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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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In the Matter of the	)	
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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	)	IB Docket No. 01-185
	)	
Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile Satellite Service	)	ET Docket No. 95-18

COMMENTS OF MOTIENT SERVICES INC.,
TMI COMMUNICATIONS AND COMPANY, LIMITED PARTNERSHIP, AND
MOBILE SATELLITE VENTURES SUBSIDIARY LLC

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Summary

Motient, TMI, and MSV strongly support the Commission's proposal to establish rules providing Mobile Satellite Service providers the flexibility to operate terrestrial base stations to augment their satellite service in urban and indoor environments. Such flexibility is critical to making MSS a vital and viable nationwide mobile service. Ancillary terrestrial operations also will help alleviate spectrum scarcity and promote greater telecommunications competition.

As the Commission has long recognized, MSS has a critical and unique role to play in providing advanced communications services in areas where for technical or economic reasons, terrestrial service cannot be provided. These include rural and remote areas and disaster sites; in such areas, MSS is often the only service.

Motient and TMI are Mobile Satellite Service pioneers. Both companies operate North American MSS systems that continue to provide robust and reliable service to customers in rural and remote areas and throughout the continent, including during times of emergency. Like other MSS providers, however, Motient and TMI have struggled financially due to the technical constraints of providing service using satellites alone and the limited size of the market for such service.

Rather than abandoning the MSS business and along with it service to America's rural and underserved populations, Motient and TMI have formed MSV. MSV plans to construct and operate a next-generation replacement system that combines high capacity, spot-beam satellites with integrated, ancillary, in-band terrestrial facilities that reuse the same spectrum as the satellite network. The result will be a better and more spectrum-efficient service. In addition, allowing such ancillary terrestrial use will be entirely consistent with the wealth of Commission precedent expanding the uses of allocated spectrum and allowing licensees operational and

technical flexibility to better serve the public interest. Wireless cable providers can now provide two-way and mobile services; broadcasters provide data services; terrestrial and satellite operations are sharing the same spectrum; and paging providers can operate from high-altitude balloons to serve rural and remote areas. Permitting MSS operators to deploy ancillary base stations is another example of such flexibility.

Terrestrial service in the L-band can and should be ancillary to satellite service. The Commission's proposed rules will insure that terrestrial service will merely supplement the satellite service, and will not detract from or differ in any material way from the principal service offered by the satellite network. MSV supports a rule requiring a GSO MSS operator to launch a satellite that provides full-CONUS coverage prior to operating MSS terrestrial base stations for commercial service.

Existing technical rules can be applied to protect adjacent band and co-channel licensees from any potential interference that could be caused by the operation of L-band terrestrial base stations. The Commission's proposal to use rules similar to those applicable to broadband PCS is appropriate; it will provide sufficient protection of other licensees as well as provide equipment manufacturers with a standard to which they are accustomed.

MSV supports the Commission's proposed licensing process, including authorizing ancillary terrestrial operations by modifying space station licenses and requiring an MSS operator to obtain a mobile earth station license prior to providing service with its terrestrial facilities. Additional licensing requirements, such as requiring equipment certification for MSS terminals and individual licensing and coordination of base stations, are unnecessary. MSV urges the Commission to allow construction and testing of terrestrial facilities at the MSS

operator's own risk to ensure that integrated terrestrial operations commence at the earliest possible date.

The Commission should reject proposals to allow terrestrial-only operations in the L-band. Independent terrestrial operations would cause debilitating interference to L-band MSS operators or otherwise take spectrum from current L-band MSS operations, would be inconsistent with the international coordination process, and would hamper access by safety services in times of emergency.

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- Exhibit A - MSV Response Matrix
- Exhibit B - Letter from Stephen G. McAllister, Captain, NYPD, to Jeffrey Corcoran, Motient
- Exhibit C - Article from Potomac Tech Journal (September 17, 2001) discussing use of Motient satellite phones after terrorists attacks in New York City
- Exhibit D - Statement of Rear Admiral M. Edward Gilbert, US Coast Guard, Retired
- Exhibit E - Paper prepared by Ericcson regarding ability of L-band terrestrial base stations to comply with Section 25.213(b)

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COMMENTS OF MOTIENT SERVICES INC., TMI COMMUNICATIONS AND COMPANY, LIMITED PARTNERSHIP, AND MOBILE SATELLITE VENTURES SUBSIDIARY LLC

Motient Services Inc. ("Motient"), TMI Communications and Company, Limited Partnership ("TMI"), and Mobile Satellite Ventures Subsidiary LLC ("MSV") respectfully submit these comments in the above-captioned proceeding in support of the Commission's proposal to provide Mobile Satellite Service ("MSS") licensees the flexibility to operate ancillary terrestrial base stations.[1] As discussed below, this flexibility will serve the public interest by putting scarce spectrum to fuller use improving communications in all areas. Rural and remote areas will benefit from the delivery of more robust satellite services; urban areas will have available more service from additional service providers; and emergency service providers will have nationwide service that is more reliable.

