can be accomplished by using direct phase-shift key (FSK) modulation techniques. This can elevate the data rate to approximately 19,200 bps. Still higher rates (up to an estimated 30,000 bps) can be achieved using a wideband direct linear modulation scheme. The chief advantage of a high speed bit rate is that it makes possible the simultaneous transmission of up to five SCA datastream channels each running at about 4,800 bps.

High speed data rates will also allow SCA entrepreneurs to enter into the private or public computer network businesses. Computer data networks could conceivably have a local anchor by using the subcarrier resources of only one single FM station. Alternatively, data networks can be constructed as nationwide satellite-delivered services that would download to a pre-defined group of FM stations in strategic market locations for the final mile delivery of various datastream signals.

A word of caution should be added about the use of subcarriers by FM stations. Possible interference caused by subcarriers that manifest themselves as crosstalk or whistles could potentially interfere with the main FM channel. Debate concerning the potential harm of interference to the main channel FM signal subsided in the late 1980s. However, the risk to using newer wideband modulation techniques and/or non-traditional subcarrier frequencies is always present. Careful design and proper engineering must be in place to achieve

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<sup>34</sup> De Sonne, M., (1990). *Spectrum of New Broadcast/Media Technologies: New Technology Developments Impacting Broadcasting Business, Markets, and Operations*. Washington, DC: National Association of Broadcasters, pp. 39-46.

## Today's FM Radio Industry and Important Developments for Its Future

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management goals of turning the subcarrier datastreams into new sources of revenue for the FM station.

### **SCA Market Innovations**

The first successful demonstration of an SCA-based Receptor<sup>TM</sup> was performed in August 1989 by AT&E Corporation of San Francisco. This was reportedly the world's first wristwatch terminal to be used for paging services. This product, called "Messagewatch," is specifically designed to automatically scan all FM radio subcarrier frequencies which carry Receptor signals in order to deliver messages to an intended subscriber. The Receptor Messagewatch intends to receive, store and display a variety of standard messages such as "Call Home" or "Call Office," or display the telephone number specifically designated by the caller. The product will be manufactured by Seiko.

The Receptor system will be dependent on an a pre-established set of several overlapping subcarrier signals originating from multiple local FM stations. Thus, this system is based on the use of a frequency-agile radio receiver to deliver its paging messages. AT&E is planning to transmit every message at a separate interval on a slightly different subcarrier frequency from numerous "host" FM stations in a given area to assure rapid delivery of paging data. Currently the system is undergoing field trial testing in Portland, Oregon, with extensive market tests to be conducted prior to the paging system's commercial introduction.

### **Radio Data System (RDS)**

The radio Data System (RDS) was developed in Europe and is currently in use there.<sup>35</sup> However, RDS can be considered a future technology which is relatively unknown in the U.S. market. One of the first high profile demonstrations of the technology was presented at the 1990 NAB convention in Atlanta, Georgia. An RDS system operates by using a combination of internal receiver control functions and a unique electronic display screen to deliver specific information services to radio audiences at home as well as in vehicles.

Given the historical use of radio subcarriers by U.S. FM stations for a wide range of data, voice and paging services, RDS also can be viewed as a market refinement currently being developed to meet new consumer needs. It is possible for FM radio stations to use RDS technology to provide listeners with a scope of new information services delivered via the subcarrier channels.

RDS systems are data-only services transmitted via FM subcarrier at 57 kHz frequency. The system is compatible with the Blaupunkt ARI traffic messaging system developed in Europe and specifically designed for carriage at 57 kHz. One current difficulty with implementing RDS technology is that the service and related hardware equipment is designed specifically to operate at this FM subcarrier band. Presently, there are a range of other

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<sup>35</sup> De Sonne, (1991). p. 59.

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subcarrier paging applications carried by stations in 57 kHz frequency band. The effect of the other applications on the national rollout of an RDS service is presently under discussion.

As of early 1991, there are only three RDS applications in use in Europe. However, other additional features are being tested at this time. The three operational services include:

**Programming service identifier** An 8-character alphanumeric (e.g., call letters, dial position, station or network slogan) is displayed on the special screen panel built into RDS receivers identifying a particular radio service;

**Internal clock** This automatically converts Universal Time Code (UTC) to local time on the display panel;

**Travel/traffic messaging services** The receiver overrides whatever is being played (cassette, CD), and switches to a local traffic messaging service reporting travel or rush hour traffic conditions. In this application the switching is initiated automatically whenever the receiver detects a digital message indicating the transmission of a new traffic alert on the subcarrier signal.



## Today's FM Radio Industry and Important Developments for Its Future

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Thus, RDS operations can be seen as establishing a data communications link between an FM station and an RDS receiver. Some of the features of RDS are unique. These include the following:

**Tuning by format.** RDS will allow listeners in the home or car to tune into FM stations by format rather than by frequency. For example, the RDS receiver can be programmed to seek an FM station of a desired format, such as Country or CHR, without stopping at every FM signal on the band. During this "seek" function, the RDS receiver will stop only at stations with the programming format pre-designated by a particular listener. This type of feature particularly appealed to American broadcasters examining the technology at the 1990 NAB Convention in Atlanta.

**"Cellular-type" FM services.** RDS receivers are also able to be programmed to search automatically for another FM station carrying a particular network program once the initial station's signal becomes too weak for satisfactory reception. This feature is similar to cellular-type technology and also could be used by FM stations with translators. Once the main FM signal passes out of range, RDS receivers could conceivably be set to "automatically tune" to translator stations extending the reach of the stations coverage area.

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**Alpha-numeric IDs.** Logos, identifiers, numbers -- even station promotions -- could be displayed by an FM station using the 8 - character alphanumeric display on RDS automobile receivers. In addition, more in-depth technical information could be transmitted to home receivers or computers using this RDS function.

