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## Satellite Radio

*We believe satellite radio will be to free radio what cable was to free over-the-air TV: better, deeper programming choices, superior sound quality.*

—Robert Kaimowitz, SG Cowen Equity Analyst<sup>1</sup>

Satellite (SAT) radio services broadcast digitally-encoded audio to Earth-based receivers, either directly from an orbiting satellite, or—if the receiver was in a shielded location—from the satellite to the receiver via a terrestrial repeater station.<sup>2</sup> These receivers (radios) could be in cars, households, offices, or carried as portable devices.

In November 2003 two companies offered satellite radio service in the U.S.: XM Satellite Radio Holdings Inc. (XM) and Sirius Satellite Radio Inc. (Sirius). XM and Sirius had purchased digital audio radio service (DARS) spectrum in 1997 from the Federal Communications Commission (FCC). Since the FCC had licensed no other DARS spectrum, the companies faced no near-term threat of additional competition. If the FCC ever made more DARS spectrum available, analysts estimated that it would take entrants at least four years to assemble the infrastructure needed to offer service.<sup>3</sup>

Unlike terrestrial AM/FM radio, which was supported by commercial advertising and free to listeners, both XM and Sirius offered SAT radio as a subscription service. XM charged users \$10 per month per receiver (a second car required a second subscription) for access anywhere in the U.S. to 100 channels of CD-quality programming with fewer commercials than terrestrial radio stations; Sirius charged \$13 for similar service. In addition to monthly subscription fees, consumers had to purchase a special radio to receive satellite broadcasts. An “after-market” SAT radio (for a car already on the road) cost \$200 or more. Adding a pre-installed SAT radio as optional or standard equipment would add somewhat less to the price of a new car.

Although Sirius was two years older than XM, Sirius had trouble engineering the chipset for its radio, and was beaten to market by XM (see **Exhibit 1** for company timelines). XM began selling nationally in November 2001; Sirius launched national service nine months later. As of September 30, 2003, XM had 930,000 subscribers and Sirius had 150,000 subscribers.

Although current investor sentiment favored XM, analysts were debating the importance of first mover advantage in the SAT radio market. Could Sirius overcome XM’s head start? More fundamentally, would there be a winner at all? Was satellite radio economically viable?

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Research Associate Alastair Brown prepared this case under the supervision of Professor Thomas Eisenmann. This case was developed from published sources. HBS cases are developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.

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## Technology

Sirius and XM produced satellite radio content from facilities in Manhattan and Washington DC, respectively. Sirius had 76 studios used by disc jockeys and talk show hosts, four studios for live performances, and a music library with over 2 million titles.<sup>4</sup> XM had similar studio assets. Both services produced most of their programming content in these studios, but each service also redistributed several channels—mostly in talk or information formats, rather than music—from third-party programmers.

Programming content was uplinked to satellites then downlinked (broadcast) to receivers and repeater stations over the “S” frequency band, which was not subject to interference during inclement weather. Unlike some satellite communications services, SAT radio did not require sophisticated tracking equipment to aim a motorized dish precisely at a satellite. However, SAT radio signals could not pass through rock or buildings (as terrestrial AM/FM radio signals could), so SAT radio service did require direct line of sight between a satellite and a small omni-directional antenna shaped like a computer mouse.<sup>5</sup>

When users were in tunnels or metropolitan areas where buildings blocked the line of sight to a satellite, terrestrial repeater stations were required to rebroadcast satellite signals. In New York City, for example, Sirius used nine such stations. To mitigate reception problems, SAT radio providers also employed digital buffering, which held several seconds of programming in the receiver’s short-term memory.

SAT radios sold in 2003 received either Sirius or XM signals—not both—and also received AM/FM terrestrial radio signals. The FCC had mandated the development of a unified standard for SAT radios that could receive both companies’ signals, but had not specified a deadline for compliance. Sirius and XM had agreed to cross-license technologies, but had not spent much on R&D to meet the FCC’s mandate. It was unclear when interoperable radios would reach the market.<sup>6</sup>

Both XM and Sirius used multiple satellites to deliver signals anywhere in the 48 contiguous United States. When more than one satellite was visible, receivers were pre-programmed to tune to the satellite that offered the strongest signal. XM used two satellites (called “Rock” and “Roll”) in geostationary orbits. Orbiting 22,300 miles above the equator, a geostationary satellite’s speed exactly matched the rotation of the earth, so it remained in a fixed position relative to the earth’s surface. From most points in the United States, XM’s satellites were visible at a constant elevation angle (height above the horizon) of between 20 to 50 degrees (90 degrees = directly overhead).

By contrast, Sirius used three satellites in elliptical orbits inclined roughly midway between the Earth’s poles and the equator. Sirius’s satellites passed much closer to the Earth over the Southern Hemisphere, allowing them to spend 16 hours per day over the Northern Hemisphere. With this orbital configuration, at least one of Sirius’s satellites typically would be visible at a higher elevation angle than the best angle offered by either of XM’s satellites.<sup>7</sup>

Higher elevation angles meant that Sirius required fewer repeater stations to ensure good reception—roughly 100, versus about 800 for XM.<sup>8</sup> Repeater stations were expensive to install and maintain, but were accessible in the event of technical trouble. By contrast, it was prohibitively expensive to repair an orbiting satellite. If one of Sirius’s satellites failed, users would experience daily service outages of several hours when neither of its two working satellites were visible.<sup>9</sup> XM was similarly exposed to the risk of satellite failure, although the resulting reception problems would be less acute. XM had more repeaters, and its second satellite would always be at a fixed position in the sky, although buildings might obstruct the line of sight. Both companies held a spare satellite on the ground, but would require roughly six months to launch a replacement.

Sirius' satellites had experienced some circuit failures since launch, but the defects had not yet impaired service quality or reduced the satellites' 15-year expected lives. XM's satellites had experienced a progressive degradation of solar panel power, which would reduce their useful lives to 6.75 years from 17.5 years. To continue offering its full complement of 100 channels, XM would need to launch its replacement satellite. The company had filed a \$400 million insurance claim for its flawed satellites. XM's insurer had denied the claim on the grounds that the satellites were still performing above insured levels and the pace of power degradation was as yet unclear. Equity analysts expected that XM would eventually receive the claim, but might need to raise additional capital in the meantime to fund the launch of its spare.<sup>10</sup>

### *Service Offerings*

XM provided nationwide coverage for 100 CD-quality radio channels. Subscribers could travel anywhere in the United States and never lose reception. Seventy-one XM channels featured music—34 of which were free of commercial advertisements—and the balance offered talk or information programming (e.g., news, sports, or comedy). Sirius offered a similar programming mix, with 60 commercial-free channels.