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[1] For the convenience of the Commission, attached hereto as Exhibit A is a "Response Matrix" listing the questions presented by the Commission in the NPRM, MSV's short response to those questions, and the page numbers of these Comments where MSV discusses its response to the given question.

Background

The impetus for this proceeding is the proposal by Motient, TMI, and MSV in January 2001 to deploy a next-generation MSS system that would use ancillary terrestrial facilities.[1] Motient and TMI are, respectively, the United States and Canadian licensees of L-band MSS systems that have been operational since the mid-1990's.[2] Together, the two companies have invested approximately $1.5 billion in the development of their first-generation MSS systems. After more than four years of commercial operations, they concluded that it would be extremely difficult to sustain two separate national satellite-only mobile communications businesses in the United States and Canada. Thus, the companies chose to combine their two systems to provide the spectrum, resources, and efficiency necessary to develop a new, more viable regional system.

Both existing systems will reach the end of their useful lives shortly. While Motient and TMI are committed to deploying a next-generation replacement system, they will only be able to afford such a replacement if the new system can overcome a fundamental limitation of MSS technology – the inability to overcome signal blockage in urban and indoor environments. To accomplish this, they propose constructing and operating integrated, ancillary, in-band terrestrial facilities to supplement signals from the planned next-generation high-power, multiple spot-beam satellites. With such a system, they will be able to provide service using smaller, less

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1 Motient, TMI, and MSV originally filed their application on January 16, 2001. *See* File No. SAT-ASG-20010116-00010 (Jan.16, 2001). At the request of Commission staff, Motient and MSV withdrew this application and refiled an identical application on March 2, 2001. *See* Application of Motient Services Inc. and Mobile Satellite Ventures Subsidiary LLC, File No. SAT-ASG-20010302-00017 et al. (March 2, 2001).

2 Memorandum Opinion, Order and Authorization, 4 FCC Rcd 6041 (1989); Final Decision on Remand, 7 FCC Rcd 266 (1992); *aff'd sub nom.* Aeronautical Radio, Inc. v. FCC, 983 F.2d 275 (D.C. Cir. 1993) ("*Licensing Order*").

expensive mobile terminals that operate reliably not only in rural and remote areas, but in urban and indoor environments as well.

The only significant opposition to MSV's application came from terrestrial wireless interests arguing that the Commission should reallocate the L-band to terrestrial-only use rather than allow MSV to augment its service with terrestrial facilities.[3] Inmarsat Ventures plc ("Inmarsat") raised technical concerns that MSV's proposed base station operations would cause potential harmful interference to other L-band satellite systems and the provision of aeronautical service.[4]

MSV responded to these oppositions in May emphasizing the importance of preserving viable MSS systems and enhancing their ability to provide service. MSV also demonstrated how use of the L-band for terrestrial-only service would be spectrum inefficient and inconsistent with international allocations. Finally, MSV demonstrated that it can operate its proposed satellites and terrestrial base stations using its currently-licensed spectrum without causing interference to

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[3] Comments of AT&T Wireless Services, Inc., File No. SAT-ASG-20010302-00017 et al. (April 18, 2001) ("AT&T"), at 3, 16; Comments of the Cellular Telecommunications and Internet Association, File No. SAT-ASG-20010302-00017 et al. (April 18, 2001) ("CTIA"), at 2-3; Opposition of Cingular Wireless LLC, File No. SAT-ASG-20010302-00017 et al. (April 18, 2001) ("Cingular"), at n.14, 9-10; Opposition of Sprint Corporation, File No. SAT-ASG-20010302-00017 et al. (April 18, 2001) ("Sprint"), at 6; Opposition of Verizon Wireless, File No. SAT-ASG-20010302-00017 et al. (April 18, 2001) ("Verizon"), at 5.

[4] *See* Partial Petition to Deny of Inmarsat Ventures PLC, File No. SAT-ASG-20010302-00017 et al. (April 18, 2001); *see also* Petition to Deny in Part of Aeronautical Radio, Inc., File No. SAT-ASG-20010302-00017 et al. (April 18, 2001) ("ARINC"); Reply Comments of SITA Information Networking Computing Canada, Inc., File No. SAT-ASG-20010302-00017 et al. (April 30, 2001) ("SITA"), at 2.

others.[5] In *ex parte* filings in July 2001, MSV provided further evidence regarding the lack of interference from its proposed integrated satellite and terrestrial system.[6]

In response to MSV's application and a similar proposal filed by New ICO Global Communications (Holdings) Ltd. for the 2 GHz band,[7] the Commission issued the instant NPRM.[8] The NPRM recognizes the value of MSS in providing "advanced communications to areas that may not be readily or economically serviced by terrestrial systems" and the importance of flexibility in spectrum management and licensing--"the Commission's favored approach . . . in recent years." NPRM, paras. 1-2. While noting that flexibility raises new issues, the NPRM finds that this complexity "does not foreclose consideration of potentially innovative ideas that may result in improved quality and availability of services to the public." NPRM, para. 2.