**Emergency Alerts.** In emergency situations, a signal from the FM station actually could cause an RDS receiver to turn itself to the "on" position even if the receiver had been "off." If the receiver is programmed to handle this function, emergency signals could be directed to interrupt a CD, cassette or DAT player while it is in use.

As of now, RDS systems are not in operation in the U.S. The cost for the necessary RDS subcarrier generator ranges from \$5,000 to \$10,000 depending on the options desired. Currently eight manufacturers make RDS generators, all of them European. Authorization is not required to install or operate most RDS subcarriers services since subcarrier use has been deregulated by the FCC. However, market demand and economics will ultimately govern the business prospects for future RDS services in America.

### DBS Audio

Competitors for the FM radio market in the form of digital audio competition comes not only from CDs, DATs and cable audio, but also from satellites.<sup>36</sup> There are several planned U.S. Direct Broadcast Satellite (DBS) services that have intentions to offer competitive digital audio services. As currently envisioned, the DBS digital audio services are positioned to be direct competitors not simply for in-home listeners, but also for audiences in other out-of-home locations. In fact, for the proposed new mobile satellite services, the in-vehicle listener is the target customer for the service.

As of early 1991, nine FCC-approved, high-powered DBS licenses have been granted. The most well-known are Hubbard Broadcasting's United States Satellite Broadcasting (USSB), and Hughes Communications Galaxy, Inc. which will serve as the hardware "anchor" for their DBS Sky Cable system.<sup>37</sup> In addition to the formal DBS service plans presented by these two companies, several other well-publicized undertakings are arranging themselves to provide direct-to-home (DTH) or quasi-DBS video services utilizing medium-powered Ku-band satellites. These ventures include the cable-backed 1991 start-up of PrimeStar, and the pending SkyPix undertaking which will hinge upon on a new video compression technology for its planned 108 video channel system. A further direct-to-home video service first announced

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<sup>36</sup> De Sonne, (1991). p. 49.

<sup>37</sup> De Sonne, (1991). p. 49.

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in 1990 was TVN Entertainment Corporation's planned 10 channels of pay-per-view titles licensed from major Hollywood studios. This new venture will employ a proprietary scrambling technology called D-Code. This system alters the scrambling algorithm at a rate of 120 times a second. FM broadcasters should be aware that high quality audio is planned to be incorporated into each of the services discussed above either as part of the video package offerings or as separate subscriber services.

### **FUTURE DEVELOPMENTS AFFECTING FM RADIO**

#### **Audio Quality: Digital/Analog**

There is a growing appetite for high quality audio as indicated by the penetration of CD players and CDs, stereo television receivers and VCRs, and the promise of new digital audio services delivered by satellite, cable and terrestrial broadcasting. The broadcasting industry has been very conscious of the demands of consumers for higher quality sound over the years. The time for digital audio broadcasting seems ripe in this era when consumers are demanding ever-increasing quality sound.

As a starting point for discussing the transmission of a digital audio signal, let us examine the current state of the FM signal. FM radio can be engineered to a very high level

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of transmission quality.<sup>38</sup> However, signal distortion and noise remain major factors affecting overall FM signal quality.

These limitations can be theoretically eradicated with an upgrade in broadcast audio signal quality using digital transmission. Digital audio signals are formed using the same binary system of zeros and ones that are used in computer coding and digital telephone transmissions. The key to the advantage digital transmissions have over analog signalling is not because digital is more resistant to noise than FM, but because digital signals are essentially immune to noise. The technology of digital broadcasting allows receivers to disregard the interfering noise a current FM signal picks up from the environment as it travels from the transmitter to the receiver in the home or car. By processing each second of audio sound in the digital domain, a digital receiver can reconstruct an audio signal to perfectly match the same wave form as it was sent from the transmitter. Thus, with the digital system ignoring the added interference now common in FM broadcasts, radio broadcasts transmitted in digital would theoretically have the same high quality sound as a compact disc.

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<sup>38</sup> De Sonne, M. (1990) *Digital Audio Broadcasting: Status Report and Outlook*, Washington, DC: National Association of Broadcasters.

### Digital Cable Radio

Several programmed audio services which take advantage of the current digital technology are in operation today. There are now three cable companies that offer digital radio systems that will provide cable customers with high quality, commercial-free music piped into their home stereo systems. This service typically costs between \$7 and \$10 per month. These companies permit customers to "purchase" albums by dialing a telephone number to order the music desired. The service can then be recorded on tape in the customer's home. Once an order is placed, the payment from the consumer is divided so that the recorded company obtains a royalty and the cable company receives a payment.

The three companies involved are: International Cablecasting Technologies, Inc., with its Digital Music Express; General Instrument's "Digital Cable Radio"; and Digital Radio Labs; "Digital Planet." These services are currently being marketed to cable systems, with Digital Cable Radio on an aggressive national roll-out schedule. These digital cable audio businesses have estimated that they can be viable with only 200,000 to 300,000 subscribers, although they plan to reach 10% penetration of the 55 million cable households within the next two to three years.

The future for businesses providing high quality audio service appears bright. In a recent General Instrument survey of the initial 450 customers for their Digital Cable Radio

service, the survey indicated that 88% of the customers believe that the service has met or exceeded their expectations, and 58% say its the most used stereo component in the house.

### **Digital Audio Broadcasting (DAB)**

Digital audio broadcasting is likely to have the greatest impact on traditional FM broadcasting in the future. It can be transmitted from satellites or from traditional broadcast transmitters, but will provide the clean interference-free reception discussed above. Digital audio broadcasting, whether terrestrial or satellite, offers specific significant technical improvements over FM radio. These technical improvements include:<sup>39</sup>

**Higher Frequency Response:** DAB ranges up to 22 kHz versus 15 kHz for FM and contains more audio information.

**No Multipath Interference:** Using a totally new digital transmission system, DAB is able to use signal waves arriving at the receiver at different times to reinforce or strengthen the received signal.

