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

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	)	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
	)	

REPLY COMMENTS OF NEW ICO GLOBAL COMMUNICATIONS

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SUMMARY OF ARGUMENT

The initial round of comments in this proceeding confirm that MSS is a crucial element of the nation's telecommunications infrastructure, and that the Commission's primary ATC proposal – permitting MSS operators to integrate "ancillary terrestrial components" into their networks – will revitalize the MSS sector and promote all of the public interest objectives that the Commission has long cited in favor of MSS allocations. The initial comments also make clear that the primary ATC proposal would promote greater spectrum flexibility and greater spectrum efficiency, would speed the deployment of advanced services in rural and remote areas, and would spur technological innovation.

Moreover, the comments reveal no feasible alternative to the Commission's integrated ATC proposal. Dual-band roaming is clearly an inferior solution in terms of both service quality and spectrum efficiency. No commenter has demonstrated that an independent terrestrial mobile service can use MSS frequencies without harmful interference to existing MSS licensees. Iridium's rather casual proposal for a "secondary terrestrial service" is conspicuously lacking in technical rigor.

The comments do show opposition to the Commission's ATC proposal, to be sure. But the opposition comes primarily from incumbent terrestrial mobile operators whose arguments are literally self-refuting and whose only solid position seems to be that they would rather have the 2 GHz MSS spectrum for themselves. Analysis of the statutory arguments made by these incumbents shows that the Commission is perfectly free to grant the proposed flexibility in this case, and in fact would be legally prohibited from attempting to auction it off.

Finally, a few comments raise points of genuine technical substance. New ICO addresses those comments and demonstrates that ATCs can be integrated into MSS networks without harmful interference to adjacent users in either the MSS or BAS services.

In summary, the Commission's ATC proposal furthers a host of public policies, from rural service to public safety to spectrum flexibility to technological innovation – and more. It does so without requiring the Commission to take spectrum away from any other service. All the Commission needs to do is amend its rules to unlock the full potential of the spectrum it has already assigned to MSS licensees. New ICO urges the Commission to resist the self-interested opposition to its proposal and give MSS licensees the authority to integrate ATCs into their networks as soon as possible.

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The initial comments in this proceeding contain few surprises. The comments reinforce the MSS industry's obvious potential to provide immense public-interest benefits to the American public. Moreover, allowing MSS operators to incorporate ancillary terrestrial components (ATCs) into their 2 GHz MSS networks[1] will go a long way toward achieving those benefits with minimal costs. The comments also demonstrate that there is no reasonable alternative to the primary ATC proposal; MSS dual-band roaming is inefficient and impractical, while Iridium's secondary terrestrial proposal is an interference minefield embedded in a regulatory morass. And opposition to ATC authority from terrestrial CMRS incumbents is so

[1] In re 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 No. 01-185, ET Docket No. 95-18, rel. Aug. 17, 2001, 2001 FCC LEXIS 4459 ("NPRM"), at ¶ 22.

internally inconsistent that the only common denominator is the sheer self-interest of those who advance these self-refuting arguments.

I. THE COMMISSION'S ATC PROPOSAL FOR THE 2 GHz MSS BANDS FINDS STRONG SUPPORT AMONG THE COMMENTERS.

The vast majority of 2 GHz MSS interests voiced broad support for the Commission's ATC proposal, with ten different parties with MSS interests in the 2 GHz band filing comments in enthusiastic support of ATC enhancements to existing 2 GHz MSS networks.[2] Tellingly, the only 2 GHz MSS party that did not support 2 GHz ATCs – Iridium – obviously has a stranded investment to protect in other spectrum bands.[3] And even Iridium agrees generally that "it makes sense to afford MSS licensees the flexibility to better serve their customers and enhance their competitive posture by permitting them to use their licensed spectrum to provide ancillary terrestrial services."[4]

The overwhelming support for the ATC proposal among MSS operators follows logically from the many benefits that ATC brings for MSS, and the many benefits MSS brings for the public. MSS commenters, for example, largely agree with the Globalstar Bondholders'

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[2] *See* Boeing Comments at 4; Celsat America Comments at 2; Constellation Communications Comments at 1-2; Comments of David A. Montanaro at 2; Comments of Globalstar and L/Q Licensee at 2; Globalstar Bondholders Comments at 17; Comments of Loral Space & Communications (hereafter "Loral Comments") at 5; Comments of Mobile Communications Holdings, Inc. (hereafter "MCHI Comments") at 2; New ICO Global Communications Comments at 5; TMI Communications Comments at 1-2.

[3] Readers who entertain doubts about whether Iridium's overriding interest is in its Big LEO system are encouraged to visit http://www.iridium.com/corp/iri_corp-story.asp?storyid=2, which contains detailed information about "the" Iridium system, with no mention of a constellation at 2 GHz. Iridium's current position as the only truly global MSS system (*i.e.*, capable of serving the poles and the oceans as well as temperate land masses) also provides Iridiumwith a strong incentive to discourage competition to its aging satellite fleet, in order to protect the monopoly rents it now receives from government users.

[4] Iridium Satellite Comments at 2.

conclusion that ATCs will greatly improve MSS coverage and service quality,[5] bringing higher quality and more reliable advanced services to the largest possible segment of the American public.[6] MCHI believes that ATCs can revitalize the MSS industry and encourage the innovative use of spectrum to deliver new, more competitive service offerings.[7]

Commenters likewise agree with Constellation's prediction that ATCs will help realize the promise of MSS by promoting rural service and the deployment of new applications based on seamless connectivity.[8] Only MSS, for example, promises to bring advanced telecommunications to vast rural stretches around the United States and around the globe that are not served by any terrestrial wireless provider and likely never will be.[9] Even where spectrum has been licensed and there are no technological barriers to deployment, terrestrial wireless deployment lags in rural areas. As the Rural Communications Association pointed out in the *Secondary Markets* proceeding, "[l]arge companies have enjoyed the benefits of both the Commission's spectrum auction processes and the minimal build-out requirements which enable the licensee to focus attention and capital resources on the most lucrative parts of its license area. Attention is clearly warranted to the consideration and adoption of policies to foster the utilization of the fallow spectrum by other entities."[10]

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5 *See* Comments of the Unofficial Bondholders Committee of Globalstar (hereafter "Globalstar Bondholders Comments") at 17 (noting that ATCs "may be the panacea needed by the MSS industry to break out of the financial doldrums").