The NPRM focuses on seeking comment concerning "a specific proposal intended to implement" the MSV and ICO requests. NPRM, para. 22. It asks for comment on the need for ancillary terrestrial operations, ways to ensure that terrestrial operations remain ancillary to satellite service, the technical rules that should be adopted to protect co-channel and adjacent band licensees from interference, and licensing procedures. Finally, the Commission asks

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5 Motient, MSV, and TMI, Consolidated Opposition to Petitions to Deny and Reply to Comments, File No. SAT-ASG-20010302-00017 et al. (May 7, 2001).

6 *See Ex Parte* Letter from Bruce D. Jacobs, Counsel for Motient and MSV, to Ms. Magalie Roman Salas, Secretary, FCC, File No. SAT-ASG-20010302-00017 et al. (July 6, 2001); *Ex Parte* Letter from Bruce D. Jacobs, Counsel for Motient and MSV, to Ms. Magalie Roman Salas, Secretary, FCC, File No. SAT-ASG-20010302-00017 et al. (July 25, 2001).

7 *Ex parte* letter from Lawrence H. Williams and Suzanne Hutchings, New ICO Global Communications (Holdings) Ltd., to Chairman Michael K. Powell, FCC, IB Docket No. 99-81 (March 8, 2001) ("ICO Letter").

8 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, *Notice of Proposed Rulemaking*, IB Docket 01-185 (August 17, 2001) ("NPRM").

interested parties to consider an alternative approach to terrestrial operations in MSS bands whereby non-MSS operators would be allowed to provide terrestrial services either in conjunction with MSS operators or as an alternative mobile service.

Discussion

I. THE COMMISSION'S PROPOSAL TO PERMIT MSS OPERATORS TO OFFER ANCILLARY TERRESTRIAL SERVICE IS IN THE PUBLIC INTEREST

A. MSS Is Vital to the Commission's Goal of Bringing Advanced Communications Services to All Areas of the Country

MSV agrees wholeheartedly with the Commission's recognition of the unique value of Mobile Satellite Service. The Commission has identified rural America's lack of sufficient access to telecommunications services, and "advanced telecommunications capability" in particular, as a major concern.[9] The Commission has also found that satellites can effectively solve this problem,[10] better than terrestrial wireless carriers.[11] Satellite technology is uniquely

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9 *See, e.g.*, Amendment of Part 1 of the Commission's Rules – Competitive Bidding Procedures, *Fifth Report and Order*, 15 FCC Rcd 15293, ¶ 52 (April 14, 2000) ("The Commission has great interest in ensuring that rural and underserved areas have access to competitive advanced telecommunications services."). For example, in the recent *Section 706 Report*, the Commission concluded that (i) "many rural Americans, particularly those outside of rural population centers and in the U.S. territories, are particularly vulnerable to untimely access to advanced services if left to market forces alone" and (ii) "[a]reas with low population density are much less likely to have subscribers to high-speed services than are urban or suburban areas." Inquiry Concerning the Deployment of Advanced Telecommunications Capability, *Second Report*, CC Docket 98-146, ¶¶ 220-223, 237-241 (August 21, 2000) ("*Section 706 Report*").

10 *See, e.g.*, Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band, 15 FCC Rcd 16127, ¶ 35 (August 25, 2000) ("*2 GHz Service Order*") ("we believe satellites are an excellent technology for delivering basic and advanced telecommunication services to unserved, rural, insular or economically isolated areas. . . . We remain committed to encouraging the expeditious delivery of telecommunications services, via satellite services, to unserved communities."); Extending Wireless Telecommunications Services To Tribal Lands, *Report and Order and Further Notice of Proposed Rulemaking*, 15 FCC Rcd 11794, ¶ 13 (June 30, 2000) ("Satellites have large

Footnote continued on next page

capable of providing instant connectivity to the most remote parts of our country. The availability of high-speed data connections to rural America depends on satellite delivery.

Simple economic forces preclude terrestrial wireless carriers from serving sparsely populated areas. Terrestrial facilities will never cover the hundreds of thousands of square miles of the United States that can only be covered efficiently and economically by satellite service. As recently as last month, the Wireless Bureau recognized this basic shortcoming of terrestrial wireless technology when it authorized a narrowband PCS licensee to operate paging repeaters

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Footnote continued from previous page

coverage areas and, in many cases, can reach an entire nation, thereby spreading the costs of deployment across a number of communities.").

11 *See* Qualcomm Incorporated, *Order*, DA 00-2438, ¶ 7 (Chief, Wireless Bureau, Oct. 30, 2000) ("[M]obile satellite service may provide an important additional emergency telecommunications resource, especially to callers located in remote and rural areas and callers located in underpopulated regions where neither landline nor terrestrial mobile services exists. Mobile satellite systems . . . can provide continuous, reliable coverage in many areas where cellular coverage is patchy."); *see also* Establishing Rules and Policies for the Use of Spectrum for Mobile Satellite Service in the Upper and Lower L-band, *Notice of Proposed Rulemaking*, 11 FCC Rcd 11675, ¶ 12 (1996) ("MSS can serve areas of the country that are too remote or sparsely populated to be served by terrestrial land mobile systems. It can generate a host of new services by providing communication between virtually any point in the country, irrespective of distance. . . It can meet rural public safety needs and provide emergency communications to any area in times of emergencies and natural disasters."); Extending Wireless Telecommunications Services To Tribal Lands, *Report and Order and Further Notice of Proposed Rulemaking*, 15 FCC Rcd 11794, ¶ 13 (June 30, 2000) ("Satellites also provide communications opportunities for communities in geographically isolated areas, such as mountainous regions and deep valleys, where rugged and impassable terrain may make service via terrestrial wireless or wireline telephony economically impractical."); *2 GHz Service Order*, Separate Statement of Commissioner Susan Ness ("Satellite technologies have long held the promise of providing communications services to rural areas in this country. Compared with terrestrial systems, there is relatively little incremental cost for satellites to reach customers located in high-cost areas, since providers do not have to extend network infrastructure across vast stretches of sparsely populated terrain.").