**Requires Much Less Power:** It is estimated that transmitting in the FM band at 100 MHz, the highest power needed for a DAB transmitter would be several hundred watts, not the tens of thousands of watts now typically required (depending upon antenna height).

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<sup>39</sup> De Sonne, (1990b). pp. 17-20.

**Spectrum Efficiency:** It is estimated that DAB is approximately four times as spectrum efficient as FM broadcasting, i. e., four times as many stations can be accommodated in the allocation scheme.

Thus, this development of a completely new audio broadcasting service, known as Digital Audio Broadcasting (DAB) quickly has appeared on the scene and will very likely revolutionize the way radio is transmitted and received in the U.S. However, many questions concerning the legal and regulatory matters of DAB still must be answered before it is introduced in America.<sup>40</sup> Specifically, matters of spectrum availability and related policy concerns over specific allocation decisions, questions on whether to authorize DAB services for terrestrial or satellite modes of delivery, or both; impact on the traditional broadcasting system, and worldwide technical equipment standards issues have yet to be decided.

However, several central questions remain. First, where will the needed spectrum be found? Technically, the best spectrum for DAB would be in the VHF or UHF bands, although these options are not feasible for a variety of reasons.<sup>41</sup> Availabilities in microband frequencies (1000 - 2000 MHz) including the L-band are reasonable possibilities for spectrum space. Other key questions relating to DAB include: Will existing broadcasters be permitted to be the licensees of these new DAB stations? Will DAB be an opportunity for America's broadcasters? The answers to these questions will certainly going to be resolved in the 1990s.

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<sup>40</sup> De Sonne, (1990b) p. 14.

<sup>41</sup> De Sonne, (1991). p. 54.



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DAB is not far off in the horizon, in fact, testing of DAB has been ongoing for over two years. There have been several over-the-air demonstrations in Europe and in Canada.

DAB could create some very different marketplace changes in American radio broadcasting. First, depending upon the amount of spectrum available, there could potentially be 12 to 16 stereo channels per market if a terrestrial system was adopted. These 12 to 16 channels would require about 4 MHz of spectrum. Final system specification of bandwidth depends on the band of frequencies selected for the DAB service. Secondly, in a terrestrial system all stereo channels could be transmitted at the same tower location with the coinciding power output, using the same transmitter. Due to the data stream of each program channel being combined with the data streams of all the other stereo program channels in the market. Then the combined data stream is fed to a single DAB transmitter and a single DAB antenna.

The FCC issued a *Notice of Inquiry* with regard to the establishment of a new digital audio radio service.<sup>42</sup> This *NOI* was partially prompted by filings made by three companies offering digital audio services.

The companies with proposals pending before the FCC are:

**Satellite CD Radio, Inc.:** Filed a petition for a rule making to allocate frequencies for a new CD-quality radio service which would in part be provided by satellites, and in part by

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<sup>42</sup> Federal Communications Commission, *Notice of Inquiry*, In the Matter of: Amendment of the Commission's Rules with Regard to the Establishment and Regulation of New Digital Audio Radio Services, August 21, 1990.

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terrestrial transmitters. For the satellite portion, it proposes to sell transponder capacity on a non-common carrier basis to both existing broadcasters and new entities; the terrestrial portion would be available to existing broadcasters.

**Radio Satellite Corporation:** Indicated in their application that they would like to construct and operate an earth station that would provide digital audio programming along with other mobile services through the mobile satellite system licensed to the American Mobile Satellite Corporation. RSC proposes to resell satellite capacity on a non-common carrier basis to common carriers and broadcasters who would provide the services.

**Strother Communications:** Is seeking a rule making requesting the Commission to allocate spectrum and adopt rules for a terrestrial digital audio broadcasting system, designed preferentially for existing broadcasters before opening it up to other entities.

## CONCLUSION

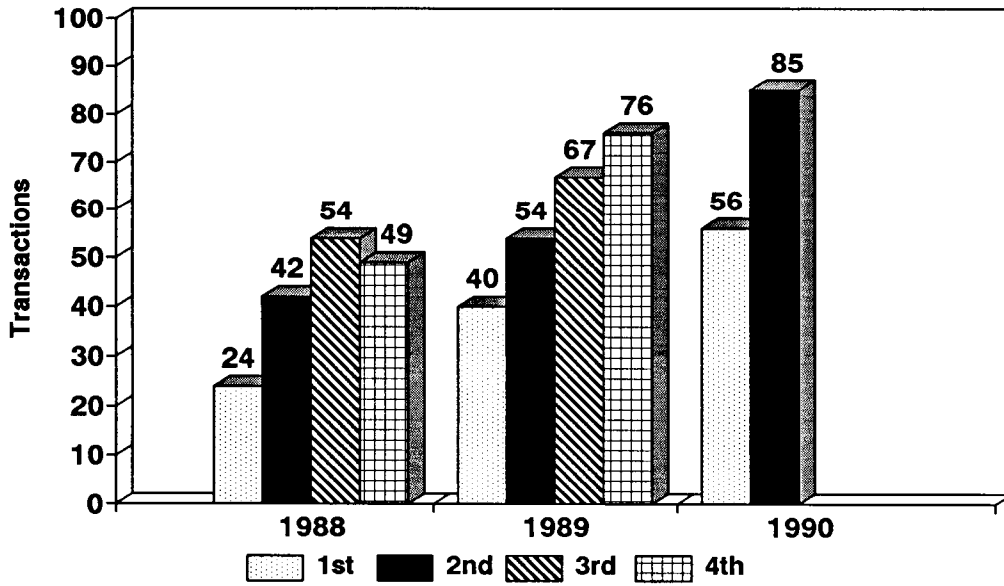
In some ways we have come full circle. The purpose of this book is to honor the work and memory of Mr. Edwin Armstrong, the man who is largely responsible for bringing FM radio to the world. His vision and determination played a key role in the long laboring process which culminated in the birth and eventual industry and market acceptance of FM radio. As we honor the memory of Mr. Armstrong, it may do us well to keep a humble eye on the future.

