IN THE GIANT'S FOOTPRINT: BRINGING MSS SERVICE TO URBAN AREAS

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Abstract

Recently in the United States several mobile satellite service operators have proposed incorporating terrestrial repeaters into their systems to fill-in service gaps that have developed due to poor reception in urban areas. The lack of access to the profitable urban markets has hindered the development of the mobile satellite service. Mobile satellite service can become a commercially viable service offering global consumer communications in urban markets through the use of terrestrial repeaters. To implement this revolutionary system component significant political opposition from the terrestrial wireless community must be overcome. Then to economically build an integrated global system that includes terrestrial repeaters, satellite operators must negotiate an international equipment and system licensing process.

Introduction

In the early 1990's the communications industry hailed satellite systems providing global mobile communications as the future of communications.[1] Unfortunately, the predictions of success did not come true. Satellite systems took too long to build and failed to claim a broad market base before the terrestrial communication services developed alternatives. Still terrestrial services provide limited coverage because they often have trouble crossing geo-political borders. Global mobile satellite systems can cross geo-political borders using an internationally coordinates licensing plan. Recent proposals that would fundamentally change the design of a mobile communication satellite system combined with further development of the fledgling international licensing scheme could breathe new life into the mobile satellite service.

This paper will explore why mobile communications satellite systems experienced commercial failure in the consumer market or found themselves limited to small niche markets. Then an exciting new system design that could significantly change the commercial viability of mobile communication satellite systems will be discussed. Finally the legal and political challenges that system operators must overcome to economically implement the new design development will be explored.

Background

Many mobile satellite service ("MSS") systems experienced financial and technical challenges that have threatened their existence in the past few years. When originally conceived MSS communication systems were envisioned as the most effective way to create a global mobile communication system. Terrestrial communication systems were

limited by the divergent technology used in different regions and a limited network build-out; geostationary satellite systems were hindered by the lag time in transmissions that made them unsuitable for voice communications. Terrestrial services also lack ubiquitous coverage because countries do not usually coordinate their licensing of the services beyond allocations made at the International Telecommunication Union ("ITU"). Unfortunately, the build-out of the consumer MSS systems took five to seven years during which the massive build-out of terrestrial networks offered coverage in all the major markets and terrestrial multi-band handsets were developed that enabled regional roaming.

The changing mobile communication marketplace drastically altered how the MSS satellite industry developed. Inmarsat , the original MSS satellite system, formed as a non-governmental organization to support maritime communications. Inmarsat expanded to provide service to remote and rural industries, but never entered the consumer communications market. In 1989 the United States encouraged the formation of Inmarsat's first regional competition, Motient (formerly AMSC).[1] Eventually other MSS providers emerged in Canada (TMI), Mexico (SatMex), Australia (Kitcomm) and Russia (TMSat). None of these systems have succeeded in entering the lucrative consumer communications market.

In 1995 the U.S. conditionally licensed two non-geo-stationary orbit ("NGSO") MSS systems to provide consumer communications and in 1997 licensed an additional two systems.[2] Theses systems worked for several years to secure and coordinate the global spectrum allocation. Ultimately, after overcoming the challenges to creating a global system the NGSO MSS operators discovered that the terrestrial communications industry developed regional plans, which claimed a large portion of the market anticipated as the economic base for the NGSO MSS systems. Therefore only two of the licensed systems, Iridium and Global Star, obtained financing and launched service.

Current Limitations on the Market Viability of Mobile Communication Satellite Systems

Currently, MSS communication systems face several challenges. Foremost, the poor reception in urban areas limits the attractiveness of MSS services. While the NGSO MSS systems offer the only truly global mobile service, piecemeal terrestrial systems saturate the profitable urban markets with regional service plans. Unfortunately, the weaker satellite signals cannot maintain a connection when the user is in a building or vehicle, so most business travelers find satellite service impractical.

Unless a communication service can attract the customer base in the profitable urban areas, it cannot support an expensive infrastructure. Satellite systems are inherently expensive infrastructures with the majority of the investment being front-loaded. By the time the MSS operators realized that their business plan of targeting global business travelers would fail, two systems were launched and the billions of dollars invested could not be recovered. As a result of these problems the two original NGSO MSS systems have not been able to recover their investments, much less become

profitable. Iridium emerged from bankruptcy in November 2000[3] and the rumors indicate that Globalstar may enter bankruptcy before the year ends.[4]

The MSS systems providing data and maritime services have faired better, but are unable to expand their services to reach the lucrative consumer markets. Inmarsat enjoys commercial success in the maritime and industrial communications market. However, like the MSS provides, Inmarsat has also been unable to expand into the lucrative consumer market. Inmarsat faces two challenges that threaten its continued success. First, Inmarsat recently converted to a private company, which must now recruit financing from the same fiscal markets as the other communications systems. Previously Inmarsat was guaranteed financing from member countries. Second, Inmarsat previously enjoyed monopoly position in several countries. Now regional terrestrial provides and other MSS systems can compete with Inmarsat for its most lucrative markets.