from a network of high-altitude balloons in order to serve rural and underserved areas that are too remote or too high cost to be covered by ground-base infrastructure.[12]

The Commission's recent report on competition in the CMRS industry demonstrates the difference in coverage area between current and proposed terrestrial wireless systems and MSV's proposed system.[13] The *Sixth CMRS Report* indicates that while 95% of the U.S. population has digital coverage, over five years after deployment began, digital service is available in less than half the nation's land mass. *Sixth CMRS Report*, Table 7 of Appendix C. (Moreover, as noted in the report, the Commission's analysis overstates the extent of this coverage in terms of both geographic areas and populations covered. *Id.* p. 24.)

The map on the following page, taken from the *Sixth CMRS Report*, is a composite view of the digital coverage of multiple networks. Despite the fact that the map overstates coverage by terrestrial networks by showing that an entire county is covered when only a small part of that county may be covered, the map shows that digital coverage is concentrated in urban and suburban areas and along major highways, while rural areas remain unserved.

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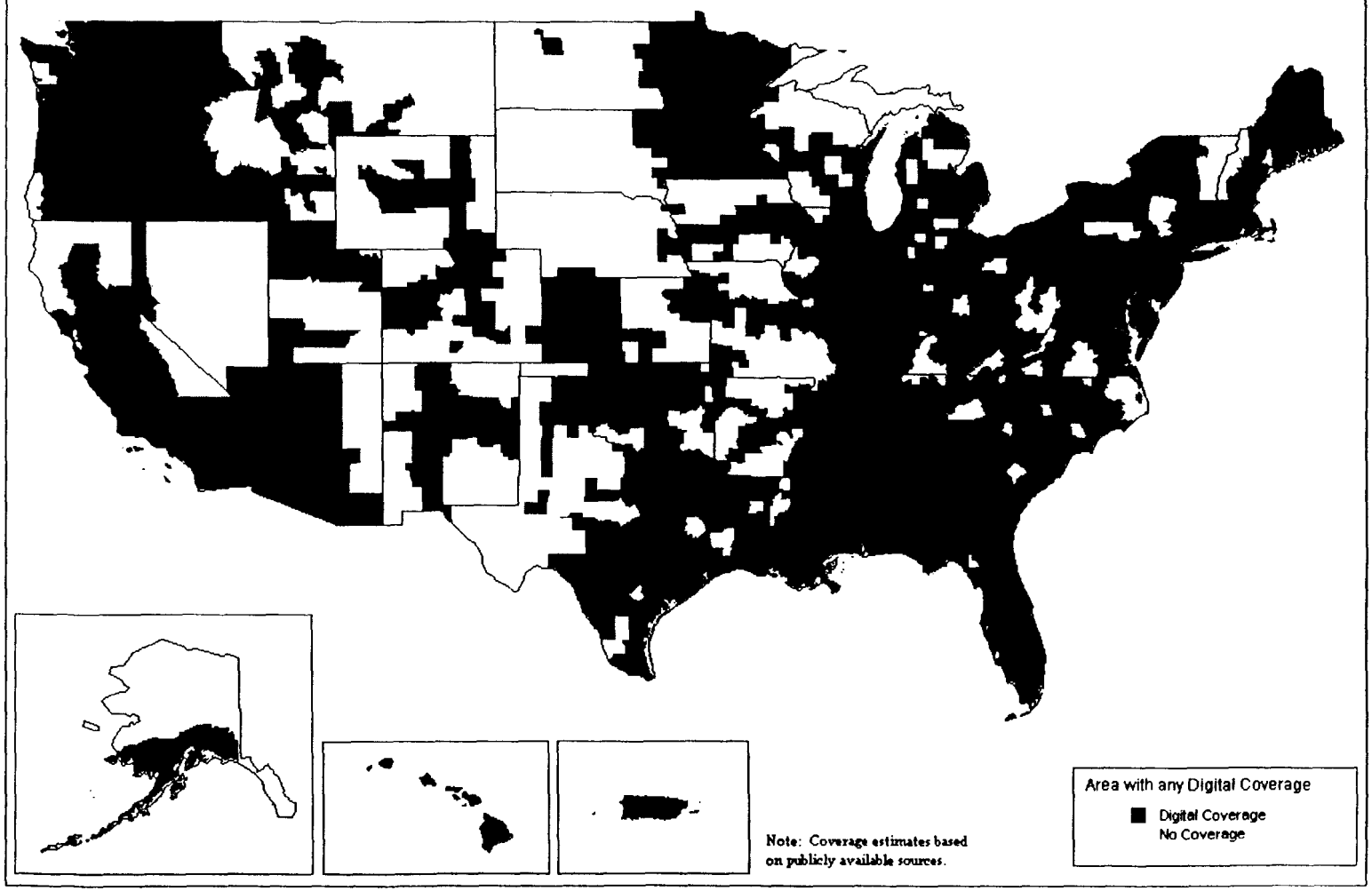
12 *See* Space Data Corporation, Petition for a Declaratory Ruling, a Clarification or, in the Alternative, a Waiver of Certain Narrowband Personal Communications Services (PCS) Rules as they Apply to a High-Altitude Balloon-Based Communications System, *Memorandum Opinion and Order*, DA 01-2132 (Chief, Wireless Telecommunications Bureau, Sept. 12, 2001).