6 *See* Constellation Communications Comments at 1.

7 *See* MCHI Comments at 2.

8 *See* Constellation Communications Comments at 7 ("The increased reliability of MSS services over large geographic areas and higher data rates can lead to new applications over MSS systems."); Globalstar Bondholders Comments at 7; MCHI Comments at 5-6.

9 *See* Globalstar Bondholders Comments at 16-17.

10 In re Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, *Comments of the Rural Cellular Ass'n*, WT Docket No. 00-230, filed Fed. 9, 2001, at 3; *see also id.* at 4 (describing deployment patterns in the A and B block PCS spectrum – auctioned half a decade ago – and

MSS commenters further agree that authorizing ATCs will promote spectrum flexibility and spectrum efficiency. Spectrum flexibility has become a common theme in recent Commission decisions,[11] and with good reason: As Loral explains, spectrum flexibility empowers licensees to seek the highest, most efficient use of spectrum.[12] As the Commission knows, flexible-use policies are likely to spur new technology developments and investment.[13] Dr. Gregory L. Rosston, formerly one of the Commission's top economists, underscores the efficiencies that flow from the ATC proposal in an appendix to these reply comments.[14] In this case, no party disputes Loral's assertion that MSS networks with integrated ATCs will use spectrum more intensively and more efficiently than is possible with MSS-only networks.[15] Integrated ATC-MSS networks will allow a greater number of customers to be served within the spectrum already allocated to MSS networks.[16] And MSS networks with integrated ATCs will free up satellite capacity to serve customers in non-urban areas.[17]

Continued …

noting that "it is very likely that large portions of the license areas may never be served by the A and B block licensees. Accordingly, in rural markets where only a small percentage of the population resides, it is very likely that there will be 60 MHz of spectrum that remains fallow unless the Commission takes meaningful action.").

11 In the recent *ITFS/MMDS Order*, for example, the Commission rightly concluded that "the public interest is served because a flexible allocation allows licensees to make efficient use of spectrum, especially if licensees are given greater freedom in determining the specific services to be offered." In re 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, ET Docket No. 00-258, *First Report and Order and Memorandum Opinion and Order* (rel. Sept. 24, 2001) ("*ITFS/MMDS Order*") at ¶ 24; Constellation Communications Comments at 10-12.

12 *See* Loral Comments at 6; *see also* Globalstar Bondholders Comments at 25; MCHI Comments at 9-10.

13 *ITFS/MMDS Order* at ¶ 24.

14 Report of Gregory L. Rosston, Ph.D. (attached as Appendix A).

15 *See* Loral Comments at 9; *see also* Globalstar Bondholders Comments at 27.

16 *See* Constellation Communications Comments at 5.

17 *See id*.at 5.

Lastly, commenters agree that ATCs are critical to the prospects of MSS. The Globalstar Bondholders bluntly forecast "that it is unlikely that the capital markets will fully fund the deployment" of a second-generation MSS constellation if integrated ATCs are not authorized.[18] Constellation emphasizes that much of the market that MSS must attract in order to survive and grow – customers who demand coverage in both rural and urban areas – will be much more likely to sign up for integrated ATC-MSS service than they are to sign up for MSS alone.[19] Loral and Globalstar agree that, without ATC authority, MSS is not assured the competitive wherewithal to attract sufficient numbers of customers who demand urban service as well as rural service; without those customers, MSS may not be able to generate enough of a revenue base to support deployment and maintenance of entire systems.[20]

Altogether, allowing ATCs in the 2 GHz band promises to increase rural service, enhance spectrum flexibility, promote spectrum efficiency, spur technological innovation, and bolster an important telecommunications service at a critical point in its development. The Commission should take this opportunity to enable MSS to reach its potential.

II. THE COMMENTS PRESENT NO FEASIBLE ALTERNATIVE TO THE PRIMARY ATC PROPOSAL.

New ICO and others have amply demonstrated why integrated ATCs are a necessary component of MSS systems, and how integrated ATCs will bring MSS closer to competitive footing with terrestrial providers while increasing the service options available to American

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[18] Globalstar Bondholders Comments at 6; *see also* MCHI Comments at 10-11.

[19] *See* Constellation Communications Comments at 5, 9.

[20] *See id.* at 11; Comments of Globalstar and L/Q Licensee at 4-5; Loral Comments at 4-5.

consumers and maximizing spectrum efficiency and flexibility. None of the alternative proposals comes anywhere close to achieving these benefits.

A. Dual-band roaming is neither a substitute for ATCs nor a spectrum-efficient approach.

Several terrestrial commenters argue that ATCs are unnecessary because it is not impossible for MSS licensees to obtain access to terrestrial networks today by negotiating for access to CMRS networks.[21] In asserting that ATCs and dual-band roaming are equivalent, these commenters show themselves to be less astute than consumers, who clearly know the difference. The comments neglect to mention, for example, that dual-band arrangements require customers to accept two phone numbers, two separate bills, manual switching between satellite and terrestrial operational modes, and larger handsets that include the redundant circuitry needed for operation in two different bands of spectrum.[22] There is no assurance that agreements with terrestrial wireless operators can be reached on reasonable terms.[23] And the very thing that makes dual-band service attractive to MSS customers – the ability to communicate on existing terrestrial systems – also gives terrestrial operators both the incentive and the ability to be less than ideally cooperative in providing reliable dual-band service to MSS customers.[24]

Dual-band roaming is a weak substitute for ATC authority, and it might not be sufficient even if it were the best option that technology allowed. Fortunately, however, the superior ATC solution is within the Commission's power. Under these circumstances, settling for second-best

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21 *See, e.g.*, AT&T Wireless Services Comments at 6-7.

22 *See* Comments of Globalstar and L/Q Licensee at 14; Globalstar Bondholders Comments at 34.