Because of these problems many NGSO system operators consolidated or reorganized this year to gain a better position in the financing markets. The most significant consolidation occurred when ICO and Teledesic[5], both licensed MSS operators whose systems are not yet operational, merged to combine their resources as ICO-Teledesic.[6] They then proceeded to acquire several other MSS communication system's licenses or form strategic partnerships with other similarly situated systems.[7] Also Motient consolidated with TMI, the Canadian MSS operator, to secure it's position in the region.[8]

A Revolutionary Proposal

ICO-Teledesic's ultimate business plan remained hidden until August, when they requested that the US Federal Communication Commission authorize them to use terrestrial repeaters in urban areas as an integrated part of their satellite system.[9] Terrestrial repeaters would provide an alternate MSS signal source in urban areas using MSS spectrum. A few weeks earlier, Motient (with TMI) made a similar request to use terrestrial base stations in its next generation system.[10]

The proposed terrestrial repeaters are integrated fixed towers in urban areas that use MSS signals. The towers equipment would increase the signal power to compensate for fade and interference in urban areas.[11] However, the terrestrial component would have to be constantly adjusted according to the real time loading to prevent interference to the satellite signal. If satellite signals can be received in urban areas, they can compete with terrestrial mobile services.

ICO-Teledesic made this proposal in the U.S. because it enjoys a strategic advantage over competitors if terrestrial repeaters are authorized for all MSS systems. ICO-Teledesic's association with Nextel, a U.S. terrestrial wireless system with significant tower equipment, will assess towers that already occupy prime urban transmission positions. Additionally, ICO-Teledesic's strategic partnerships with other MSS systems, lay the ground-work for creating system that could enable a roaming system similar to the one current terrestrial mobile systems use.

Legal Implications

The ramifications of adding terrestrial repeaters go beyond the obvious marketing advantages. At the ITU countries carefully craft spectrum

allocation to accommodate multiple services. Currently no allocation exists for a hybrid terrestrial/satellite communication system. Of course terrestrial repeaters do not constitute a truly hybrid system, since the terrestrial component would not be altering the form of the signal, nor controlling the routing of the signal. Still MSS systems will require new international legal and regulatory approval to implement terrestrial repeaters on a global basis. The two most significant challenges will be overcoming the political challenges from terrestrial wireless and the legal challenges of securing equipment licensing and local interference coordination for the terrestrial repeaters.

Policy Confrontations Occurring in the United States

Global MSS providers that support changing the regulatory framework in the United States to accommodate terrestrial repeaters face considerable political opposition from the terrestrial wireless industry. The addition of terrestrial repeaters will make MSS systems competitive with terrestrial wireless. The United States and many other countries auction terrestrial wireless spectrum, while MSS systems receive their spectrum allocations for free. Terrestrial wireless competitors have already object to the market advantage the MSS systems would enjoy if they implement terrestrial repeaters while using un-auctioned spectrum.

The Federal Communications Commission ("FCC") issued a notice of proposed rulemaking examining licensing rules for the terrestrial component and asking for comments.[12] The rulemaking proceeding provides the first battleground for the political challenges to terrestrial repeaters that MSS operators must over come. The FCC identify the appropriate MSS systems operating in frequencies which can accommodate signal power increases and still be coordinated with terrestrial services. In addition to accommodating interference problems that arise from the stronger signal the FCC must address the competition concerns raised by terrestrial wireless providers.

The terrestrial wireless community challenges, that MSS providers using a terrestrial component would enjoy a competitive advantage because MSS spectrum is not auctioned. The disparate market positions result form an FCC policy that considers auctions the most efficient method for distributing commercial terrestrial wireless spectrum. While auctions have raised significant funds in the past few years, some industry experts are beginning to question their wisdom. The most notable problem results when the astronomical cost of spectrum hinders the winner from financing the building of their system leaving the spectrum fallow for several years. The FCC must balance the damage to terrestrial wireless operators that have been forced to pay significant amounts for their spectrum with the unique advantages a strong MSS system would offer to consumers.

MSS systems offer many advantages to consumers for which terrestrial wireless cannot provide alternatives or substitutions. Most significantly, satellite offers the best option for providing rural areas with telecommunication services.[13] The large satellite footprint extends wireless communication services to rural areas, where markets cannot support the build out cost of terrestrial facilities.