13 *See* In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, *Sixth Report*, FCC 01-192 (released July 17, 2001) ("*Sixth CMRS Report*").

Estimated Rollout with Any Digital Coverage



The coverage of 2.5G and 3G systems will be even less extensive than 2G "digital" coverage. These more advanced technologies are able to deliver the full data rate only when subscribers are comparatively close to a base station. Thus, it will take significantly more infrastructure to deploy 3G than was required for 2G.

MSV's proposed next-generation satellite system, augmented with terrestrial operations, will provide digital coverage to the entire land mass of the United States and its coastal waters. The most sparsely populated areas will receive substantially the same voice and high-speed data services at the same time as the densest urban areas. Geostationary satellite ("GSO")-mobile air interface standards have been evolving to incorporate high-speed packet-switched data modes. Over the next few years, as terrestrial systems begin to offer high-speed data services, the evolving GSO standards will be ready to offer similar 3G services. MSV's next-generation system, whether based on GSM or CDMA technology, will have the potential to offer high-speed wireless data at speeds up to 384 kbps. Thus, MSV's proposed services will meet Congress' goal of enabling all Americans to enjoy "advanced telecommunications capability."[14]

In addition to serving the Commission's goal of bringing advanced communications to all areas, MSS systems also serve a critical role in times of national emergency and disasters. Many disasters, such as earthquakes and hurricanes, disrupt terrestrial wireline and wireless telecommunications systems. Because MSV's satellites will be located 22,000 miles above the Earth, its infrastructure is unaffected by these disasters. MSS systems thereby provide a reliable

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[14] *See* Telecommunications Act of 1996, Pub. L. 104-104, 110 Stat. 56, § 706 (1996), reproduced in the notes under 47 U.S.C. § 157; Inquiry Concerning the Deployment of Advanced Telecommunications Capability, *Second Report*, CC Docket 98-146 (August 21, 2000).

means of communications for emergency response organizations. For example, following the recent terrorist attacks in New York City, Motient provided over a hundred MSS terminals to rescue workers, including the New York City Police Department and the American Red Cross, to assist when other means of communications were unavailable.[15] The unique dispatch radio, or "push-to-talk," feature of Motient's service is especially critical in times of emergency. This feature allows communications to be broadcast to a large group of users simultaneously, thereby allowing for coordination of rescue efforts. MSV plans to continue offering this dispatch radio service with its next-generation system.

Motient currently provides service to hundreds of federal, state, and local governmental agencies, including critical public safety organizations like the Federal Emergency Management Agency, U.S. Coast Guard, and local fire and police departments. As indicated in the attached exhibit, public safety organizations have been working to develop nationwide interoperability between the wireless systems of many different Federal, state, and local emergency response, public safety, and governmental organizations.[16] MSV's proposed system will provide a strong foundation for a nationwide wireless system available to all of these users.

Finally, MSS systems serve many private sector customers in critical industries such as interstate transportation and oil and natural gas exploration and drilling. MSS provides a critical form of communications for maritime users as well.[17] The low-cost handsets expected for the

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15 *See* Letter from Stephen G. McAllister, Captain, NYPD, to Jeffrey Corcoran, Motient (attached as Exhibit B); Taylor Lincoln, *Tech Firms Step Into the Breach After Terrorist Acts*, Potomac Tech Journal (Sept. 7, 2001) (attached as Exhibit C). Because the attacks occurred at the southern edge of Manhattan, rescue workers could position themselves within line-of-sight of Motient's satellite in order to receive service.

16 Exhibit D (Statement of Rear Admiral M. Edward Gilbert, US Coast Guard, Retired).

17 *See id.*

MSV system will be particularly beneficial for the thousands of boaters who cannot afford the expensive mobile terminals of current MSS systems.

B. Ancillary Terrestrial Operations Are Vital to the Commercial Viability of MSS

A market exists for the truly continent-wide service that MSV proposes to offer with its integrated satellite and terrestrial system, particularly with the added functionality and value that will be provided. Subscribers in rural and remote areas want access to wireless high-speed data and good coverage using an inexpensive, lightweight mobile phone—just like what is available to their urban counterparts. Many urban subscribers want a single, lightweight mobile terminal that will provide reliable service (including high-speed data service) when they travel in rural and remote areas that are not, and likely never will be, served by terrestrial-only carriers. These urban, suburban, and rural consumers will choose MSV because they want and need its unique capabilities.