23 *See* Celsat America Comments at 8 ("Given that Celsat and others cannot be assured that definitive arrangements with terrestrial wireless carriers will be reached, the mere possibility that alternative arrangements might be made should have no bearing on the issue of terrestrial reuse of the satellite spectrum."); Comments of Globalstar and L/Q Licensee at 15.

24 *See* Globalstar Bondholders Comments at 35.

simply will not work. It would be entirely inconsistent with the Commission's spectrum-flexibility policies. And it would fly in the face of spectrum-efficiency policies, because significant chunks of MSS spectrum would continue to lie fallow, with MSS signals unable to provide the complete and reliable coverage that the ATC proposal could realize.[25]

B. Iridium's STS proposal is as completely impractical as any other independent terrestrial use of MSS spectrum.

Iridium's proposal to allocate an independent secondary terrestrial service ("STS") is completely unworkable. It is blithely presented without a shred of evidence that it can be accomplished without harmful interference to any or all 2 GHz licenses,[26] and the tone of Iridium's comments suggests that the demise of 2 GHz MSS may be exactly what Iridium as a Big LEO operator hopes to achieve. ICO has demonstrated, with technical rigor, that operating any independent terrestrial mobile service in MSS frequencies would be so difficult as to be practically impossible.[27] If Iridium wishes to advance "STS" as a serious proposal, it will need to substantiate its breezy and at times *ad hominem* comments with competent technical analysis.[28]

Neither Iridium's proposal nor any other independent terrestrial mobile service is feasible in the midst of the MSS service at 2 GHz. As the Commission recently noted in denying satellite

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25 *See* Celsat America Comments at 9.

26 Iridium's conclusory statement that spreading STS licenses over 14 MHz of spectrum "should provide" adequate interference protection is no substitute for a sufficiently rigorous technical analysis. *See* Iridium Satellite Comments at 6.

27 *See* New ICO Global Communications Comments at 31-36 and Appendix A.

28 ICO is reluctant to dignify Iridium's execrations about ICO and Nextel with any reply. It is perhaps necessary, and unquestionably sufficient, to state that Nextel is a publicly traded corporation, and that any deal between ICO and Nextel regarding ATC would need to be approved by Nextel's independent board members because of Craig McCaw's interest in ICO.

service in ITFS/MMDS spectrum,[29] band sharing between an independent terrestrial system and an MSS operator will not work,[30] and none of those favoring independent terrestrial mobile operations are able to explain even in general terms how the interference, facilities-integration, and spectrum-sharing issues could be worked out between MSS operators and independent terrestrial operators, whose interests will necessarily be in direct conflict.

Furthermore, independent terrestrial networks are not feasible without wholesale reallocation of spectrum.[31] Leaving aside the fact that reallocation is not warranted here and would not in any way serve the public interest, even broaching the idea would wreak regulatory havoc. An across-the-band allocation for terrestrial mobile such as Iridium suggests would, for example, require the Commission to initiate a full proceeding to at least partially revoke the existing 2 GHz MSS licenses, and then to find that the revocations were in the public interest.[32] To the extent that the independent terrestrial service made it impossible for previously licensed MSS systems to operate free from harmful interference, Commission precedent suggests that terrestrial auction winners would be required to provide MSS licensees such as New ICO with "comparable facilities" in other bands.[33] The Commission recently concluded that splitting the ITFS/MMDS bands would weaken the economics of incumbent ITFS/MMDS operators and

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29 *See ITFS/MMDS Order* at ¶ 3 (denying the Satellite Industry Association's request for an MSS co-allocation in ITFS/MMDS spectrum based on interference concerns).

30 *See* Constellation Communications Comments at 16; Globalstar Bondholders Comments at 33.

31 *See* Globalstar Bondholders Comments at 33.

32 *See* 47 U.S.C. §§ 312(c), 316 (a)(1); Constellation Communications Comments at 16.

33 *See* In re Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, *Second Report & Order & Second Memorandum Opinion & Order*, 15 F.C.C. Rcd. 12315, 12344-45 (2000) ("*2 GHz Relocation Order*)", at ¶¶ 91-92; *see generally* 47 C.F.R. § 101.75.

harm their ability to serve rural and other underserved areas;[34] 2 GHz MSS spectrum should remain inviolate for precisely the same reasons.

Additionally, the record shows that all of the benefits of the ATC proposal are achievable only if ATCs are integrated into MSS networks. Only integrated ATCs will promote spectrum efficiency, rural service, the deployment of advanced applications, and seamless service everywhere from mountain peaks to urban canyons. And only integrated ATCs will be able to coordinate efficiently – via common network control centers – with existing MSS systems.[35]

III. ARGUMENTS AGAINST THE ATC PROPOSAL FROM INCUMBENT MOBILE PROVIDERS ARE SELF-SERVING AND SELF-CONTRADICTORY.

A. The incumbent mobile providers' policy arguments are specious.

A number of incumbent terrestrial mobile providers threw up a barrage of specious arguments against the ATC proposal. It is interesting, if not enlightening, to watch these parties argue amongst themselves – and sometimes *with* themselves – about whether MSS represents a powerful juggernaut poised for competitive dominance or a failing industry whose prospects are so weak that its spectrum should be redistributed posthaste. Even arguments that are almost coherent when read in isolation become ludicrous when strung together without regard for self-contradiction. And in the end, after the arguments of the terrestrial mobile providers cancel each other out, only their powerful self-interest remains.

Many of these comments foster the idea that ATCs will give MSS operators an unfair competitive advantage. In reality, the ATC proposal will not give MSS operators an unfair advantage versus terrestrial mobile incumbents, and the terrestrial commenters themselves do not

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[34] *See ITFS/MMDS Order* at ¶ 11; Comments of Globalstar and L/Q Licensee at 15.

[35] *See* Comments of Globalstar and L/Q Licensee at 13-14.

appear to truly believe that even ATC-enhanced MSS will credibly compete with existing terrestrial systems, much less have a meaningful advantage over them. For example, while terrestrial incumbents allege on the one hand that ATCs will give MSS operators an unfair advantage,[36] they then allege on the other hand that MSS networks are doomed commercially and that urban customers will be unwilling to pay the prices necessary to support the satellite infrastructure.[37] Which is it: unfair advantage or commercial doom?