## **Today's FM Radio Industry and Important Developments for Its Future**

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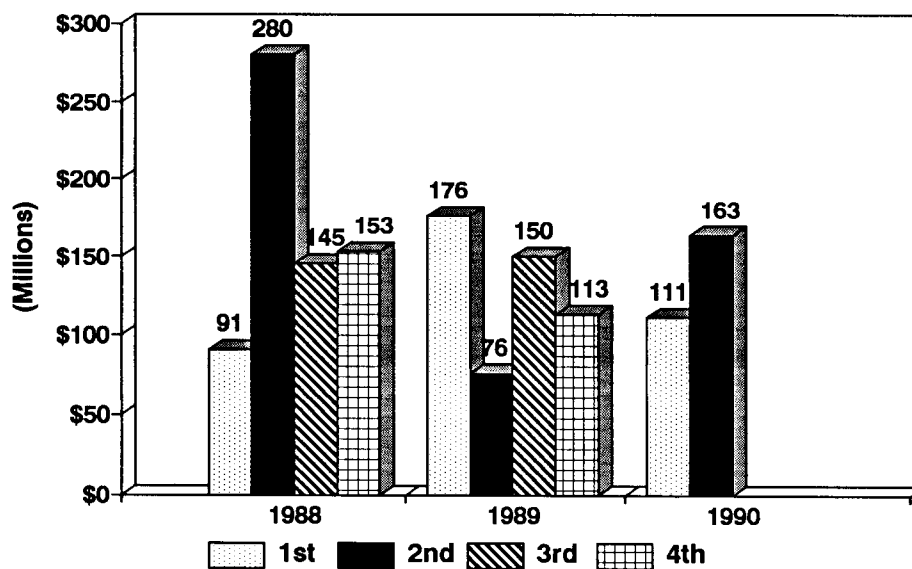
It is not so clear that we will have it any easier than did he as he set about the task of realizing his dream.

**Figure 1**  
**Number of FM-Only Sales By Quarter**  
**1st Qtr. 1988-2nd Qtr. 1990**



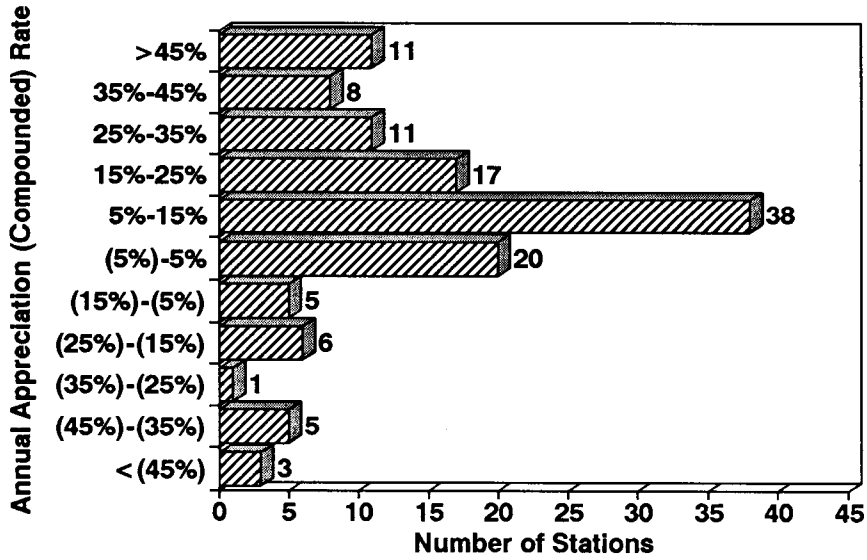
*Source: Trends in Radio Station Sales: 1988-1990.*

**Figure 2**  
**Dollar Volume of FM-Only Sales**  
**1st Qtr. 1988 - 2nd Qtr. 1990**



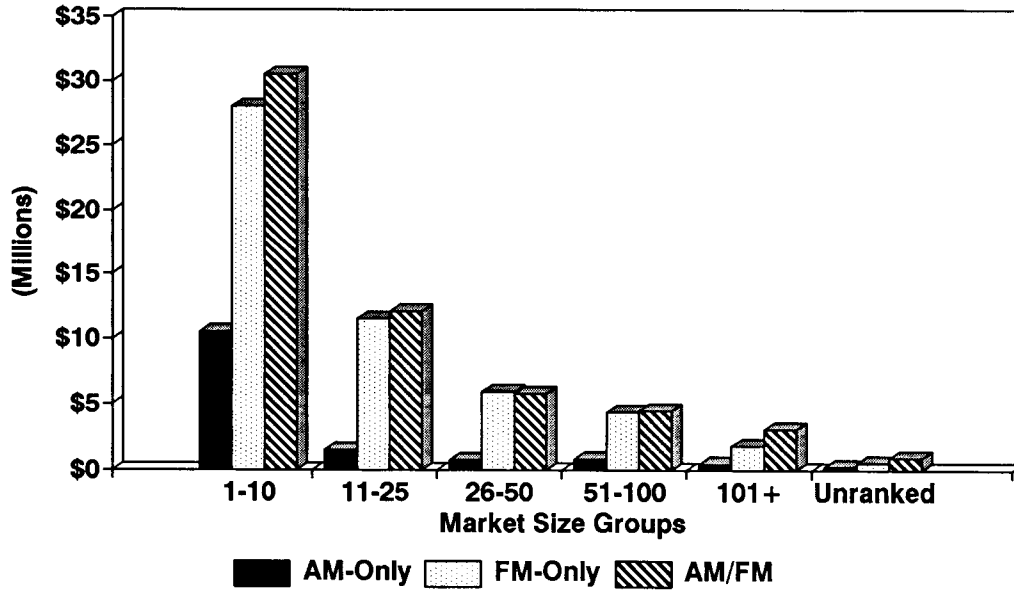
Source: Trends in Radio Station Sales: 1988-1990.