Both SAT radio services provided highly segmented programming (see **Exhibit 2** for a breakdown of XM's programming). For example, XM offered channels devoted to uncut hip-hop, traditional jazz, and NASCAR auto racing. By contrast, far fewer programming choices were offered by terrestrial radio stations due to channel capacity constraints and the direct link between revenue and audience size for ad-supported terrestrial stations. To avoid signal interference, the FCC had restricted the number of terrestrial stations licensed in each city and regulated their power. Consequently, most stations had an effective range of 30 miles or less. A large metropolitan area like greater Boston (population: about six million) might have 30 to 40 commercial AM/FM stations and perhaps a dozen non-profit stations programmed by universities or affiliates of government-sponsored National Public Radio. About 65% of the U.S. population lived in one of the fifty largest metropolitan areas, all of which had at least one million residents. A smaller city like Bakersfield, California (population: about 200,000) might have a dozen radio stations. Twenty-two million U.S. radio listeners—nearly 10% of the population—had access to five or fewer terrestrial radio channels.<sup>11</sup>

It was economically attractive for several terrestrial radio stations in a given market to each accept a smaller share of the big audience for the most popular programming formats (e.g., soft rock or country). By doing so they could generate a larger audience—and thus more revenue and profit—than they would with 100% audience share of a niche format (e.g., opera or “industrial/rave”). Consequently, most niche formats were not available to terrestrial radio listeners, even in the largest markets. (See **Exhibit 3** for listening time for different terrestrial formats.)

In addition to offering greater programming variety, both SAT radio companies had recruited high-profile stars to host shows, for example, Quincy Jones and Wynton Marsalis at XM, and Sting, MC Lyte and Grandmaster Flash at Sirius. Also, satellite radio was not governed by FCC rules that prohibited the distribution of profane or indecent content over public airwaves.<sup>12</sup>

Analysts believed that future advances in digital compression technology could allow SAT radio companies to offer more channels as well as data-enabled services. With such services, a listener might be able to order, with a single push of a button, a product advertised on SAT radio directly through her cell phone. Ford had reserved bandwidth for future data transfer services from Sirius.<sup>13</sup>

## *The Market*

Both Sirius and XM had limited their services to the United States, and focused primarily on listeners in cars, which accounted for 42% of all radio use, rather than the market for in-home use or portable devices (see **Exhibit 4** for a description of target markets, and **Exhibit 5** for data on terrestrial radio usage patterns and industry ad revenue). In-home adoption rates were expected to be limited because SAT radios required an external antenna, typically mounted on the roof or an exterior wall.

In 2003, there were roughly 200 million cars and trucks in the United States, of which 95% had radios. Within the car market there were two segments: SAT radios pre-installed in new cars and after-market purchases for cars already on the road. The new car market comprised roughly 17 million vehicles sold annually in the United States.<sup>14</sup> By comparison 11 million after-market terrestrial car radios were sold each year.<sup>15</sup> The smaller after-market channel was the initial focus for both XM and Sirius, but auto manufacturers began offering pre-installed SAT radios as optional equipment in a few new car models in 2002.

SAT radios were produced for both companies by a variety of manufacturers and were distributed by many retailers (see **Exhibit 6**). In addition to a dashboard unit, first generation SAT radios required an external tuner and an antenna. The tuner, about the size of a CD player, was typically installed under a seat, behind the dashboard, or in the trunk. The antenna could be placed anywhere on the exterior of the car, but had to be connected to the radio by wire. Including installation, an after-market first generation SAT radio retailed for roughly \$400 to \$500 after factoring in subsidies from SAT radio companies to manufacturers and retailers.<sup>16</sup> In 2002, a second generation of smaller “plug and play” SAT radios was introduced. These devices integrated the radio and tuner into a single dashboard unit priced at about \$150 to \$250. This price point was close to the cost of a conventional AM/FM aftermarket system.<sup>17</sup>

Although SAT radio offered the benefits described above—greater programming variety, reception across the United States, CD-quality audio, and fewer commercial interruptions—there were many barriers to market adoption for consumers:

- First, SAT radio was a subscription service and required the purchase of additional equipment. Furthermore, the concept of subscription satellite radio was new, so channel partners had to explain and sell the service. To this end, XM and Sirius each planned to spend heavily on mass media advertising. Both companies also had websites for streaming their product (<www.xmradio.com> and <www.siriusradio.com>) and had installed kiosks in consumer electronics stores to stimulate interest.
- Second, after-market installation would involve some hassles, although plug-and-play radios would alleviate part of this pain. Also, first generation SAT radios had been criticized for reception problems—some users had complained of brief signal outages—and ergonomic flaws. For example, some radios required scrolling through more than a hundred channels using only “up” and “down” buttons.
- Finally, the FCC had prohibited SAT radio services from offering local programming, such as community news, traffic, and weather. Even if this prohibition were to be relaxed, XM and Sirius currently lacked the channel capacity to offer local programming. However, SAT radio subscribers could continue to rely on terrestrial stations for such information, because SAT radios included AM/FM tuners.

### *Business Model*

**Revenue** Merrill Lynch's equity analyst forecasted \$1.6 billion in total industry revenues by 2007 (see Exhibits 7 and 8 for projected income statements for XM and Sirius, respectively).<sup>18</sup> Both companies planned to earn most of their revenue through subscription fees. Although advertising was projected to account for a modest share of total revenue, SAT radio offered several advantages as an advertising medium.<sup>19</sup> First, a subscription relationship implied that SAT radio providers could learn more about listeners' demographics, which would facilitate targeted marketing. Furthermore, the willingness to pay a monthly fee suggested that SAT radio customers would be more affluent than terrestrial radio listeners. Second, the aggregation of niche audiences would appeal to advertisers who lacked other means to reach these consumer segments. Finally, with fewer ads on SAT radio, it seemed likely that people would pay more attention to ads they did hear.

**Variable operating costs** Costs that varied directly with revenue and/or the number of subscribers included: (1) customer service and billing expenses, estimated to be about \$12-\$18 per customer per year by 2007; (2) performance rights fees paid to societies that represented musicians and composers (e.g., ASCAP and BMI), projected to be 5.5% to 7% of revenue in 2007; and (3) revenue sharing with certain content providers and OEM partners—expected to equal 18% of XM's 2005 revenue.

**Fixed operating costs** In 2003, fixed operating expenses for XM would include programming costs (other than music royalties) of about \$20 million. Recurring fixed payments for XM's network operations (satellite ground stations, repeater maintenance, and "roof real estate" leases) were projected to be \$43 million. Sirius was expected to spend a total of \$32 million in 2003 for programming and network operations. R&D expenses were forecast to be \$13 million and \$18 million for XM and Sirius, respectively. Finally, corporate general and administrative overheads were expected to be \$26 million and \$32 million for XM and Sirius, respectively.

**Capital costs** SAT radio services had incurred substantial capital costs. Through September 30, 2003, total capital expenditures for XM had been over \$900 million, including \$475 million for satellite construction and launch, \$268 million for repeater stations, and \$134 million for uplink and production facilities.<sup>20</sup> Sirius's capital costs exceeded \$1.0 billion, and included \$746 million for satellite construction and launch and \$65 million for repeater stations. XM and Sirius also had paid \$89 million and \$83 million, respectively, for spectrum rights in an FCC auction. In SEC filings, both XM and Sirius stated that they expected their eight-year FCC licenses to be renewed upon expiration, although neither mentioned whether renewal would require additional fees.

**Customer acquisition costs** Variable subscriber acquisition costs for equipment subsidies and dealer incentives were projected to decline by 2007 to \$50 for both companies. In addition, as noted above, both companies had negotiated deals to pay ongoing sales royalties to auto manufacturers for subscriptions resulting from SAT radios pre-installed in their new car models. Finally, both Sirius and XM were expected to spend heavily on mass-market advertising.

**Subscriber growth** By the end of 2003, Merrill Lynch estimated XM and Sirius would have 1,275,000 and 220,000 subscribers, respectively. By the end of 2007, Merrill projected that XM would have 7.3 million subscribers, and Sirius would have 4.7 million customers. W. R. Hambrecht's forecasts through 2007 were similar, and W. R. Hambrecht predicted that SAT radio companies would serve a total of 23 million subscribers in 2010 (representing 11% of all autos that year), with XM capturing 62% of the market.