In the same vein, terrestrial mobile commenters complain that the ATC proposal would give MSS operators an unfair windfall,[38] only to turn right around and argue that MSS networks are simply too costly to survive in today's market.[39] Which is it: are MSS operators getting off cheap, or paying too much?

Terrestrial mobile commenters likewise claim that it will be impossible for the Commission to enforce any requirement of ancillarity, and they speculate that it may be difficult for the Commission to revoke ATC authority if satellite coverage fails.[40] But they themselves are subject to essentially the same regime with buildout and substantial service requirements.[41] If those kinds of rules are suitably enforceable for the incumbent mobile providers, what makes them so problematic for MSS providers?

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36 *See* AT&T Wireless Services Comments at 4, 11; Joint Comments of Cingular Wireless & Verizon Wireless at 10-12.

37 *See* AT&T Wireless Services Comments at 5-6, 9; Comments of the Cellular Telecommunications & Internet Ass'n (hereafter "CTIA Comments") at 12; Joint Comments of Cingular Wireless & Verizon Wireless at 15-16 & n.48; Comments of Telephone & Data Systems at 12.

38 *See* AT&T Wireless Services Comments at 4, 11; Joint Comments of Cingular Wireless & Verizon Wireless at 10; Comments of Telephone & Data Systems at 12.

39 *See* AT&T Wireless Services Comments at 5; Joint Comments of Cingular Wireless & Verizon Wireless at 18; Comments of Telephone & Data Systems at 12.

40 *See* AT&T Wireless Services Comments at 5-6; CTIA Comments at 5-7; Joint Comments of Cingular Wireless & Verizon Wireless at 15.

41 *See* 47 C.F.R. § 24.103; *id*. § 24.203.

The terrestrial mobile commenters seem to think that the economic viability of MSS in the marketplace is not worthy of the Commission's concern.[42] They have no hesitation, however, in asking the Commission to "level the playing field" by imposing unwarranted constraints on ATCs if the proposal is adopted.[43]

There are, of course, certain objective facts on which these arguments are based. Satellite systems capable of providing advanced, "on-net" services to anyone, anytime, anywhere are expensive – enormously expensive; but that does not mean they cost *too* much, or that they are doomed to commercial failure, because the public interest benefits of this global connectivity are also enormous, and they justify the expense. Likewise, New ICO certainly believes that global MSS systems will be extremely attractive to a large number of people who are currently underserved, and for that reason New ICO will enjoy commercial success. But that does not mean that an MSS network with ATCs would enjoy some overwhelming and unfair competitive advantage, because there are just as certainly a huge number of people for whom urban-only coverage in just a single "home" market is perfectly adequate. In short, global MSS constellations cost a lot, but they are worth the cost. And because they are the *only* technology that can deliver these public interest benefits, the adoption of flexible-use policies that will make them commercially viable is a *public* necessity. The arguments of the incumbent mobile

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[42] *See* AT&T Wireless Services Comments at 9, 10; Joint Comments of Cingular Wireless & Verizon Wireless at 16-20; Comments of Telephone & Data Systems at 11-12.

[43] *See* CTIA Comments at 13-14. In a similar vein, the Progress & Freedom Foundation ("PFF") proposes to levy a fee on MSS providers that make use of ATC. ICO does not believe the imposition of user fees would be in the public interest. As the PFF recognizes, (1) the Commission's legal authority to levy such fees is a matter of considerable controversy; (2) there is currently no basis for predicting that ATC-enhanced MSS service will compete directly with standard CMRS networks; and (3) there are no data on which to base any reliable economic analysis of a user fee regime. *See* Comments of the PFF at 13 n.49, 14-15. ICO does agree, however, that if any system of user fees is implemented, it is absolutely essential that MSS operators be "credited" with the enormous sums they must spend in order to construct, launch, and operate MSS networks. *See id.* at 14-15.

providers to the contrary are self-interested and self-contradictory, and as such they should be rejected.

B. The ATC proposal does not violate 303(y) or 309(j). In fact, it is auctioning, rather than not auctioning, that would be illegal.

Contrary to the protests of the CMRS interests, Section 303(y) of the Communications Act supports flexible use of this spectrum. First, integrated ATCs will be fully consistent with international agreements to which the United States is a party, and in the case of IMT-2000, ATC authority will actually *promote* our international policy goals of achieving integrated satellite-terrestrial services.[44] Second, integrated ATCs will be in the public interest, because they will promote telecommunications service offerings to both rural and urban Americans, and will increase spectrum efficiency in the process.[45] Third, integrated ATCs will promote, not deter, investment in communications services, systems, and technology, particularly innovative arrangements for satellite/terrestrial sharing.[46] Finally, as demonstrated below, integrated ATCs will be structured so as to avoid harmful interference to other users.[47]

Section 309 of the Act, for its part, only applies to the grant of initial licenses.[48] In no way does the Commission's ATC proposal require the grant of initial licenses or give rise to the

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[44] *See* 47 U.S.C. § 303(y)(1); Celsat America Comments at 9-10; Comments of Globalstar and L/Q Licensee at 9; Loral Comments at 8-9.

[45] *See* 47 U.S.C. § 303(y)(2)(A); Section I, *supra*. *Cf.* AT&T Wireless Services Comments at 13 (complaining that ATC is not in the public interest because it would expose CMRS providers to direct competition).

[46] *See* 47 U.S.C. § 303(y)(2)(B); Constellation Communications Comments at 5; Comments of Globalstar and L/Q Licensee at 8. *Cf.* CTIA Comments at 11 (arguing, with no apparent factual or logical basis, that ATC will deter investment because MSS operators did not obtain their spectrum via auctions).

[47] *See* 47 U.S.C. § 303(y)(2)(C); Section V, *infra*.