Additionally, MSS systems are truly global. While terrestrial wireless can offer roaming plans that cover large geographic areas, business traveler still must make alternate arrangements when traveling to other continents. Finally the MSS systems are more resilient during emergencies. If disasters occur that damage the terrestrial towers the MSS systems can still provide coverage in the entire footprint, while the terrestrial services often loss coverage in the most damaged areas.[14]

Predicting what the FCC will ultimately do is difficult. Obviously allowing MSS systems to integrate terrestrial repeaters serves the consumer's best interest.[15] However, the overall public interest must account for the impact the new competition will have on the terrestrial wireless providers. The FCC could consider auctioning the terrestrial portion of the MSS spectrum by urban market area to offset the competitive advantages,[16] or the FCC might take this opportunity to end auctions for terrestrial spectrum.[17] Allowing MSS systems to integrate terrestrial repeaters will be a politically difficult decision for the FCC, but approval will serve the long-term public interest.

After the initial success of auctions in the United States, other countries began auctioning commercial terrestrial wireless spectrum. England enjoyed a successful auction in the spring of 2001, but recent auctions in other countries have been less successful or cancelled. Still if MSS operators attempt to gain authorization to use terrestrial repeaters in other countries, the local terrestrial wireless industry will raise objections similar to those MSS operators are facing in the United States.

Long-term Expansion on a Global Scale

If terrestrial repeaters can make MSS systems competitive in the urban wireless market, then repeaters should be used in urban markets all over the world. Initially MSS operators will benefit from finding strategic market partners to gain access to existing towers. ICO-Teledesic choose to begin the process in the United States because of the synergies with Nextel; other MSS systems would need to forge similar relationships to reduce the cost of implementing a terrestrial component. However, to develop a truly global communications system MSS operators must address the disparate national licensing regimes, whose regulation they have previously avoided.

MSS systems adopted different approaches to obtaining service and equipment authorization in multiple countries. MSS operators managed to limit the necessary system licenses by obtaining one space system and a few gateway earth station licenses. In most countries the MSS operators only needed to secure the basic service spectrum allocation resellers of the satellite service generally secured the sales license. The ITU streamlined the equipment authorization process by creating a global mobile personal communication service ("GMPCS") agreement. All members that ratify the GMPCS agreement allow handset equipment properly registered under the agreement to enter their country and be used for MSS communications. The streamlining of the equipment authorization process drastically reduced the cost and effort of implementing a global communications system.

When contrasting the two approaches, the piecemeal authorization

gained by allowing resellers to secure licenses that resulted in different countries requiring special concessions, was less effective than the GMPCS agreement. Additionally, trying to ensure proper regulatory compliance with responsibility was decentralized resulted in increased costs when work was repeated or records lost. Alternatively, the authorizations secured under the GMPCS agreement could be tailored to accommodate conflicts in countries, while still providing uniform accommodation of the global service. The centralization of filing and records at the ITU ensured that records were available and maintained even during periods of business upheaval. Therefore, the GMPCS agreement offers the better model for further international approval systems.

The incorporation of terrestrial repeaters for urban areas across the globe will benefit from a streamlined coordination option similar to the GMPCS agreement. For terrestrial repeaters to be implemented under the current regulatory schemes, the MSS operators would need to approach the government of every country where there was a significant urban market to receive authorization and licensing of the terrestrial component. Coordinating a multinational global communication system requires significant financial and legal resources. The equipment and retransmission approval process for terrestrial repeaters must also be streamlined if global MSS systems are to be commercially viable. Utilizing a common process to streamline the approval process of terrestrial repeater equipment in multiple countries offers a low-cost way to develop global systems. The GMPC agreement exemplifies the necessary international coordination needed to accommodate global systems.

Unfortunately, few groups can gain international consensus quickly. However the MSS community managed to facilitate their original allocations and agreements within a few years. Regional organizations offer a platform from which to build a new treaty regime for the approval of terrestrial repeater equipment and use. Negotiating a treaty in large group where most members will not be immediately affected contributes to delays and unreasonable demands that delay a solution. The urban areas where MSS operators would initially seek to use terrestrial repeaters tend to be clustered. MSS operators should build consensus on the need for agreement and general terms among the countries, which will immediately benefit from the use of terrestrial repeaters. Then the interested countries can approach the regional spectrum management organization. A prepackaged agreement generally supported by the countries most affected should be approved fairly quickly. If MSS operators can negotiate these regional agreements with similar provision then an international consensus will be easier to build.