### *Strategic Partners*

XM's key strategic partnership was with General Motors (GM), which had a 29% percent share of U.S. auto sales in 2002. In exchange for equity and the right to serve as the sole provider of SAT radios for GM vehicles, XM had promised to make fixed, annual payments to GM that totaled more than \$400 million over a 12-year period commencing in November 2001. XM also subsidized the cost of radios in GM cars, and paid GM a percentage of subscription revenue earned from GM vehicles with pre-installed XM radios.<sup>21</sup> GM had promoted XM's service aggressively, viewing SAT radio as a means to differentiate its products. XM radios would be a factory-installed option on 44 of GM's 57 car models in 2004. GM had accounted for 25% of XM's subscribers as of October 2003.<sup>22</sup>

XM's other OEM partners would offer XM radios on 26 models in 2004 (see **Exhibit 9** for data on OEM relationships). Honda and Toyota had not signed exclusive distribution contracts, but to date had only offered XM equipment. Honda, which had a 7.4% share of the U.S. auto market in 2002, had acquired an equity stake in XM in 2000, but had not received special subsidies or revenue sharing terms in exchange for this investment.

XM's other strategic investors included Clear Channel Communications and DirecTV (see **Exhibit 10** for data on SAT radio companies' equity investors). Clear Channel was the largest U.S. terrestrial radio broadcaster and outdoor advertising (billboard) company. Clear Channel had offered XM some content for redistribution, including several Spanish-language channels, and sold advertising on XM's behalf.

DirecTV had been owned by Hughes Electronics, a GM subsidiary, but in April 2003 was sold to Rupert Murdoch's News Corp. DirecTV was the leading U.S. provider of direct broadcast satellite (DBS) television services, a business that shared many characteristics with satellite radio. Although DirecTV already bundled digital audio service with its premium TV packages (see section below entitled "Competition"), analysts speculated that XM might someday be packaged with DirecTV service, which reached 12 million customers in November 2003.

Sirius's key strategic partners were Ford and DaimlerChrysler, which together controlled 36% of the U.S. car market in 2002. In exchange for offering Sirius's radios exclusively in their new cars, Ford and DaimlerChrysler received a percentage of subscription revenue from vehicles with pre-installed Sirius radios. In addition, Ford and DaimlerChrysler had each been granted warrants to purchase four million shares of Sirius' common stock at a \$3.00 exercise price (on November 19, 2003 the Sirius's stock price was \$2.03). These warrants would be exercisable once Ford and DaimlerChrysler had shipped 1.5 million and 4 million Sirius-enabled vehicles, respectively.

Ford was expected to offer Sirius radios on 10 models in 2004; DaimlerChrysler would offer Sirius service on 16 Chrysler models and 10 Mercedes models. In addition, Sirius had exclusive distribution deals with BMW and Mazda, which planned to offer Sirius radios on six and two of their 2004 models, respectively. In contrast to XM's OEM partners, which offered SAT radio as a factory-installed options, most of Sirius's OEM's provided SAT radio as a dealer-installed option. This typically resulted in higher equipment costs for subscribers, due to dealer markups. Sirius's OEM partners were expected to shift to factory installation in response to XM's success with this approach.

### *Financing*

Sirius went public in September 1994, long before XM's IPO in October 1999. From their inceptions through Q3 2003, Sirius and XM had each raised \$2.4 billion in equity and debt.<sup>23</sup> On September 30, 2003, Sirius and XM had \$260 million and \$738 million in debt, respectively. At that

time, Sirius and XM had \$479 million and \$457 million in cash and equivalents, respectively. Merrill Lynch projected that XM would reach EBITDA breakeven in 2006 and Sirius would achieve breakeven the following year (see **Exhibits 7 and 8**). According to Merrill's projections, XM would need to raise roughly \$100 million in additional capital through 2006, assuming that its insurance settlement fully covered the cost of launching its replacement satellite and constructing another spare. Sirius would require about \$180 million in additional capital through 2007.

Sirius and XM had reasonably solid balance sheets as of late 2003, because each company had completed a dramatic restructuring and had raised new capital over the prior year. Sirius had issued new common stock in exchange for a large portion of its debt and preferred stock. XM had swapped new debt and warrants for over \$300 million of existing debt. To conserve cash, XM also had renegotiated its agreement with GM. GM accepted a \$89 million convertible note in lieu of \$115 million in fixed payments from 2003 to 2006, and had created a \$100 million credit facility that XM could use to finance remaining payments.

### *Competition*

The main competition to satellite radio would be from terrestrial analog AM/FM radio. SAT radio had other potential competitors, including terrestrial digital radio. In January 2002, Ford took a stake in Ibiquity Digital Corp., which had developed terrestrial AM/FM digital receivers that matched SAT radio's sound quality. Ibiquity's technology shared the frequency already in use by an analog AM or FM station; hence, no additional spectrum was required for a station to simulcast analog and digital versions of its programming. Stations would only have to spend about \$75,000 for transmission equipment required to use Ibiquity's technology. Listeners would need to acquire new receivers, which would add about \$100 to the cost of a car radio.<sup>24</sup> Privately-held Ibiquity, which had 14 of the 25 largest U.S. radio broadcasters as investors in addition to Ford, had licensed its technology to 280 stations in 100 cities as of October 2003.

Other industry observers speculated that Internet radio might someday compete with SAT radio. Websites could stream radio to cars through "3G" (third generation) broadband wireless communication services. However, in 2003, the bandwidth required for such streaming was expensive, and audio quality was inconsistent. Consequently, most analysts were skeptical about the near-term economic viability of mobile Internet radio services.<sup>25</sup>

Another potential competitor to SAT radio was digital radio provided by cable or satellite TV providers. Beginning in the early 1990s, cable system operators had offered dozens of channels of CD-quality music without commercial interruption as a subscription service priced at \$5 to \$10 per month (subscribers also had to acquire a separate tuner at a cost of about \$150). These cable radio services had only achieved two percent household penetration levels where they were marketed. Cable operators shifted their distribution strategy in the late 1990s when they began to deploy digital set-top converter boxes to boost television channel capacity. Digital set-tops also could be used to tune audio signals, eliminating the need for separate audio reception equipment. Cable audio service was no longer sold a la carte; it was bundled with additional TV channels as part of a premium digital service tier.<sup>26</sup> By 2002, over twenty million U.S. homes received digital audio in this manner, either through their cable operator or through similar services bundled into the premium tiers of satellite TV operators like DirecTV.<sup>27</sup> Consumers found these services attractive: 75% of homes with digital audio service provided by a cable or satellite TV operator listened for an average of 8 hours per week.<sup>28</sup>

Finally, satellite radio faced competition from CDs and audiocassettes. In their cars, consumers spent three times more hours listening to their radios than to CDs or tapes despite the selection

afforded by these formats.<sup>29</sup> The main deterrent for pre-recorded formats was ease of use: commuters did not want to constantly handle CDs and tapes while driving. However, storage of music and ease of access were improving. Sony, for example, had developed a radio with a 10-GB hard drive that could store 165 hours of MP3 music and could “rip” from an audio CD.