[48] *See* 47 U.S.C. § 309(j); *see also* Loral Comments at 10.

possibility of mutually exclusive applications.[49] And even if Section 309 did apply here, the Commission could and should use its broad authority to bypass such auctions based on a finding that they are not in the public interest.[50]

Additionally, the ORBIT Act very specifically bars auction of any part of the 2 GHz MSS spectrum. The ORBIT Act expressly bars the Commission from "assign[ing] by competitive bidding … spectrum used for the provision of international or global satellite services."[51] Even if the Commission approves an independent terrestrial service in this spectrum, it will not change the fact that this spectrum is used for global satellite communications and is, therefore, not auctionable.[52] New ICO and other non-geostationary (NGSO) MSS licensees at 2 GHz are required to be capable of providing services not only domestically, but also to most of the rest of the world,[53] bringing the 2 GHz MSS spectrum within the ORBIT Act's explicit prohibition.

IV. THE CONCERNS EXPRESSED BY PARTIES TO THE 2 GHz MSS RELOCATION ARE EASILY ADDRESSED.

Three parties filing comments in this proceeding did so based solely on the interests of licensees who are being relocated out of 2 GHz MSS spectrum.[54] While their concerns about the impact that new independent terrestrial operations would have on the 2 GHz relocation are well

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49 *See NPRM* ¶ 39 (noting that "the obligation to use competitive bidding under Section 309(j) would not appear to be implicated").

50 *See* 47 U.S.C. § 309(j)(6)(E) ("[N]othing in this [competitive bidding] subsection shall be construed to relieve the Commission of the obligation in the public interest to continue to use … threshold qualifications, service regulations, and other means in order to avoid mutual exclusivity in application and licensing proceedings.").

51 47 U.S.C. § 765f.

52 *See id.*; Loral Comments at 15.

53 *See* 47 C.F.R. § 25.143(b)(2) (requiring Big LEO and 2 GHz NGSO MSS systems to be capable of providing service not only "throughout the fifty states, Puerto Rico and the U.S. Virgin Islands," but also to "all locations as far north as 70º latitude and as far south as 55º latitude").

54 *See* American Petroleum Institute Comments; Joint Broadcasters Comments; Society of Broadcast Engineers Comments.

founded, they must not be allowed to reopen settled relocation policies based on the authorization, or even mere consideration, of integrated ATCs for MSS systems at 2 GHz.

New ICO agrees that ATC authority will necessitate some minor tinkering with the existing relocation policies. For example, as API proposes, the interference potential of the ATC portion of an MSS network should be governed by TIA's Technical Service Bulletin 10-F,[55] not just the TSB86 standards that are appropriate for interference generated by emission from MSS satellites.[56] And MSTV and NAB are right to insist that spectrum being vacated by the Broadcast Auxiliary Service ("BAS") be used fully and efficiently[57] – something that will only happen if the Commission allows integrated ATC-MSS operations.

The relocation comments also expose even more difficulties with the alternative idea of independent terrestrial service in the 2 GHz band. Independent terrestrial mobile operators would expect to use the "Phase II" spectrum at 2008-2025 MHz much sooner than will MSS licensees, an event that truly would require complete reconsideration of the 2 GHz relocation plan.[58] As noted above, independent terrestrial use of the MSS frequencies would also entail the reallocation of spectrum to new services and new entrants, triggering a need for full reallocation in accordance with revised BAS relocation principles.[59]

At the same time, MSS-integrated ATC authority does not require or even permit reconsideration of 2 GHz relocation rules that were finalized sixteen months ago,[60] became

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55 *See* American Petroleum Institute Comments at 6-7.

56 *See* NPRM ¶¶ 75-76.

57 *See* Joint Comments of the Association for Maximum Service Television, Inc. and the National Association of Broadcasters (hereafter "Joint Broadcasters Comments") at 6.

58 *See id.* at 7-10.

59 *See id.* at 16.

60 *See 2 GHz Relocation Order*, 15 F.C.C. Rcd. at 12322-53, ¶¶ 18-112.

effective fifteen months ago,[61] and are wholly unrelated to approval (or disapproval) of ATC authority. For example, the American Petroleum Institute's attempt to require relocation based on potential interference rather than actual interference is completely unrelated to the question of ATC authority.[62] The *Notice* that began this proceeding asked whether the introduction of ATCs "materially affected" the existing relocation rules;[63] it did not issue an open-ended invitation to modify any and all relocation rules.

For similar reasons, the Society of Broadcast Engineers'[64] request for a stay of the two-year negotiation period is procedurally defective because it would reverse rather than preserve the *status quo*. Even if the Commission were to reach the substance of the stay request, it must fail because SBE is unlikely to prevail on the merits, ICO and other 2 GHz MSS licensees would suffer irreparable harm during the stay period, neither SBE nor any other party would suffer irreparable harm in the absence of a stay, and grant of the stay would not serve the public interest.[65]

Finally, the reply comments filed by MSTV and NAB in the 3G proceeding last week contain statements about MSS and the ATC proposal that are so outlandish that they must be answered.[66] First, MSTV and NAB are incorrect in stating that MSS systems can only serve the

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61 *See id.* at 12331, ¶ 46.

62 *See* American Petroleum Institute Comments at 7.

63 NPRM ¶ 72.

64 *See* Society of Broadcast Engineers Comments at 3-4.

65 *See generally* In re Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, *Opposition to Motion for Stay of Mandatory Negotiating Period*, New ICO Global Communications (Holdings) Ltd., ET Docket No. 95-18, filed Oct. 29, 2001, at 3-6.

66 *See* In re 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, *Joint Reply Comments of the Association for Maximum Service TV, Inc. and the National Ass'n of Broadcasters*, filed Nov. 8, 2001 ("MSTV/NAB 3G Reply Comments").

30 largest markets during Phase I of the 2 GHz relocation.[67] On the contrary, the 2 GHz MSS relocation rules make the 1990-2008 MHz band available *nationwide* as soon as the first MSS operator has relocated Nielsen Designated Market Areas 1-30 and commenced operations.[68] Second, the ATC proposal does not represent a "metamorphosis of MSS from a satellite service to rural and remote areas into a major market wireless provider."[69] It represents a way to achieve the original vision for MSS to serve *all* areas, including rural and remote areas that are not served otherwise. Third, MSTV and NAB are flat-out wrong in insinuating that New ICO is attempting to use ATC to minimize its BAS relocation costs. All that New ICO's prior comments suggested was that, if the Commission were to allow *independent* terrestrial operations (not ATCs) in MSS spectrum, then those independent operators should shoulder a fair share of the relocation costs.[70] Fourth, MSTV and NAB conclude, without apparent analysis, that integrated ATC will require relocation to take place "more rapidly," leaving no justification for the two-phase relocation plan.[71] This would be true for independent terrestrial operations, but since integrated ATC operations will occur only after full satellite coverage is achieved, it is difficult to see how ATC will require relocation "more rapidly" than the satellite service that is its necessary prerequisite.