Motient and TMI have been providing MSS in the L-band since the mid-1990s. Both companies have experienced first-hand the extent of reception problems with MSS signals in urban and indoor environments and the effect such limited coverage has had on the commercial viability of MSS.

MSS handsets do not work outdoors in urban areas because the satellite signal path is typically blocked by man-made structures. Existing MSS providers have been able to provide from 4 to 16 dB of margin. As discussed further in the attached Technical Appendix, the attenuation for outdoor use in urban areas averages about 22 dB plus an additional 3 to 4 dB of attenuation due to body shielding. This attenuation greatly exceeds the available margin. *See* Technical Appendix, Section I.

Indoor environments (such as inside a building or a vehicle) further block MSS signals. MSV estimates that there typically is building penetration attenuation of 18 dB for dense urban areas, 12 dB for suburban areas, and 6 dB for in-car coverage.[18]

The inability of MSS carriers to provide service in urban and indoor environments has prevented MSS providers from developing a critical mass of customers. This lack of critical mass has resulted in more expensive equipment and higher rates than would be the case for a service with more customers.[19]

As shown below, customers of satellite-only MSS must pay hundreds or thousands of dollars for equipment as well as airtime charges of at least a dollar a minute. In contrast, cellular

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18 The different attenuation factors for suburban and urban areas reflect that buildings in urban areas are commonly constructed with different building materials than those in suburban areas. For example, buildings in urban areas are more typically made of concrete and steel.

This signal blockage is not limited to buildings in urban areas. Given the costs of constructing and operating terrestrial base stations and the difficulties in procuring sites for these facilities, however, MSS operators are not expected to deploy significant numbers of terrestrial facilities in rural and suburban areas. In addition, some MSS customers may choose to solve in-building coverage problems in rural and suburban areas with the use of low-power short-range links, such as Bluetooth or 802.11. *See* Technical Appendix, Sections I and II.

19 Inmarsat has argued that MSS is commercially viable without ancillary terrestrial operations and has pointed to its own success as evidence of this. Reply Comments of Inmarsat Ventures plc, File No. SAT-ASG-20010302-00017 (May 7, 2001). Such success, however, is the exception rather than the rule. Moreover, Inmarsat has a global base of maritime customers (who are unaffected by the loss of signal coverage in urban areas) established as a result of many years of operation as a monopoly intergovernmental organization, during which it absorbed substantial losses. *See* Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Satellites Providing Domestic and International Service in the United States, *Report and Order*, IB Docket No. 96-111, 12 FCC Rcd 24094, ¶ 125 (1997) (discussing privileges and immunities and tax free status Inmarsat has enjoyed as an intergovernmental organization).

customers typically pay nothing for equipment and enjoy airtime charges that are often less than a tenth of that of MSS customers.

MSS Retail Equipment and Airtime Pricing
Satellite-Only v. Cellular/PCS

Operator	Equipment Manufacturer	Equipment Price	Service Provider	Per Minute Airtime
Globalstar	Qualcomm	$895	Globalstar	$ 1.40
Inmarsat (mini-M)	Nera	$2,245	Comsat Mobile	$ 2.00
Iridium	Motorola	$895 - $1,495	Stratos Global	$ 2.00
Motient	Mitsubishi	$2,999	Motient	$ 1.10
Cellular/PCS	Various	$0-150	Various	$.12 - .15

Source: Mobile Satellite Ventures

The descriptions of MSS airtime charges are approximations, based on characteristic pricing plans advertised by service providers.[20] The description of cellular pricing uses information in a recent Wall Street Journal article comparing mid-priced calling plans from four major wireless carriers.[21]

In contrast to current MSS mobiles, the end-user products of the MSV integrated satellite and terrestrial network will be attractive, feature rich, and low cost. MSV believes that few users are prepared to pay more than a nominal premium over the price for existing cellular or PCS

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20 Equipment prices for Globalstar, Inmarsat, and Iridium are for single unit purchases of a mobile and standard accessories (*e.g.*, charger), excluding shipping and applicable taxes, in effect August 22, 2001 at a major dealer/distributor. Motient equipment price is suggested retail price. Airtime pricing is for a rate plan including at least 50 minutes of monthly usage for U.S. coverage. These figures exclude activation charges, roaming charges (if any), and applicable taxes.

21 Young, S. "Which Cellphone Provider – and Calling Plan – Is Best for Me?," *The Wall Street Journal*, September 10, 2001, p. R8.

mobiles. In fact, MSV's mobiles will be virtually indistinguishable from the cellular-only (or PCS-only) products offered by terrestrial-only operators. MSV will use existing standards, hardware, and software to the maximum extent practical to ensure that its costs are competitive with terrestrial wireless carriers. Consequently, the prices for equipment and airtime for MSS users will drop significantly if allowed to incorporate ancillary terrestrial operations.