### *Conclusion*

With restructuring completed and XM reporting strong subscriber growth, Wall Street analysts were cautiously optimistic about SAT radio's prospects. Their sanguine forecasts contrasted markedly with views held by investors a year earlier: both company's stocks had collapsed during 2001 and 2002, due to bearish sentiment in the overall stock market and concerns about the financial viability of SAT radio providers. XM's stock reached a low of \$1.66 in November 2002; Sirius's shares bottomed at \$0.38 four months later. Both stocks had subsequently recovered strongly: XM was priced at \$20.87 on November 19, 2003; Sirius traded at \$2.08 on that day (see **Exhibit 11**). Equity market capitalization at these prices was \$3.1 billion for XM and \$2.1 billion for Sirius.

Other observers were less impressed with prospects for SAT radio: short positions as a percentage of average daily trading volume were very high for both XM and Sirius. For short sellers, many questions remained unanswered: Was there strong latent demand for this service? Could subscribers be acquired for a reasonable price? Would either company ever deliver profits?

**Exhibit 1a** XM Timeline

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1992	Company founded.
1997	Submits \$89.9 mm winning bid to FCC for DARS license
1998	Signs contract with Hughes unit (now Boeing Space Systems) to develop and launch two satellites. Signs licensing agreements with Pioneer and Alpine to develop radios for auto market. Signs licensing agreement with STMicroelectronics to develop radio chipset.
1999	Raises \$250 mm from strategic investors, including \$50 mm each from GM and DirecTV and \$75 mm each from Clear Channel and a private investment group. Enters exclusive distribution agreement with GM. Announces agreement with Delphi to manufacture XM radios. Completes IPO, raising net proceeds of \$113 mm.
2000	STMicroelectronics delivers XM receiver chipsets to radio manufacturers. Signs agreement with SIRIUS to develop unified standards. Honda makes \$50 mm investment in XM.
2001	Launches XM-1 and XM-2 satellites Rolls out service in Dallas and San Diego, followed by a nationwide rollout Pioneer and Alpine ship XM radios to retailers. Boeing announces flaws that will result in shorter than expected satellite lives.
2002	Sony, Delphi release XM plug-and-play radios. Avis signs an exclusive agreement with XM.
2003	XM completes refinancing, including \$225 mm of new funding, \$300 mm note exchange, \$250 mm of GM payment deferrals, \$100 mm GM line of credit XM completes a \$150 mm equity offering. Delphi introduces \$120 plug-and-play XM radio.

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Source: Adapted from Peter Friedland, Michaela Crouch, "Initiating Coverage of Satellite Radio," W. R. Hambrecht Equity Research, October 21, 2003, pp. 5–6.

**Exhibit 1b** SIRIUS Timeline

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- 1990 Company founded.  
Proposes that FCC establish satellite digital audio radio services (DARS) and submits application.
- 1992 FCC allocates S-band spectrum for DARS.
- 1994 Completes IPO with net proceeds of \$4.4 mm.
- 1997 Submits winning bid of \$83.3 mm to FCC for DARS license.
- 1998 Completes construction of terrestrial repeaters covering San Francisco.
- 1999 Signs exclusive agreement with Ford.
- 2000 Signs exclusive agreements with DaimlerChrysler and BMW.  
DaimlerChrysler invests \$100 mm in SIRIUS.  
Signs agreement with XM to develop unified standard.  
Blackstone Group invests \$200 mm in SIRIUS.
- 2001 Raises net proceeds of \$230 mm through a public equity offering.  
Agere delivers SIRIUS receiver chipsets to radio manufacturers.  
Kenwood ships SIRIUS radios to retail outlets.
- 2002 Launches service in Denver, Houston, Phoenix and Jackson, MS, followed by a nationwide rollout.  
Hertz signs an exclusive agreement with SIRIUS.
- 2003 In March, completes recapitalization that: 1) eliminates 91% of outstanding debt and convertible preferred stock in exchange for 622 mm shares; and 2) raises \$200 mm through the issuance of 212 mm shares to several institutions.
- In May, raises \$193 mm from a convertible offering, and in June, an additional \$146 mm in an equity offering.
- Kenwood and Audiovox introduce first plug-and-play SIRIUS radios.
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Source: Adapted from Peter Friedland, Michaela Crouch, "Initiating Coverage of Satellite Radio," W. R. Hambrecht Equity Research, October 21, 2003, p. 4.

## Exhibit 2 XM Satellite Radio Channel Lineup

Title	Genre	Title	Genre
XM Preview	Preview Channel	World Zone	World Music
The 40s	Big Band/Swing/Forties	The Joint	Reggae
The 50s	Fifties	NGOMA	Music from Africa
The 60s	Sixties	Audio Visions	New Age
The 70s	Seventies	Radio Taj	Hindi-Indian
The 80s	Eighties	C Wave	Mandarin-Chinese
The 90s	Nineties	XM Classics	Traditional Classical
America	Classic Country	Fine Tuning	Pop Classical
WSIX-XM Nashville	Nashville Country	VOX	Opera
X Country	Progressive Country	XM Pops	Classical Hits
Hank's Place	Traditional Country	Radio Taj	Hindi-Indian
Bluegrass Junction	Bluegrass/American Folk	C Wave	Mandarin-Chinese
Highway 15	Non-Stop Country	XM Classics	Traditional Classical
Top 20 on 20	Top 20 Hits	Fine Tuning	Pop Classical
KISSXM	LA Rock	VOX	Opera
Mix	Pop Mix	XM Pops	Classical Hits
The heart	Love Sings	Boneyard	Hard Rock
Lite XM	NY Lite Rock	XM Liquid Metal	Heavy Rock
MTV	Rock/Pop	XMU	New Rock
VH1	Rock/Pop	Fred	Classic Alternative
Cinemagic	Movie Soundtracks	XM Café	Modern/Soft Alternative
On Broadway	Showtunes	Top Tracks	Classic Rock Hits
U-Pop	Euro & Global Chart Hits	Radio Disney	Children
Special X	Special Topics	XM Kids	Children
The Torch	Christian Rock	XM News	Top Story News
The Fish	Christian Pop	USA Today	News
On the Rocks	Cocktail Mix	Fox News	News
Ethel	Alternative Hits	CNN Headline News	News
Deep Tracks	Deep Album Rock	The Weather Channel	24 Hr Weather Radio
The Loft	Acoustic/Folk	CNBC	Business News
XM Music Lab	Progressive Fusion	CNN fn	Financial News
Unsigned	Independent Artists	Bloomberg	News and Business
Soul Street	Classic Soul	CNET Radio	Tech News
The Flow	Urban Top 40	BBC World Service	World Affairs
BET	Urban	C-SPAN	US Gov. And Public Affairs
Spirit	Gospel	CNN en Espanol	News in Spanish
The Groove	Old School R&B	ESPN Radio	Sports Talk/ Play-by-Play
The Rhyme	Classic Rap	CNN Sports III.	Sports News
Raw	Uncut Hip Hop	Fox Sports Radio	Sports News Talk
Real Jazz	Traditional Jazz	Sporting News Radio	Sports Talk
Watercolors	Light Jazz	NASCAR Radio	Auto Racing
Beyond Jazz	Modern Jazz	XM Comedy	Comedy
Frank's Place	Great Vocals/Standards	Laugh USA	Family Comedy
XM Blues	Blues	Extreme XM	Radio Crazies
Luna	Latin Jazz	Discovery Radio	Health/General Science
The Move	Modern Electronic Dance	E!	Entertainment/News
Bpm	Latest Hot Music	ABC News	News and Talk
Club 82	Urban Mixes	Ask!	Experts and Advice
Chrome	Disco	Buzz XM	Talk and Opinion
Aquila	Spanish Top 40	Babble On	Young and Sassy Talk
Romantico Moderno	Spanish Pop Hits	Open Road	Trucker's Channel
Vibra	Rock in Spanish	The Power	African American
Tejan	Tejano	Family Talk	Christian Talk
Caliente	Caribbean		

Source: Adapted from Robert B Kaimowitz, "XM Satellite Radio," SG Cowen, December 26, 2001, p. 2.