To be sure, integrated ATC should not be a vehicle for weakening existing relocation protections for incumbents,[72] but neither does it provide grounds for imposing onerous new

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67 *See* MSTV/NAB 3G Reply Comments at 2-3.

68 *See* 47 C.F.R. § 74.602(a)(3); *2 GHz Relocation Order* at 12326, ¶ 31.

69 *See* MSTV/NAB 3G Reply Comments at 2.

70 *See* New ICO Global Communications Comments at 50-51.

71 *See* MSTV/NAB 3G Reply Comments at 3.

72 *See* American Petroleum Institute Comments at 12.

restrictions on MSS licensees – like extending the two-year negotiation period or changing the rules to require a "one step" relocation of the BAS.

V. ATCS CAN BE IMPLEMENTED IN THE 2 GHZ MSS BAND WITHOUT INTERFERENCE TO ADJACENT USERS.

As New ICO has already explained,[73] integrated ATCs can be implemented without causing harmful interference to adjacent users. Three commenting parties – The Boeing Company, the Society of Broadcast Engineers, and the Wireless Communications Division of TIA – raised interference concerns about integrated ATCs. Upon examination, however, all of these concerns are overstated.

Boeing's comments expressed support for the ATC concept generally, but raised the concern that implementation of ATCs in the MSS downlink spectrum might cause interference to an adjacent MSS operator's satellite-only operations.[74] However, as set forth in more detail in Appendix B, Boeing has overestimated the interference that ATCs would cause to adjacent MSS users. Most importantly, Boeing neglects to consider New ICO's ability to place dedicated satellite-only channels on the edges of its selected assignment, so as to create guard bands between New ICO's ATC operations and the satellite-only MSS operations of Boeing or another MSS licensee. In addition, Boeing has ignored the natural discrimination of useful signals against ATC signals due to Boeing's user terminal's antenna pattern, and omitted any consideration of the effects frequency separation, voice activation, power control, and other interference mitigation techniques. Taking these further matters into account, and amending Boeing's analysis accordingly, it becomes clear that New ICO can operate ATCs in the MSS

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[73] *See* New ICO Global Communications Comments at Appendix A.

[74] *See* Boeing Comments at 5-7, 9-10, 12.

downlink spectrum without actually causing harmful interference to Boeing or any other 2 GHz operator. New ICO is so confident of this analysis that it would support a rule conditioning ATC operation on successful coordination with adjacent MSS operators.

SBE fears that ATC might cause "brute force overload" to the electronic news gathering (ENG) receive-only sites scattered around the country.[75] No apparent analysis supports this conclusion, other than SBE's claim that PCS has caused similar interference to ENG sites.[76] The first problem with SBE's argument is that the "brute force" of ATC will not be any more severe than what the BAS is already required to withstand under the existing interference environment, so if there is a problem it is because BAS filters aren't adequate even for the existing environment. Moreover, SBE's own comments indicate the various ways such interference has been and can be solved.[77] Significantly, all of the equipment in this band is going to be replaced, at MSS expense, when the BAS makes its "Phase II" move above 2025 MHz, so if better filters need to be included, that can be specified at the time of the Phase II move. In Appendix C, New ICO provides a complete technical evaluation of SBE's arguments. As with Boeing, SBE has not raised any interference concerns that are unique to ATC and that cannot be solved using standard mitigation techniques.

TIA's Wireless Communications Division (WCD) raises three technical issues. One is a general request for technical information about ATC,[78] a request that should have been satisfied

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75 *See* Society of Broadcast Engineers Comments at 7-8.

76 *See* Society of Broadcast Engineers Comments at 8.

77 *See* Society of Broadcast Engineers Comments at 8 ("[F]ixes include state of the art band pass, high pass, and PCS band reject filters, and improved intermediate frequency ("IF") modules using surface acoustic wave ("SAW") filters to get IF rejections of 60 dB or better.").

78 *See* Comments of the Wireless Communications Division of the Telecommunications Industry Association (hereafter "WCD Comments") at 6-8.

by the technical appendices to New ICO's initial comments and is certainly satisfied by the technical appendices to these reply comments. The second is WCD's assertion that FDMA/TDMA and CDMA networks must be separated in spectrum and in power, making co-channel sharing impossible.[79] New ICO agrees that CDMA and FDMA/TDMA networks are incompatible as WCD notes, but this fact facilitates rather than prevents ATC, by enabling a dual-mode handset to distinguish between satellite and terrestrial modes without resorting to band segmentation. Third, WCD cites a number of elements of the technical analysis submitted with New ICO's March 8 *ex parte* letter,[80] and argues that these elements show that New ICO plans to use band segmentation to make ATC work. WCD's arguments on this point betray a misunderstanding of New ICO's previous filings. Appendix D corrects the misunderstandings in detail.

New ICO therefore is confident that ATC will not cause harmful interference to other satellite or terrestrial operators.

VI. CONCLUSION

The Commission's ATC proposal furthers a host of public policies, from rural service to public safety to spectrum flexibility to technological innovation – and more. It does so without requiring the Commission to take spectrum away from any other service. All the Commission needs to do is amend its rules to unlock the full potential of the spectrum it has already assigned to MSS licensees. New ICO urges the Commission to resist the self-interested opposition to its

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79 *See* WCD Comments at 4.

80 *Ex Parte* Letter from Lawrence H. Williams and Suzanne Hutchings to Chairman Michael K. Powell, dated Mar. 8, 2001 (filed in IB Docket No. 99-81), incorporated into the record of this proceeding by NPRM ¶ 5 & n.6.

proposal and give MSS licensees the authority to integrate ATCs into their networks as soon as possible.