In the NPRM, the Commission asks whether MSS providers can rely on commercial arrangements with existing terrestrial wireless carriers to overcome the inability of MSS to provide urban and in-building coverage. NPRM, para. 27. Past experience proves such arrangements are unsatisfactory for MSS operators because they provide minimal revenue to the MSS operator. In addition, it has become extremely difficult to convince the leading handset manufacturers to expend resources toward the development of low-volume, "unique" handsets that would be necessary to operate with multiple protocols.

Motient developed dual-mode terminals and briefly offered such a service but found serious problems with this business model.[22] The initial high cost of Motient's dual-mode equipment compared with cellular or PCS mobiles made it unattractive to consumers. The complexity, size, and weight of the product also made it harder to sell. Thus, Motient's dual-mode equipment volume stagnated and equipment prices remained high. The biggest problem, however, was that most of the revenue flowed to the terrestrial provider rather than the satellite operator. Terrestrial subscribers in urban and suburban areas roam to the satellite service only infrequently and the MSS operator's roaming revenues are accordingly low. At the same time, satellite subscribers with dual-mode equipment often roam extensively on terrestrial systems.

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[22] Iridium, Globalstar, (old) ICO, ACeS and Thuraya all offered, proposed to offer, or offer such service.

This leaves the satellite carrier earning a full margin on only a small fraction of the calls its customers generate. Further, the terrestrial provider has no incentive to market services outside the terrestrially-covered area.

The segmentation of the United States PCS and cellular markets into different technical air interface standards also makes it impossible to develop a comprehensive nationwide network based on an agreement with a single terrestrial carrier.[23] An MSS operator would have to successfully negotiate agreements with carriers employing each standard in order to provide nationwide service.

Another daunting obstacle to the success of this approach is the reluctance of mobile handset manufacturers to make multi-mode MSS terminals, especially now in light of recent disappointments in the industry. In order to provide fully functional equipment that all subscribers could use, mobile handsets would need to be available for CDMA, TDMA, GSM, and AMPS and in the PCS and cellular bands. Only with such a product or variety of products could the MSS operator ensure service availability and in-building penetration margins comparable to the systems that MSV and ICO have proposed. The development of such a handset or variety of handsets in sufficient quantities to make the price attractive to consumers is extremely unlikely.[24] In contrast, with MSV's proposal, the satellite service and the ancillary terrestrial component would be fully integrated over the same frequency band and use substantially the same air interface – requiring only one single-mode/single-band mobile. In

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23 These technical air interface standards include CDMA, TDMA, GSM, and AMPS.

24 Systems such as Iridium, Globalstar, ACeS, and Thuraya have pursued or are pursuing such an approach. Dual-mode phones manufactured by Motorola, Ericsson, and Kyocera for the MSS systems of Iridium, Globalstar, and ACeS have been larger, heavier, and several times more expensive than handsets used with terrestrial-only carriers.

addition, satellite and terrestrial modes can share many of the components.[25] Consequently, MSV anticipates the retail cost of the MSV mobile terminal to be not much more than current terrestrial prices.

Finally, requiring MSS carriers to rely on arrangements with terrestrial carriers or to acquire spectrum in other bands to serve urban and indoor environments ignores the need to use scarce spectrum as efficiently as possible. The MSV and ICO proposals represent innovative approaches to spectrum management that allow MSS providers to use their currently-licensed spectrum, that is otherwise unusable in urban and indoor environments, in a more effective and efficient manner. The Commission's goal should be to increase the public's supply of accessible spectrum, not to increase the demand for existing spectrum.

C. Ancillary Terrestrial Operations Will Reduce Spectrum Scarcity

The United States faces a severe shortage of spectrum that is impeding the deployment of new and innovative services.[26] Key to eliminating that shortage is to put existing spectrum to use more efficiently. Ancillary terrestrial use of otherwise unusable L-band MSS spectrum in urban and indoor environments ensures that L-band spectrum is more efficiently used, without diminishing capacity for satellite service to rural and underserved areas. MSV will re-use for

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25 MSV's ability to operate in both the satellite and terrestrial modes in the same frequency band helps to reduce component count relative to "dual-mode" terminals especially in the front-end (RF section) of the product. The same frequency synthesizer, RF filters, LNA, PA, and antenna elements can be used for both modes of transmission. The same RF and IF passive and active elements and the same frequency synthesizer can be used to perform the transceiver functions whether the mobile is communicating terrestrially or over the satellite. At the base-band section of the transceiver, a single ASIC chip containing DSP, μP, memory, vocoders, and I/O logic suffices to perform all modulation and demodulation functions.

26 Principles for Promoting the Efficient Use of Spectrum by Encouraging the Development of Secondary Markets, *Policy Statement*,15 FCC Rcd 24178 (December 1, 2000).

terrestrial service the exact same spectrum that other customers, in other geographical areas, use for satellite communications. The spectrum used for terrestrial service cannot be used in the same geographic area for satellite communications due to intra-system interference constraints. Only a fully integrated system, in which terrestrial and satellite operations are coordinated in real time using a common radio resource management algorithm, can achieve this efficiency.