**Exhibit 3** Radio Formats

<b>Format</b>	<b>% Share of Radio Listening Among Persons 12+</b>
News/Talk	16.9%
Adult Contemporary	15.3%
Contemporary Hits Radio	11.4%
Country	9.0%
Oldies	8.1%
Urban	8.0%
Hispanic	6.9%
Alternative	5.0%
Album Rock	4.8%
Classic Rock	4.2%
Adult Standards	3.0%
Smooth Jazz	2.7%
Religious	2.5%
Classical	1.7%
Remaining Formats	0.5%

Source: Adapted from *Radio Marketing Guide & Fact Book for Advertisers*, Radio Advertising Bureau (2001–2002 Edition).

**Exhibit 4** Potential Markets

<b>Target Market</b>	<b>Opportunity</b>
Commuters	<ul style="list-style-type: none"> <li>▪ 110 million</li> <li>▪ 35 million travel 1 hour+ each day</li> </ul>
Niche Music Listeners	<ul style="list-style-type: none"> <li>▪ Classical, jazz, rap, gospel, soundtracks</li> <li>▪ 30% of recorded music sales</li> <li>▪ Generally unavailable on radio</li> </ul>
Truck Drivers	<ul style="list-style-type: none"> <li>▪ 3 million professional truck drivers</li> <li>▪ 1.1 million long distance haulers</li> </ul>
Marine Market	<ul style="list-style-type: none"> <li>▪ 7 million recreational boaters</li> </ul>
Recreational Vehicles	<ul style="list-style-type: none"> <li>▪ 3 million recreational vehicles</li> </ul>
Sparse Radio Zones	<ul style="list-style-type: none"> <li>▪ 105 million radio listeners outside of top 50 markets</li> <li>▪ 1.6 million people have access to 1 radio station</li> <li>▪ 1 million people receive no radio stations</li> <li>▪</li> </ul>

Source: Adapted from Ty P. Carmichael Jr., "XM Satellite Radio Inc.," Credit Suisse First Boston, April 6, 2001, p. 14.

**Exhibit 5** Terrestrial Radio Information

- On average, radio reached 95.8% of all consumers 18 and over each week, 77.6% each day. This demographic averaged 21 hours and 15 minutes of radio listening each week.
- In any 24-hour period, 63% of adults ages 25-54 were exposed to radio within one hour of making their largest purchase of the day, 68% of those 18-34, and 60% of those 35-64.
- In 1995, \$9.1 billion was generated from local advertising on the radio; \$1.9 billion came from national spots; and \$0.4 billion from network revenue. In 2000, these numbers jumped to \$15.2 billion, \$3.6 billion and \$1.0 billion, respectively. Local advertising spots encompassed local marketers advertising locally. National spots were national marketers advertising in specific localities. Network revenue was generated from ads running on nationally syndicated programming.

Source: Adapted from *Radio Marketing Guide & Fact Book for Advertisers*, Radio Advertising Bureau (2001-2002 Edition).

**Exhibit 6** Manufacturers and Retailers of Satellite Radios

Manufacturers		Retailers	
Sirius	XM	Sirius	XM
Alpine	Sanyo	Circuit City	Circuit City
Delphi-Delco Electronics	Sony	Best Buy	Best Buy
Clarion	Motorola	Tweeter	Radio Shack
Kenwood	Pioneer	Home Entertainment Group	Sears & Roebuck Co.
Matsushita	Alpine	Good Guys	Tweeter
Recoton	Mitsubishi	Al and Ed's	Ultimate
Sony	Audiovox	CarToys	Al and Ed's
Visteon	Clarion	Sound Advice	CarToys
Panasonic	SHARP		Sound Advice
Jensen	Blaupunkt		Mobile-One
	Fujitsu Ten		Crutchfield
	Delphi-Delco Electronics		Cowboy Maloney's
	Bontec		Electronic
	Visteon		Magnolia Hi-Fi
	Panasonic		
	Hyundai Autonet		

Source: Adapted from John L. Stone, "Sirius Upside Potential: Sirius Satellite Radio," Ladenburg Thalmann & Co. Inc., August 15, 2001; and John L. Stone, "Ready for Prime Time: XM Satellite Radio," Ladenburg Thalmann & Co. Inc., August 15, 2001.

Exhibit 7 XM Operating Model (\$ millions)