Respectfully submitted,

/s/

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APPENDIX A

Report of Gregory L. Rosston, Ph.D.
11/13/2001

I. Introduction/Executive Summary

My name is Gregory L. Rosston. I am Deputy Director of the Stanford Institute for Economic Policy Research at Stanford University. I am also a Lecturer in the Economics Department at Stanford University. I received my Ph.D. and M.A. in economics from Stanford University, and my A.B. with honors in economics from the University of California, Berkeley. My specialties in economics are industrial organization and regulation with an emphasis on telecommunications. I served at the Federal Communications Commission ("Commission" or "FCC") for three and one-half years as the Deputy Chief Economist of the Commission, as the Acting Chief Economist of the Common Carrier Bureau and as a senior economist in the Office of Plans and Policy. In these positions, I had significant involvement with the Commission's spectrum policy and auction-related issues. I have been the author or co-author of a number of articles relating to telecommunications competition policy and spectrum policy, including an FCC staff working paper on spectrum policy. My Ph.D. dissertation studied the effects of FCC policy on the land mobile radio industry. I have also co-edited two books on telecommunications.

I have been asked by New ICO Global Communications (Holdings) Ltd. ("New ICO") to analyze the Commission's proposal to amend its rules governing the 2 GHz MSS licenses to allow the flexibility to provide ancillary terrestrial service. In particular, I would like to address the contention that the FCC's ATC proposal would not be an efficient use of spectrum[1] and would result in an unfair windfall for MSS operators.[2] My analysis shows that consumers in all areas of the country will benefit from a forward-looking, market-based approach to spectrum management. Allowing additional flexibility for spectrum licensees will increase competition and the attendant consumer benefits. In addition, in this case, the flexibility holds the promise of helping to bridge the digital divide by increasing rural access to high bandwidth services and reducing the cost of service for poor urban residents. My analysis looks at the benefits for spectrum efficiency of allowing technical flexibility, the economics of satellite services, and then applies this to the 2 GHz MSS satellite service.

II. Spectrum Efficiency

The Commission has a mandate to manage the spectrum in the public interest. Historically, that meant dictating specific services to be provided using specific technologies for each set of frequencies. However, over the past 10 years, the Commission has moved toward a

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1 *See* AT&T Wireless Comments at 8.

2 *See* AT&T Wireless Comments at 4, 11; Joint Comments of Cingular Wireless & Verizon Wireless at 10; TDS & USCC Comments at 12.

more flexible approach to spectrum management, allowing licensees to choose technology and the services provided.[3] For example, rather than mandate technology for PCS licensees, the FCC set interference standards and had only minimal restrictions on the services that a new PCS licensee could provide. In recent policy statements and in its notice on secondary markets in spectrum, the Commission has indicated a desire to continue on this path.

> In this new effort, we seek to significantly expand and enhance the existing secondary markets for spectrum usage rights to permit spectrum to flow more freely among users and uses in response to economic demand, to the extent consistent with our other statutory mandates and public interest objectives. We believe that an expanded system of private sector markets will serve the public interest by creating new opportunities for increasing the communications capacity and efficiency of spectrum use by licensees.[4]

In that secondary market proceeding, I participated in a filing with a group of 37 economists that encouraged the Commission to adopt a more market-based approach to spectrum policy than it has done to date.[5] In those comments, we urged the Commission to pay particular attention to interference concerns, but not to dictate technology choice or service provision.

Chairman Powell recently gave a speech in which he also advocated a more market-oriented approach to spectrum management. "It is important that the Commission move from its traditional spectrum management paradigm of 'command and control' to a paradigm of market-oriented allocation policy to provide more flexible allocations that allow multiple uses so that spectrum can be put to its highest and best use."[6]

If the Commission lets licensees decide on technology and service provision, service providers will have a strong incentive to investigate the market, evaluate technology and make choices that will most likely lead to success in the marketplace. Success in the marketplace is heavily dependent on providing services that customers find attractive. By allowing the entrepreneurs who get the licenses to realize the benefits and bear the risks from their choices, they are more likely to maximize consumer surplus when there is a competitive market.

Spectrum flexibility is also likely to lead to more innovation in spectrum use. Innovation is key to improving the service to consumers. Innovation induced by flexibility can take many forms – better services, lower prices and service to underserved areas. With the flexibility to develop new business plans and services, licensees will have the incentive to seize the opportunities rather than to plod through the procedures at the Commission that slow the process of new service introduction. Satellite services have significant room for improvement to make

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[3] The move has neither been complete nor without deviation.

[4] "In the Matter of Principles for Promoting the Efficient Use of Spectrum by Encouraging the Development of Secondary Markets," rel. December 1, 2000, at 1-2.

[5] "Comments of 37 Concerned Economists," In the Matter of Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, Feb. 7, 2001. ("37 Concerned Economists")

[6] "Digital Broadband Migration" Part II, October 23, 2001, available at http://www.fcc.gov/Speeches/Powell/2001/spmkp109.html.

their services viable and flexibility may be the key that allows them to compete in the telecommunications marketplace.

The best way for the Commission to stimulate a competitive market for spectrum-based services (and to increase competition for wireline services from spectrum-based providers) is to make as much spectrum freely available to the market as possible. By this, I mean not only that the Commission should make the spectrum available to the market, but that it should make spectrum available with minimal restrictions. That way, many providers can compete in what were previously walled-off markets, spectrum will flow to its highest-value use, and consumers will gain.

A couple of examples of flexibility show the benefits. In the 28 GHz proceeding, the Commission originally envisioned LMDS to be a one-way competitor to cable television, as evidenced by its pioneer preference award to CellularVision. Later, when the spectrum allocation was finalized, the rules not only allowed one-way cable-like programming, but also allowed two-way voice, video and data. As a result, the LMDS licensees did not have to come back to the FCC to get permission to change the services or technology choice. They simply had to comply with interference rules.