**Figure 3**  
**Distribution of Annual Gains (Losses)**  
**FM Stations, 1st Qtr.1988-2nd Qtr.1990**



Source: Trends in Radio Station Sales: 1988-1990.

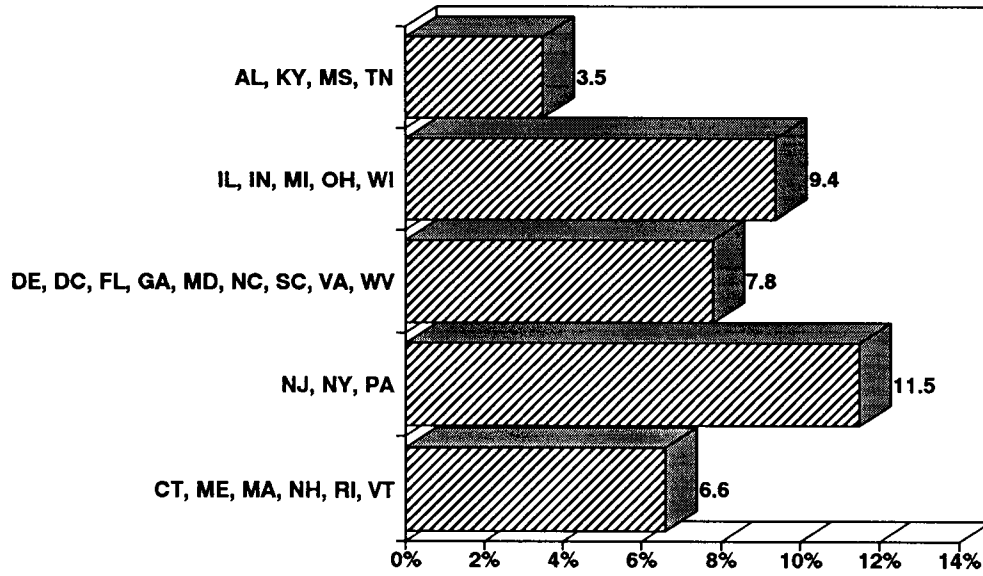
**Figure 4**  
**Average Prices By Market Size**



Source: Trends in Radio Station Sales: 1988-1990.

10/6/90/1

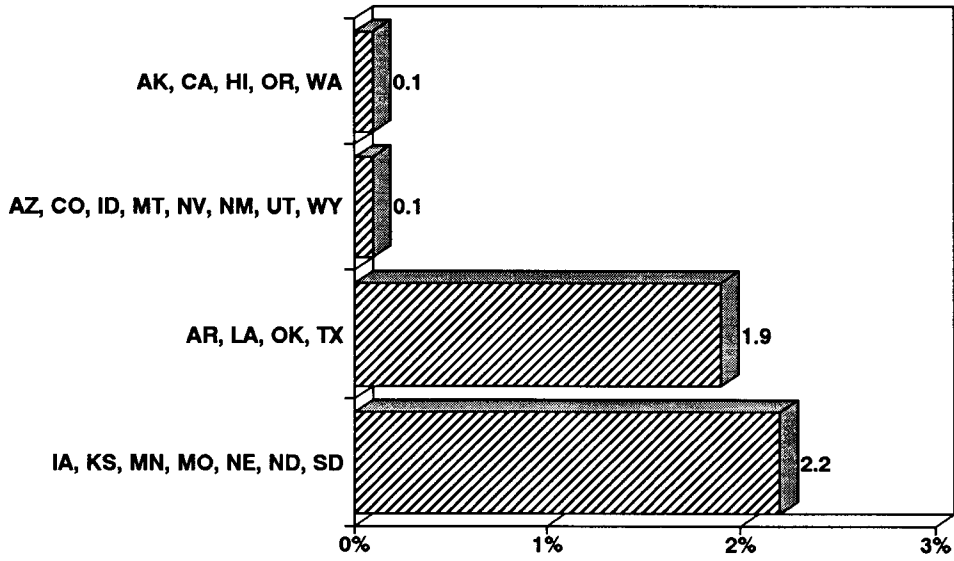
**Figure 5**  
**Annual Appreciation Rates By Region**  
**All Stations, 1st Qtr 1988-2nd Qtr 1990**



Source: Trends in Radio Station Sales: 1988-1990.