	2002	2003E	2004E	2005E	2006E	2007E
<b>Total Year-end Subscribers (in thousands)</b>	<b>347</b>	<b>1,275</b>	<b>2,702</b>	<b>4,258</b>	<b>5,889</b>	<b>7,284</b>
Net Additions	319	929	1,427	1,556	1,632	1,395
- OEM Gross Additions	54	403	973	1,333	1,574	1,656
- After Market Gross Additions	286	664	885	975	950	900
<b>Total Gross Additions</b>	<b>340</b>	<b>1,067</b>	<b>1,858</b>	<b>2,308</b>	<b>2,524</b>	<b>2,556</b>
<b>Subscription Revenue per Subscriber</b>	<b>\$9.43</b>	<b>\$8.97</b>	<b>\$9.24</b>	<b>\$9.42</b>	<b>\$9.90</b>	<b>\$10.19</b>
- Subscription Revenues	\$16.3	\$78.3	\$204.7	\$375.9	\$583.0	\$788.5
- Activation Fees/Other Revenues	1.5	9.4	8.7	15.5	21.6	25.1
<b>Subscriber Revenue</b>	<b>\$17.9</b>	<b>\$87.7</b>	<b>\$213.3</b>	<b>\$391.4</b>	<b>\$604.6</b>	<b>\$813.6</b>
<b>Net Advertising Revenue</b>	<b>\$2.3</b>	<b>\$5.7</b>	<b>\$27.1</b>	<b>\$63.9</b>	<b>\$103.7</b>	<b>\$138.9</b>
<b>Total Revenue</b>	<b>\$20.2</b>	<b>\$93.4</b>	<b>\$240.4</b>	<b>\$455.3</b>	<b>\$708.3</b>	<b>\$952.5</b>
OEM Revenue Sharing	\$0.4	\$9.5	\$33.6	\$73.5	\$122.2	\$169.5
<i>% of total revenue</i>	1.8%	10.1%	14.0%	16.1%	17.3%	17.8%
Performance Rights Fees	10.9	17.0	20.3	23.5	33.3	44.7
<i>% of subscription revenue</i>	54.0%	18.2%	9.5%	6.0%	5.5%	5.5%
Cost of Equipment	1.7	10.2	11.1	13.9	15.1	15.3
Fixed Programming Costs	19.9	20.1	20.3	20.5	20.7	20.9
Network Operations (Repeaters, Uplink)	44.8	42.9	45.0	45.7	46.4	47.1
Customer Care/Billing	15.6	25.4	31.0	49.9	64.8	77.4
<i>Monthly cost/subscriber</i>	<i>\$8.92</i>	<i>\$2.95</i>	<i>\$1.40</i>	<i>\$1.25</i>	<i>\$1.10</i>	<i>\$1.00</i>
General & Administrative	26.4	26.1	26.6	27.1	27.7	28.2
Research & Development	10.8	13.4	12.0	12.4	12.7	13.1
Other/Charges	36.8	33.3	--	--	--	--
<b>Pre-Marketing Operating Costs</b>	<b>\$167.4</b>	<b>\$197.9</b>	<b>\$199.9</b>	<b>\$266.4</b>	<b>\$342.9</b>	<b>\$416.2</b>
<b>Pre-Marketing Cash Flow</b>						
<b>(Excluding GM Revenue Share)</b>	<b>(\$147.2)</b>	<b>(\$104.4)</b>	<b>\$40.5</b>	<b>\$188.9</b>	<b>\$365.4</b>	<b>\$536.2</b>
<b>% Margin</b>	<b>NM</b>	<b>NM</b>	<b>16.8%</b>	<b>41.5%</b>	<b>51.6%</b>	<b>56.3%</b>
Fixed GM Payment Amortization	\$13.6	\$35.6	\$37.3	\$37.3	\$37.3	\$37.3
Advertising & Marketing	90.5	64.0	65.0	65.0	65.0	65.0
Subsidies to Retailers & Equipment Manufacturers	54.1	82.2	124.5	133.9	126.2	127.8
Retention Marketing, Marketing Overheads	12.9	14.4	28.0	28.8	29.7	30.6
Ad Sales, Other	1.9	2.5	2.6	2.8	2.9	3.0
<b>Total Marketing</b>	<b>\$173.0</b>	<b>\$198.7</b>	<b>\$257.3</b>	<b>\$267.7</b>	<b>\$261.1</b>	<b>\$263.7</b>
<b>Total Operating Costs</b>	<b>340.4</b>	<b>396.5</b>	<b>457.2</b>	<b>534.1</b>	<b>604.0</b>	<b>679.9</b>
<b>EBITDA</b>	<b>(\$318.0)</b>	<b>(\$303.1)</b>	<b>(\$216.9)</b>	<b>(\$78.8)</b>	<b>\$104.4</b>	<b>\$272.5</b>
<b>% Margin</b>	<b>NM</b>	<b>NM</b>	<b>NM</b>	<b>NM</b>	<b>14.7</b>	<b>28.6</b>
Depreciation & Amortization	118.6	159.1	171.6	192.6	202.1	211.5
<b>EBIT</b>	<b>(\$436.6)</b>	<b>(\$462.2)</b>	<b>(\$388.4)</b>	<b>(\$271.4)</b>	<b>(\$97.7)</b>	<b>\$61.1</b>
Net Interest Expense	58.5	83.1	81.1	93.0	111.5	80.8
Tax	0.0	0.0	0.0	0.0	0.0	0.0
<b>Net Income</b>	<b>(\$495.0)</b>	<b>(\$545.3)</b>	<b>(\$469.6)</b>	<b>(\$364.4)</b>	<b>(\$209.2)</b>	<b>(\$19.7)</b>
Preferred Dividends/Other	20.9	6.8	16.6	16.6	16.6	16.6
<b>Net Income to Common Shareholders</b>	<b>(\$515.9)</b>	<b>(\$552.1)</b>	<b>(\$486.2)</b>	<b>(\$381.0)</b>	<b>(\$225.8)</b>	<b>(\$36.3)</b>

## Exhibit 7 (continued)

	2002	2003E	2004E	2005E	2006E	2007E
Net Debt (excludes pfds, conversions, warrants)	\$441.3	\$508.1	\$696.6	\$832.4	\$746.2	\$818.2
Maintenance CapEx	(35.6)	(10.0)	(10.0)	(10.0)	(10.0)	(10.0)
Satellite Replacement	0.0	(8.0)	(201.5)	(136.0)	(15.0)	(240.0)
<b>CF from Operations</b>	<b>(294.3)</b>	<b>(253.8)</b>	<b>(147.8)</b>	<b>2.3</b>	<b>112.3</b>	<b>181.5</b>
<b>Free Cash Flow (CFFO-Maintenance CapEx)</b>	<b>(\$329.9)</b>	<b>(\$263.8)</b>	<b>(\$157.8)</b>	<b>\$(7.7)</b>	<b>\$102.3</b>	<b>\$171.5</b>

Source: Adapted from Marc Nabi, "XM Satellite Radio Holdings, Inc.," Merrill Lynch Equity Research, November 6, 2003, Exhibit 4.

Exhibit 8 Sirius Operating Model (\$ millions)

	2002	2003E	2004E	2005E	2006E	2007E
<b>Total Year-end Subscribers (in thousands)</b>	<b>30</b>	<b>220</b>	<b>972</b>	<b>2,193</b>	<b>3,443</b>	<b>4,692</b>
Net Additions	30	190	753	1,221	1,250	1,249
- Subscription Revenue	\$1.0	\$11.9	\$76.9	\$212.3	\$378.0	\$545.7
- Activation Fees/Other Revenues	0.0	1.2	2.7	7.4	13.3	19.0
<b>Subscriber Revenue</b>	<b>\$1.0</b>	<b>\$14.1</b>	<b>\$79.6</b>	<b>\$219.7</b>	<b>\$391.4</b>	<b>\$564.7</b>
<b>Net Advertising Revenue</b>	<b>\$0.1</b>	<b>\$0.4</b>	<b>\$3.2</b>	<b>\$10.4</b>	<b>\$20.3</b>	<b>\$32.1</b>
<b>Total Sirius Revenue</b>	<b>\$1.1</b>	<b>\$14.5</b>	<b>\$82.8</b>	<b>\$230.1</b>	<b>\$411.6</b>	<b>\$596.8</b>
OEM Revenue Sharing	\$0.1	\$1.0	\$9.6	\$33.0	\$64.6	\$101.6
<i>% of subscriber revenue</i>	<i>NM</i>	<i>6.8%</i>	<i>12.0%</i>	<i>15.0%</i>	<i>16.5%</i>	<i>18.0%</i>
Performance Rights Fees	0.1	1.0	5.6	15.4	27.4	39.5
<i>% of subscriber revenue</i>	<i>7.0%</i>	<i>7.0%</i>	<i>7.0%</i>	<i>7.0%</i>	<i>7.0%</i>	<i>7.0%</i>
Fixed Programming Costs	\$22.7	\$29.4	\$31.0	\$32.2	\$33.5	\$34.9
Network Operations, Studio	39.3	31.5	35.5	36.9	38.4	39.9
Customer Care/Billing	7.9	9.0	21.5	42.7	59.2	73.2
<i>Monthly cost/subscriber</i>	<i>\$157.75</i>	<i>\$8.27</i>	<i>\$3.00</i>	<i>\$2.25</i>	<i>\$1.75</i>	<i>\$1.50</i>
General & Administrative	30.7	31.7	30.5	31.7	33.0	34.3
Research & Development	30.1	18.3	18.0	18.7	19.5	20.2
<b>Pre-Marketing Operating Costs</b>	<b>\$130.7</b>	<b>\$121.9</b>	<b>\$151.6</b>	<b>\$210.7</b>	<b>\$275.5</b>	<b>\$343.7</b>
<b>Pre-Marketing Cash Flow</b>	<b>(\$129.6)</b>	<b>(\$107.4)</b>	<b>(\$68.8)</b>	<b>\$19.4</b>	<b>\$136.1</b>	<b>\$253.1</b>
Fixed Advertising, OEM Payments	\$87.3	\$121.1	\$120.0	\$115.0	\$115.0	\$115.0
Subsidies to Retailers & Equipment						
Manufacturers	\$21.0	\$60.3	\$85.0	\$106.0	\$105.9	\$106.3
Non-Cash Compensation, Other	(7.9)	22.8	3.0	3.0	3.0	3.0
<b>Total Operating Costs</b>	<b>\$231.2</b>	<b>\$326.1</b>	<b>\$359.6</b>	<b>\$434.6</b>	<b>\$499.4</b>	<b>\$568.0</b>
<b>EBITDA (Excl. Non-Cash Compensation)</b>	<b>(\$230.1)</b>	<b>(\$311.6)</b>	<b>(\$276.8)</b>	<b>(\$204.6)</b>	<b>(\$87.8)</b>	<b>\$28.8</b>
<i>% Margin</i>	<i>NM</i>	<i>NM</i>	<i>NM</i>	<i>NM</i>	<i>NM</i>	<i>4.8%</i>
Depreciation & Amortization	82.7	95.1	101.4	102.7	105.4	108.1
<b>EBIT</b>	<b>(\$305.0)</b>	<b>(\$429.5)</b>	<b>(\$381.2)</b>	<b>(\$310.3)</b>	<b>(\$196.2)</b>	<b>(\$82.3)</b>
Net Interest Expense	100.9	25.4	7.1	12.2	14.3	12.0
<b>Net Income</b>	<b>(\$405.9)</b>	<b>(\$454.9)</b>	<b>(\$388.3)</b>	<b>(\$322.4)</b>	<b>(\$210.5)</b>	<b>\$(94.3)</b>
Preferred Dividends/Other	34.0	(168.3)	--	--	--	--
<b>Net Income to Common Shareholders</b>	<b>(\$439.9)</b>	<b>(\$286.5)</b>	<b>(\$388.3)</b>	<b>(\$322.4)</b>	<b>(\$210.5)</b>	<b>\$(94.3)</b>