The technology already exists to provide such a fully integrated satellite and terrestrial service using the same MSS frequencies. Known algorithms will be applied to develop a radio resource manager that controls system-wide frequencies and distributes them dynamically over both the satellite and terrestrial segments to minimize interference and satisfy capacity demand. As discussed in the attached Technical Appendix, the development of this dynamic radio resource manager will be based largely on software principles currently in use by cellular and PCS systems for managing resources in hierarchical mobile cellular environments.[27]

In addition, MSV will be able to monitor the aggregate signal level generated by mobile terminals communicating with ancillary terrestrial facilities.[28] Such monitoring will enable MSV to guarantee that the interference allowance limit set forth by the ITU will not be exceeded relative to other satellite systems utilizing co-frequency spectrum over distant geographical areas (such as Inmarsat's operations in South America). Because MSV's own satellite system will be the most affected by signals generated by ancillary terrestrial operations, it will have every incentive to monitor and minimize these signal levels in order to ensure that the quality of its satellite service is not compromised.

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27 Technical Appendix, Section II.

28 Technical Appendix, Section III.

Further technological advances in satellite design will make MSS more effective and efficient in the future, but will not be sufficient to overcome the inherent limitations on satellite use in urban areas. Several satellite manufacturers are preparing to build and deploy GSO satellite antennas that are significantly larger than the 12-meter aperture used on ACeS and Thuraya. This development will increase both the power efficiency of the satellite and its potential for greater frequency reuse. Larger satellite antennas also create higher gain spot beams, which increases the available link margin and the ability of the satellite signal to penetrate deeper inside structures, but such increases are not expected to be sufficient to eliminate the need for ancillary terrestrial facilities to provide reliable urban coverage.

As the Commission noted in the introduction to the NPRM, giving licensees the necessary flexibility to use their spectrum more efficiently is its "favored approach to spectrum management and licensing." NPRM, para. 2. Only last month, the Wireless Telecommunications Bureau authorized a terrestrial wireless licensee to operate paging repeaters from a network of high-altitude balloons because it would otherwise be too costly and difficult to serve rural and underserved areas.[29] MSS carriers deserve this same type of operational flexibility to be able to operate terrestrial base stations to overcome MSS signal blockage problems in urban and indoor environments.

In many other instances, the Commission has permitted licensees to supplement the services for which they were originally licensed in order to maximize use of their spectrum,

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[29] *See* Space Data Corporation, Petition for a Declaratory Ruling, a Clarification or, in the Alternative, a Waiver of Certain Narrowband Personal Communications Services (PCS) Rules as they Apply to a High-Altitude Balloon-Based Communications System, *Memorandum Opinion and Order*, DA 01-2132 (Chief, Wireless Telecommunications Bureau, Sept. 12, 2001).

despite these additional services being inconsistent with the original plans for the spectrum.[30] This past September, for example, the Commission allowed Multipoint Distribution Service ("MDS") and Instructional Television Fixed Service ("ITFS") licensees to provide mobile services with their spectrum "in order to provide additional flexibility . . . and promote more efficient use, thereby serving the public interest."[31] The Commission has also established new or revised service allocations designed to give licensees flexibility with respect to the kinds of services they can provide and the ability to structure their services in a manner that would maximize their spectrum use.[32] To increase spectrum efficiency, the Commission has permitted

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30 *See, e.g.*, Amendment of Parts 2 and 73 of the Commission's AM Broadcast Rules Concerning the Use of the AM Sub-carrier, *Report and Order*, 100 FCC 2d 5 (1984) (allowing AM licensees to use their carrier signals for any broadcast or non-broadcast use that does not interfere with their main broadcast channel operation or the signals of other broadcast stations); Digital Data Transmission Within the Video Portion of Television Broadcast Station Transmissions, *Report and Order*, 11 FCC Rcd 7799 (1996) (amending the Commission's rules to allow broadcast television licensees to use approved methods of transmitting ancillary digital data inserted into the video portion of the standard NTSC television signal without prior Commission authorization); Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two-Way Transmissions, *Report and Order*, 13 FCC Rcd 19112 (1998) (allowing MDS/ITFS licensees to deploy two-way systems), recon., 14 FCC Rcd 12764 (1999), further recon., 15 FCC Rcd 14566 (2000).

31 Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, *First Report and Order and Memorandum Opinion and Order*, ET Docket No. 00-258, FCC 01-256 (Sept. 24, 2001).

32 *See, e.g.*, Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, *First Report and Order*, 15 FCC Rcd 476, ¶ 1 (2000) (establishing service rules to afford 700 MHz licensees the flexibility to provide fixed, mobile, and new broadcast-type services in their licensed spectrum in order to enable "the broadcast possible use of this spectrum"); Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service, *Report and Order*, 12 FCC Rcd 10785 (1997) (affording WCS licensees the flexibility to provide fixed, mobile, and radiolocation services as well as satellite digital audio radio service (DARS) in their licensed spectrum); Geographic Partitioning and Spectrum Disaggregation by CMRS Licensees, *Report and Order and Further Notice of Proposed Rulemaking*, 11 FCC Rcd 21831 (1996) (allowing broadband PCS licensees to partition and disaggregate spectrum

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