A more direct approach to an international agreement might be possible by building on the existing GMPCS agreement. However, retransmission standards and coordination rules would need to be developed through the ITU for the terrestrial repeaters. Such coordination studies would not be organized until the next World Radio Conference, which is scheduled for 2003. To stay competitive the services will need to be responsive within a few years to new technology.[18] Unfortunately the ITU process for developing standards tends to lag behind

the informal development of industry standards. MSS operators could decrease deployment time by creating a new independent agreement that addresses all issues simultaneously.

Conclusion

MSS can become a commercially viable service offering global consumer (and other) communications through the use of terrestrial repeaters. To implement this revolutionary system component significant political opposition from the terrestrial wireless community must be overcome. To economically build out a global system using terrestrial repeaters, MSS operators must negotiate an international equipment and system licensing process.

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[1] *See Amendment of Parts 2, 22, and 25 of the Commission's Rules,* 4 FCC Rcd 6041, 6058 (1989)(Second Report & Order).

[2] *See Motorola Satellite Communications, Inc for Authority to Construct, Launch and Operate a Low Earth Orbit Satellite System in the 1616-1626.5 MHz Band,* 10 FCC Rcd 2268 (1995)(Order & Authorization; *Loral/Qualcomm Partnership, L.P .for Authority to Construct, Launch and Operate a Low Earth Orbit Satellite System in the 1610-1626.5 MHz/2483.5-2500 MHz Band,* 10 FCC Rcd 2333(1995)(Order & Authorization); *Constellation Communications, Inc. for Authority to Construct, Launch and Operate a Low Earth Orbit Satellite System,* 1997 FCC LEXIS 3423 (1997)(Order & Authorization); *Mobile Communications Holding, Inc. for Authority to Construct, Launch and Operate a Low Earth Orbit Satellite System,* 1997 FCC LEXIS 3427 (1997)(Order & Authorization). In a later licensing proceeding more MSS systems were licensed but none are operational yet.

[3] *See* Matthew Fordahl, *Virginia Company Acquires Iridium Assets,* AP State & Local Wire, Dec. 13, 2000.

[4] *See* Andy Pasztor, *Globalstar Halts Debt Repayment, Hires Bank to Pursue Alternatives,* The Wall Street Journal, Jan. 17, 2001 at A16.

[5] Teledesic enjoys a unique relationship with a prominent US terrestrial company, Nextel, through the majority shareholder in both corporations.

[6] *See ICO-Teledesic Global Limited,* DA 01-6 (IB, released Jan. 9, 2001).

[7] Often the strategic partnership agreements grant ICO-Teledesic a future option for to acquire the system.

[8] *See In the Matter of Motient Services, Inc. and Mobile Satellite Ventures Subsidiary LLC Application fro Assignment of Licenses and fro Authority to Launch and Operate Next-Generation Mobile Satellite System,* SAT-ASG-20010116-00010 (Jan. 16, 2001).

[9] *See Ex parte* letter from Lawrence H. Williams and Suzanne Hutchings, New ICO Global Communications (Holdings) Ltd., to Chairman Michael K. Powell, Federal Communications Commission, IB Docket No. 99-81 (March 8, 2001)

[10] *See Application filed by Motient Services Inc. and Mobile Satellite Ventures Subsidiary LLC for Assignment of Licenses and for Authority to Launch and Operate a Next-Generation Mobile Satellite Service System* (March 1, 2001). *See* Public Notice, Report No. SAT-00066 (rel. March 19, 2001).

[11] Neither MSS operator proposes to operate the terrestrial stations like boosters, in that they would only increase the power of the signal. The proposed terrestrial repeaters would connect to the earth stations that provide access to the satellites and link into the public telecommunication system.

[12] *See* In the Matter of Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Band Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile Satellite Service, IB Docket No. 01-185, NPRM (released August 17, 2001). Comments must be filed 28 days after publication of the notice in the Federal Register.

[13] The advantages of satellite systems have been born out in the satellite broadcast markets, which successful offer television service to many rural areas where the cost of providing cable service is prohibitive.

[14] Iridium and GlobalStar experienced usage spikes on September 11, 2001 when cellular systems in New York City were damaged. Iridium also provided the Department of Defense and the New York police and fire department with emergency phone service during rescue and

recovery operations.

[15] In the past few weeks, MSS providers may have gained additional support for implementing terrestrial repeaters as an integrated part of their system. Obviously terrorist groups would benefit from being able to use global MSS communications. If all members are on the same MSS system they can theoretically bypass transmitting through earth stations where their communications can be monitored. Adding terrestrial repeaters would provide a place for surveillance and increase the ability to locate where the transmission are originating.

[16] Auctions for global satellite spectrum is banned under U.S. law.

[17] In a recession economy the cost of auctions could inhibit the development of new services and technologies, ending many of the benefits auctions provide in a strong economy.

[18] This lesson was learned by the previous system's loss of their market during the build-out phase.