## Exhibit 8 (continued)

	2002	2003E	2004E	2005E	2006E	2007E
Net Debt/(Cash) (including Preferreds)	489.5	(158.5)	89.5	245.5	259.5	210.3
Capital Expenditures	(41.6)	(18.0)	(18.0)	(18.0)	(18.0)	(18.0)
Working Capital	(8.4)	12.0	46.0	74.9	73.6	70.9
<b>CF from Operations</b>	<b>(320.8)</b>	<b>(276.3)</b>	<b>(232.9)</b>	<b>(136.9)</b>	<b>(23.5)</b>	<b>92.7</b>
<b>Free Cash Flow (CFFO-CapEx)</b>	<b>(362.4)</b>	<b>(294.3)</b>	<b>(250.9)</b>	<b>(154.9)</b>	<b>(41.5)</b>	<b>74.7</b>

Source: Adapted from Marc Nabi, "Sirius Satellite Radio Inc.," Merrill Lynch Equity Research, October 30, 2003, Exhibit 3.

## Exhibit 9 Satellite Radio OEM Partners

Partners	Product Lines	2002 Share of U.S. Auto Sales
<b>XM Exclusive</b>		
General Motors	Buick, Cadillac, Chevrolet, GMC, Oldsmobile, Pontiac, Saturn, Saab	28.6%
Honda <sup>a</sup>	Acura, Honda	7.4%
Toyota <sup>a</sup>	Toyota, Lexus	10.4%
<b>XM Total</b>		<b>46.4%</b>
<b>SIRIUS Exclusive</b>		
DaimlerChrysler	Chrysler, Dodge, Jeep, Mercedes, Mitsubishi	14.4%
Ford	Ford, Lincoln, Mercury, Volvo, Jaguar, Land Rover, Aston Martin	21.5%
BMW	BMW, Mini	1.5%
Mazda		1.5%
<b>SIRIUS Total</b>		<b>38.9%</b>

Source: Adapted from Peter Friedland, Michaela Crouch, "Initiating Coverage of Satellite Radio," W.R. Hambrecht Equity Research, October 21, 2003, Exhibit 3.

<sup>a</sup>Honda and Toyota were exclusive with XM by practice, though neither had an exclusive agreement.

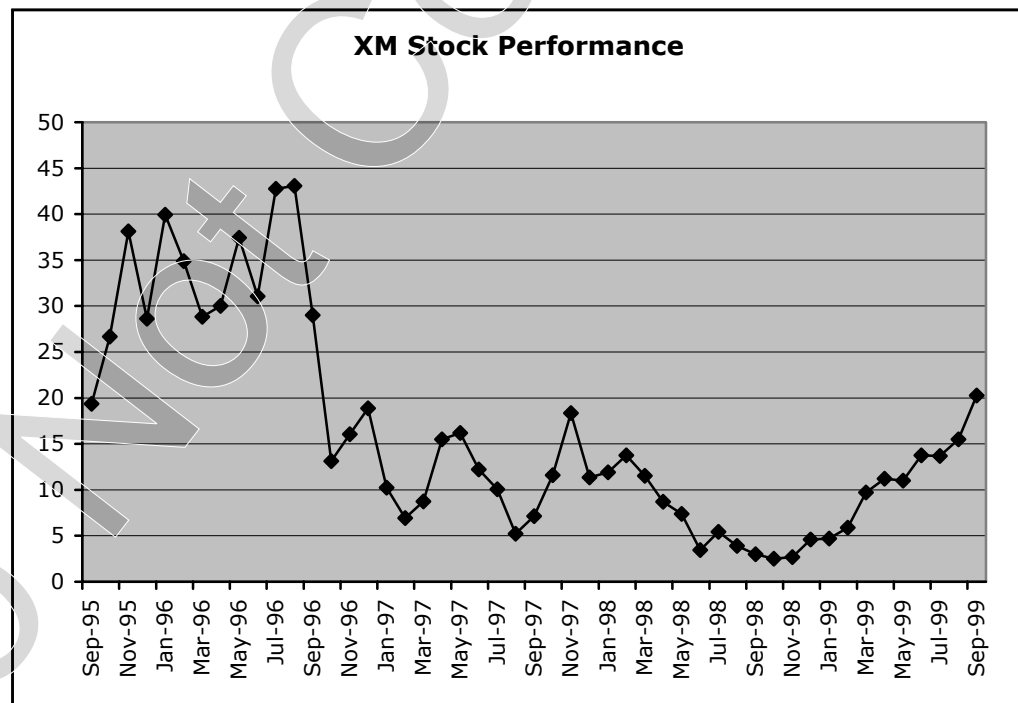
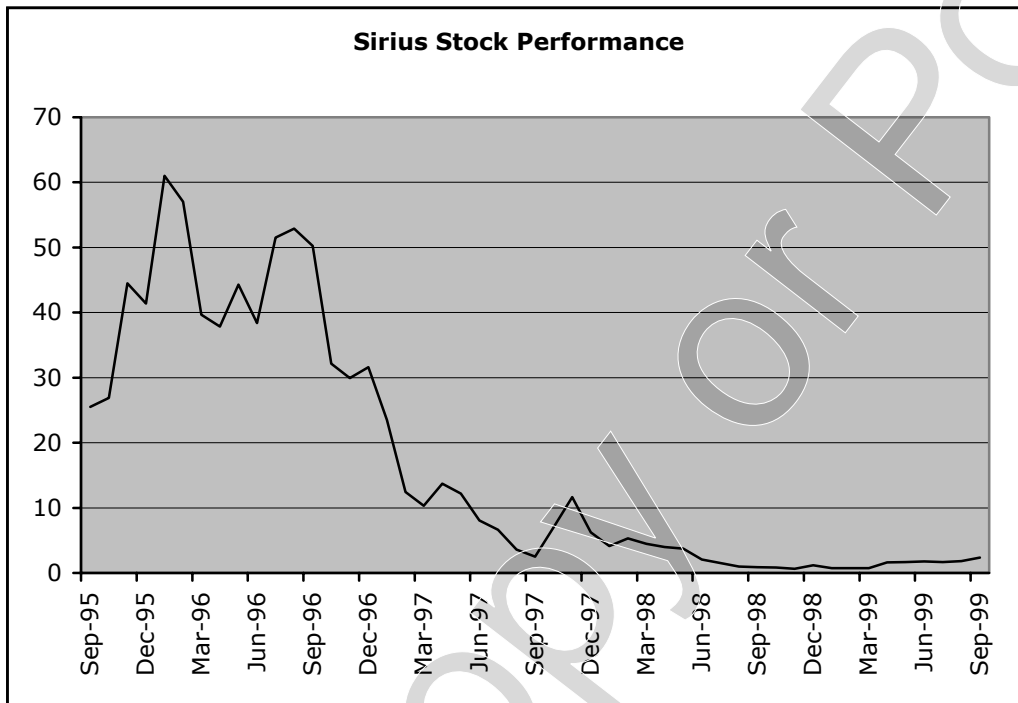
**Exhibit 10** Investors Owning More Than 3% of XM or Sirius Common Stock