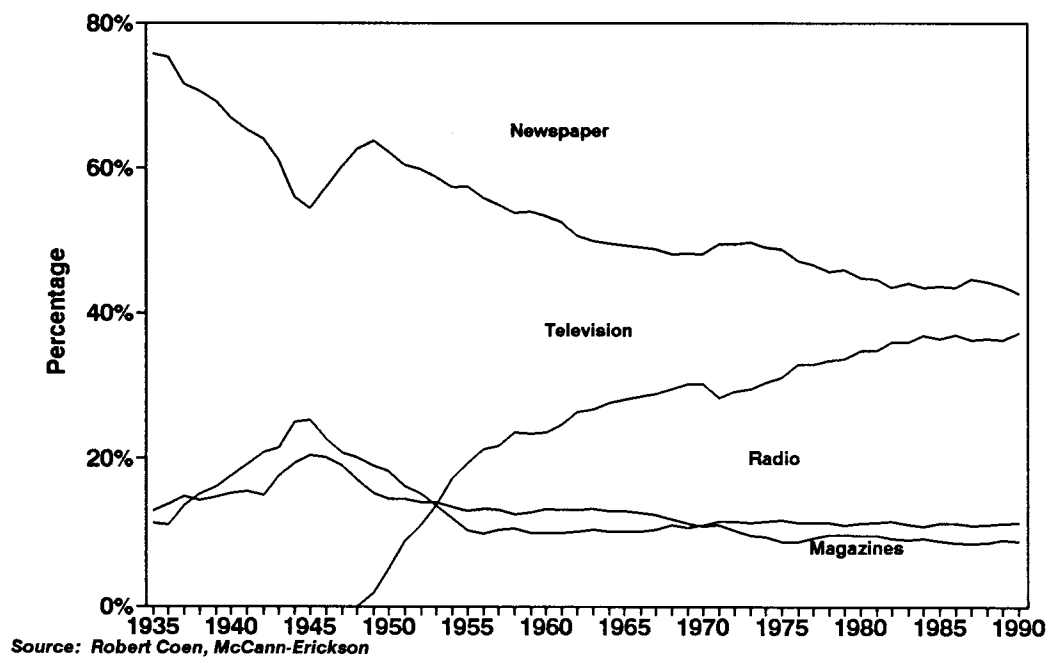
**Figure 6**  
**Annual Appreciation Rates By Region**  
**All Stations, 1st Qtr 1988-2nd Qtr 1990**



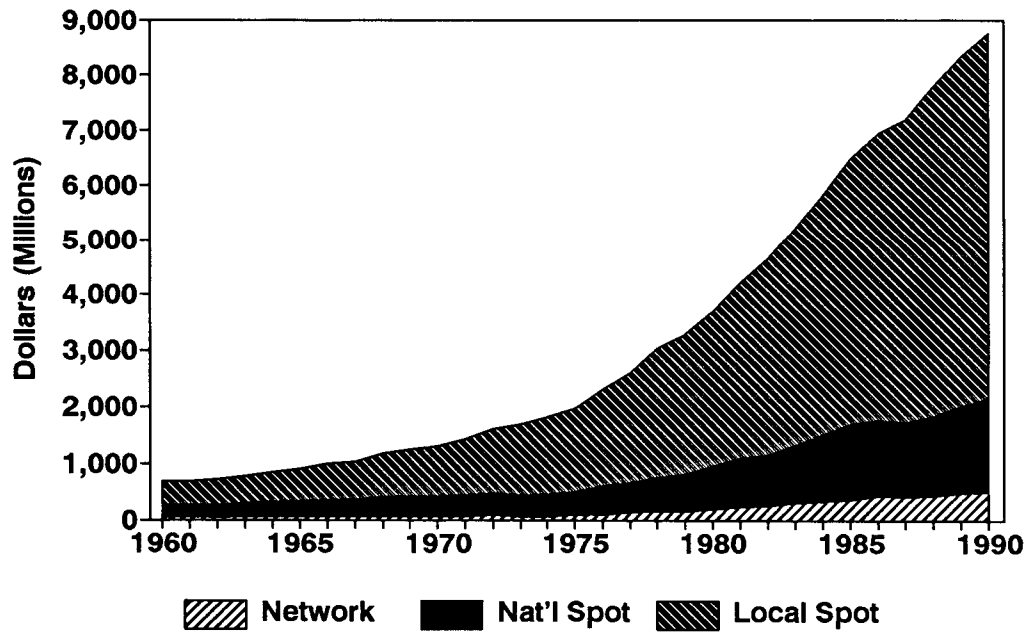
Source: Trends in Radio Station Sales: 1988-1990.

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**Figure 7**  
**Advertising Shares of Various Media**

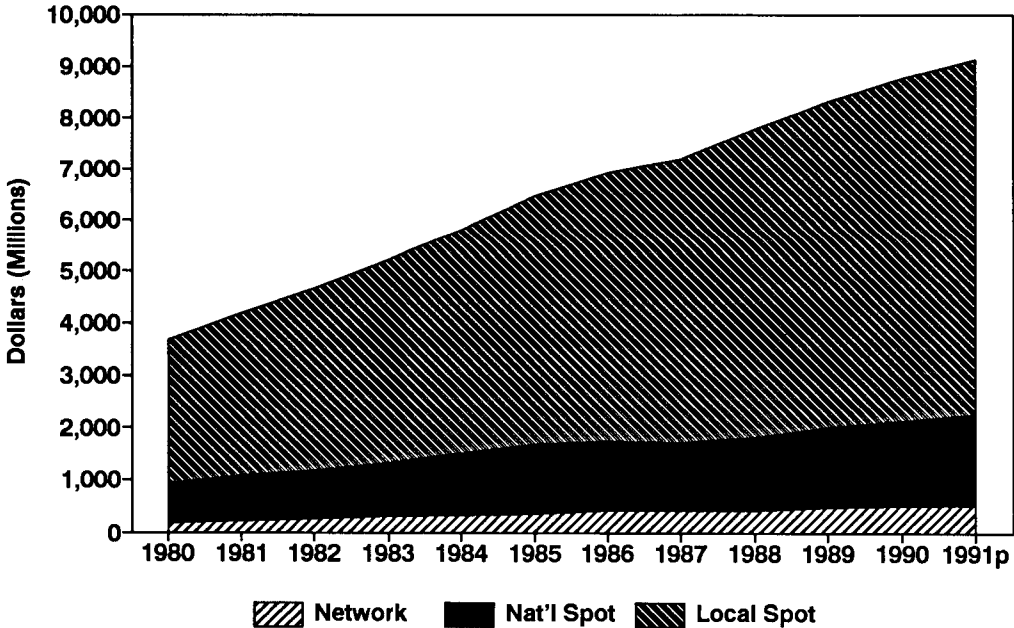


**Figure 8**  
**Total Radio Advertising, 1960-1990**



Source: Robert Coen, McCann-Erickson

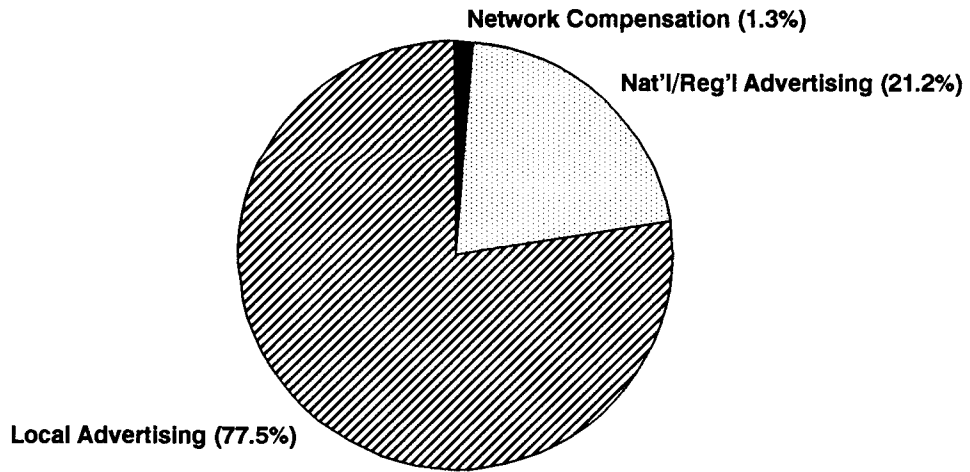
Figure 9  
Total Radio Advertising, 1980-1991



Source: Robert Coen, McCann-Erickson

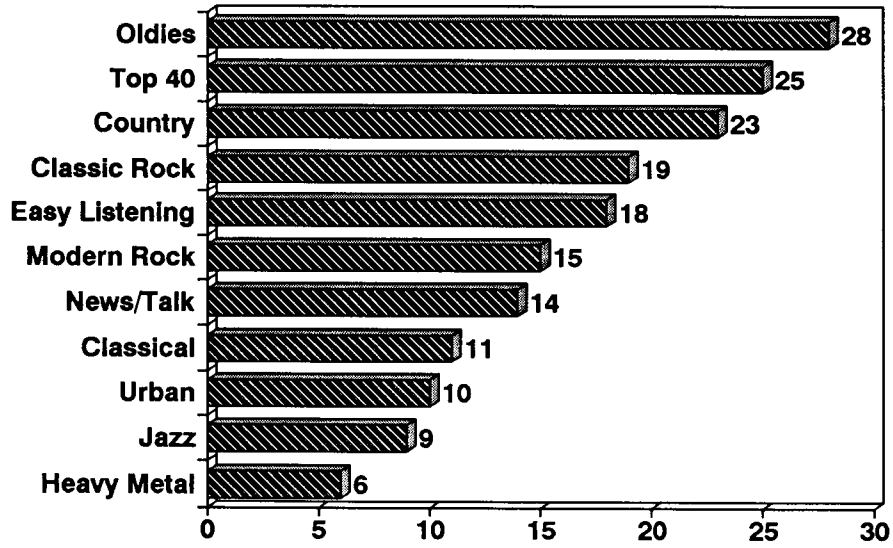
3-31-80  
129

**Figure 10**  
**1989 FM National Averages**



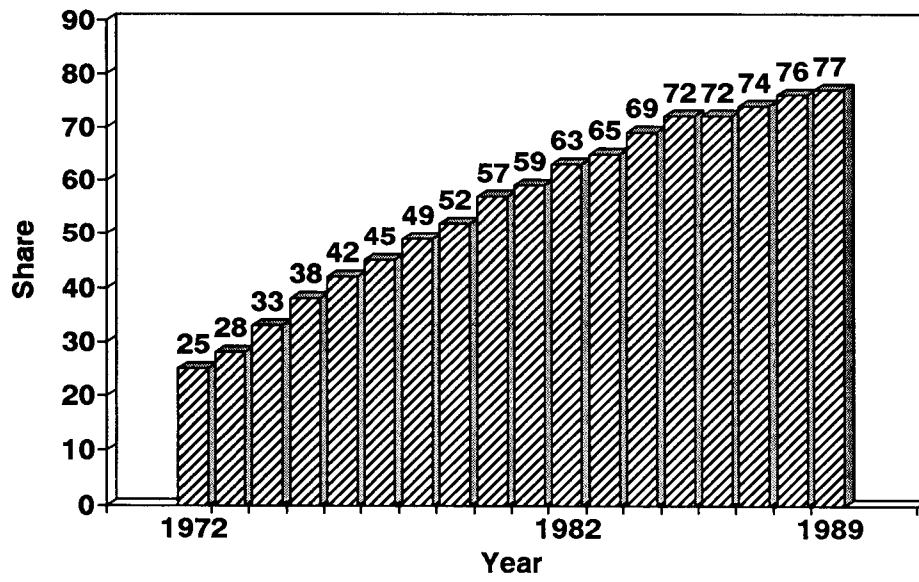
**Source: 1990 NAB/BCFM Radio Financial Report.**