XM		Sirius	
Partner	% Ownership <sup>a</sup>	Partner	% Ownership
General Motors	9.2%	Oppenheimer Funds	22.0%
American Honda	8.3%	Apollo Investment Fund	11.8%
Hughes Electronics	6.8%		
Eastbourne Capital	4.7%		
AEA Investors	3.9%		
Madison Dearborn	3.5%		
Clear Channel	3.1%		
Columbia Capital	3.0%		

Source: Adapted from Peter Friedland, Michaela Crouch, W R Hambrecht Equity Research, October 21, 2003, "XMSR: Initiating Coverage with a Hold Rating," Exhibit 4 and "SIRI: Initiating Coverage with a Hold Rating," October 21, 2003, Exhibit 4.

<sup>a</sup>Calculations reflect fully diluted shares.

Exhibit 11 Stock Price Performance



Source: Stock price data is from OneSource.

## Endnotes

<sup>1</sup> Robert B. Kaimowitz, "XM Satellite Radio," SG Cowen, December 26, 2001, p. 1.

<sup>2</sup> <[http://www.its.bldrdoc.gov/projects/t1glossary2000/\\_satellite\\_digital\\_audio\\_radio\\_service.html](http://www.its.bldrdoc.gov/projects/t1glossary2000/_satellite_digital_audio_radio_service.html)>, accessed February 1, 2002.

<sup>3</sup> John L. Stone, "Sirius Upside Potential," Ladenburg Thalmann & Co. Inc., August 15, 2001, p. 14.

<sup>4</sup> Bethany McClean, "Satellite Killed The Radio Star," *Fortune*, January 22, 2001, p. 97.

<sup>5</sup> John L. Stone, "XM Satellite Radio," Ladenburg Thalmann & Co. Inc., August 15, 2001, p. 9.

<sup>6</sup> Peter Friedland, Michaela Crouch, "Initiating Coverage of Satellite Radio," W R Hambrecht Equity Research, October 21, 2003, p. 4.

<sup>7</sup> Sirius 10K.

<sup>8</sup> Peter Friedland, Michaela Crouch, "Initiating Coverage of Satellite Radio," W R Hambrecht Equity Research, October 21, 2003, p. 6.

<sup>9</sup> John L. Stone, "Sirius Upside Potential," Ladenburg Thalmann & Co. Inc., August 15, 2001, p. 9.

<sup>10</sup> Peter Friedland, Michaela Crouch, "Initiating Coverage of Satellite Radio," W R Hambrecht Equity Research, October 21, 2003, p. 4.

<sup>11</sup> Robert B. Kaimowitz, "XM Satellite Radio," SG Cowen, December 26, 2001, p. 2.

<sup>12</sup> Chris Seper, "XM radio may be the next big thing, but check the competition first," *The Plain Dealer Cleveland*, January 7, 2002, p. C2.

<sup>13</sup> John L. Stone, "Sirius Upside Potential," Ladenburg Thalmann & Co. Inc., August 15, 2001, p. 10.

<sup>14</sup> Ty P. Carmichael Jr., "XM Satellite Radio Inc.," Credit Suisse First Boston, April 6, 2001, p. 20.

<sup>15</sup> John L. Stone, "Sirius Upside Potential," Ladenburg Thalmann & Co. Inc., August 15, 2001, p. 12.

<sup>16</sup> John L. Stone, "Sirius Upside Potential," Ladenburg Thalmann & Co. Inc., August 15, 2001, p. 7.

<sup>17</sup> Peter Friedland, Michaela Crouch, "Initiating Coverage of Satellite Radio," W R Hambrecht Equity Research, October 21, 2003, Exhibit 4.

<sup>18</sup> Marc Nabi, *Merrill Lynch Equity Research*, "Sirius Satellite Radio Inc.," October 30, 2003, Exhibit 3; and "XM Satellite Radio Holdings Inc.," November 6, 2003, Exhibit 4. These reports are the source for cost projections cited in this section, unless otherwise noted.

<sup>19</sup> John L. Stone, "Sirius Upside Potential," Ladenburg Thalmann & Co. Inc., August 15, 2001, p. 23.

<sup>20</sup> Company 10Ks are the source for data on capital expenditure in this paragraph.

<sup>21</sup> Information in this section on OEM partnership agreements is from XM and Sirius 10Ks.

<sup>22</sup> Peter Friedland, Michaela Crouch, "Initiating Coverage of Satellite Radio," W R Hambrecht Equity Research, October 21, 2003, p. 5.

<sup>23</sup> Unless otherwise noted, company 10Ks are the source for information in this section.

<sup>24</sup> Brendan Coffey, "Big Audio Dynamite," *Forbes*, March 18, 2002, p. 166.

<sup>25</sup> John L. Stone, "Sirius Upside Potential," Ladenburg Thalmann & Co. Inc., August 15, 2001, p. 16.

<sup>26</sup> Simon Appelbaum, "Video Saved the Audio Star," *Cablevision*, April 24, 2000, p. 44.

<sup>27</sup> DIRECTV, Music Choice and Wink Communications Announce New Interactive Television Commerce Service, *PR Newswire*, November 5, 2001.

<sup>28</sup> John L. Stone, "Sirius Upside Potential," Ladenburg Thalmann & Co. Inc., August 15, 200, p. 16.

<sup>29</sup> John L. Stone, "Sirius Upside Potential," Ladenburg Thalmann & Co. Inc., August 15, 2001, p. 19.