**Figure 11**  
**Radio Formats**



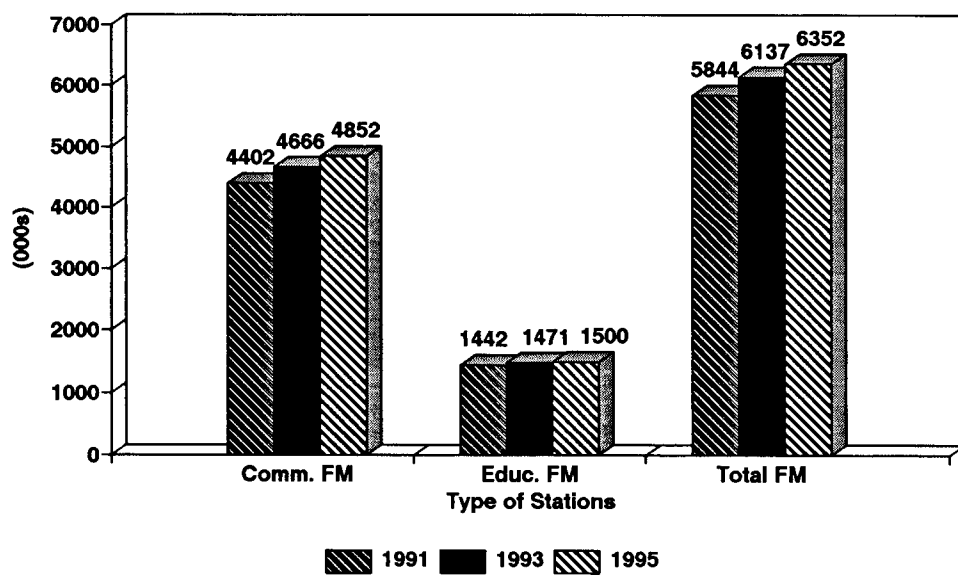
*Source: Broadcasting Dec 3 1990.*

**Figure 12**  
**FM Share of Radio Listening**



*Source: Radar Volume 1, 1972-1989, Copyright Statistical Research, Inc.*

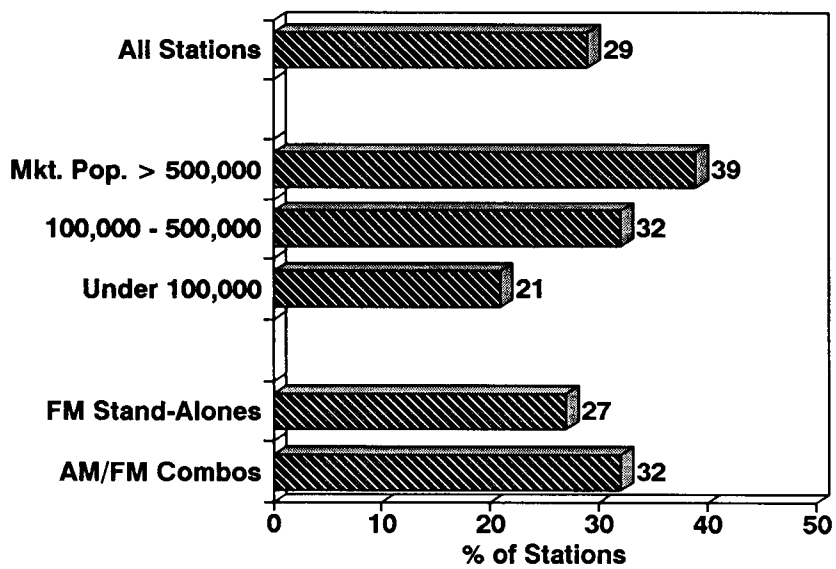
**Figure 13**  
**FM Radio Stations, 1990, 1993, 1995**



*The 1993, & 1995 data are NAB projections.*

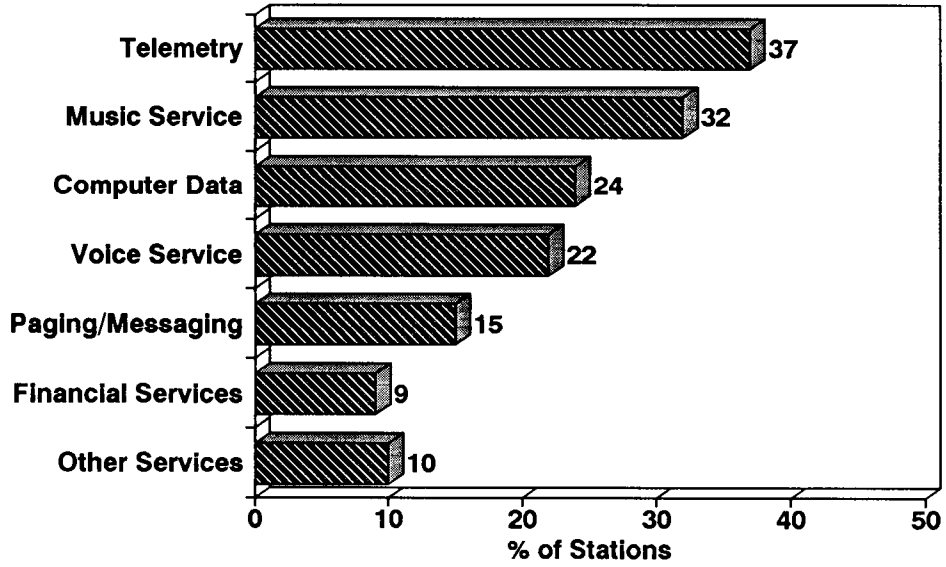


**Figure 14  
Subcarrier Usage  
FM Radio Stations**



*Source: 1990 Broadcast Technology Report.*

**Figure 15**  
**Subcarrier Services**  
**FM Radio Stations Using Subcarriers**



Source: 1990 Broadcast Technology.

1990 Broadcast Technology

Today's FM Radio Industry  
And Important Developments For Its Future

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Austin J. McLean

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