A similar situation occurred with CMRS providers. All of the providers licensed to use cellular, PCS, and SMR spectrum bands — originally focused on voice communications. But many have added data capability, and many have also radically changed the transmission technology used.[7] All of these mobile wireless providers are also expected to make further technological changes over the next few years to increase data throughput and capacity. The LMDS and CMRS examples show that there are many ways that the spectrum can be used to increase consumer benefits and competition at the same time.

Some parties may have incentives to object when the FCC grants increased spectrum flexibility, and this case is no exception. These complaints generally fall into two categories: equity and budget. Some parties will claim that it will be unfair to allow additional flexibility for certain licensees if they have not paid for that benefit.[8] However, this misunderstands the market effect of flexibility and puts the interests of incumbents ahead of consumers. Each time the Commission grants flexibility, it will generally be to a class of all similarly situated licensees, not to a single licensee. In addition, the more the Commission makes it a practice to grant full flexibility, the more competition it will engender overall. Because flexibility will be the rule rather than the exception, parties will use their flexibility to compete with other licensees, including those with newfound flexibility. Thus, it is less likely that there will be a large windfall gain. Even if the grant of additional flexibility were a windfall gain, the Commission should still address whether consumer welfare would be enhanced more by the grant than by withholding or delaying the grant of flexibility in the hopes of garnering revenue. Obviously simply withholding the additional flexibility from the market would be the worst solution for overall welfare. Consumers will be the beneficiaries as licensees are better able to compete and

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[7] Cellular providers have moved from AMPS to digital (TDMA, GSM or CDMA), SMR providers have moved from analog to iDEN and some PCS providers have swapped digital technologies already.

[8] *See, e.g.*, Joint Comments of Cingular Wireless and Ve rizon Wireless, at 10-12.

provide services that may be better or cheaper. If consumer welfare is enhanced by granting spectrum flexibility, it is irrational to withhold that flexibility solely to prevent an existing licensee from benefiting.

Moreover, the Commission has in the past added flexibility to existing licenses without charging for it. For example, MDS licenses initially authorized analog one-way video service. Subsequently, the Commission authorized MDS licensees to provide two-way digital service. The Commission was essentially forced to grant these rights to MDS licenses *ex post* when licensees complained to the Commission that they would be unable to compete with a limited service offering. Rather than waiting for such complaints and petitions, the Commission should have awarded these rights initially.

Some may object to the grant of additional flexibility in a world where initial licenses are generally awarded by auction and additional revenues could be raised by auctioning or charging for flexibility. However, with additional flexibility for an existing licensee, there will generally only be a single firm, the current licensee on that spectrum, that values highly the additional flexibility that goes with the specific frequencies.

It may be possible to raise additional revenues, but auctioning additional flexibility where there is likely only a single party that values the specific additional flexibility is not likely to be feasible without creating unintended problems as well. Since competition for the flexibility rights is likely to be low, the only way to extract revenues would be to withhold some flexibility or guess at an appropriate reserve price and credibly commit to withholding flexibility rights if the reserve price is not met.[9] It is extremely difficult for a government agency to make these types of market judgments, and the risk to consumer welfare from withholding is likely much greater than the benefits from increased auction revenue. As a result, the Commission should aggressively move forward to award maximum flexibility whenever and wherever it can.[10]

Flexibility in terms of service and technology will allow licensees to provide the services that consumers demand at the lowest cost. If the Commission does not allow flexibility, implicitly or explicitly, the Commission is determining that it knows better than the market what services and technologies are appropriate to maximize consumer welfare. This is extremely difficult for the Commission at any point in time, and certainly more difficult for long periods of time that are covered by spectrum licenses.

III. Economics of Satellites

Satellite services have two important economic characteristics relevant to this proceeding: substantial sunk upfront costs and broad coverage along with capacity constraints and coverage holes. Like all other wireless services, satellite services require access to spectrum with a reasonable level of certainty about the amount of interference that can be expected from

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[9] Others may bid strategically upon flexibility rights even if they have no desire or ability to use the additional flexibility simply to block flexibility for anticompetitive reasons.

[10] *See* "37 Concerned Economists", fn. 5.

other services and an understanding abut the rights to emit transmissions that might cause interference to other service providers.

A. Sunk costs

Satellite services require significant upfront expenditures for the development and deployment of the satellite system. All wireless systems require upfront development expenditures, but unlike terrestrial wireless systems, it is physically difficult to modify the satellite equipment once it is in place. It is also difficult to re-deploy satellite system assets. This is an important point when it comes to investment incentives. Once a satellite is in orbit and configured for a particular service and frequency, the ability to re-use that equipment in other ways is limited. This is why the owners of the Iridium system planned to abandon entirely their system; a terrestrial wireless system would most likely be able to use tower sites and other equipment to provide other services – it would be unlikely to burn up the equipment rather than attempting to re-use it or sell it to another provider.

The prospects of high sunk costs can affect operators' entry decisions. Operators are more likely to resist entry into a market because the higher exit costs (or lower ability to recoup entry costs) lead to a lower expected profit. In other words, if a satellite operator expects to recoup nothing of its sunk costs in the case of a business failure, then the case of a business success must be expected to yield higher profits so that the expected overall profit is the same.

The Commission should adopt spectrum policies that allow competitive firms the ability to choose the business plan that maximizes expected profits. But the Commission should not put itself in the position of holding back on flexibility, only to be meted out to those companies that would otherwise fail. To do so would be bad spectrum policy and would create perverse incentives for firms in the marketplace

B. Coverage

Once a satellite system is launched, it can provide substantial geographic coverage; a LEO system can provide global coverage. If the system is operational, then it will broadcast signals everywhere – in the U.S. that means in the wilds of Montana and the streets of New York. The system operator will want to make the best use of the spectrum everywhere.

Since demand for wireless services per square mile is substantially higher in New York than in Montana, the operator will want to find a way to increase the use of spectrum in New York. In some cases, this may mean using more spectrum in New York and less in Montana, in other cases there would be different technical solutions.

Prior to entry and incurring sunk costs (and afterwards), a prospective service operator will make detailed calculations about the expected return on its service. The operator will only enter if it expects to make a profit. One way of thinking about the profit for the satellite business is to decompose (or separate) the profits into rural and urban profits acknowledging that there are substantial common costs in the provision of these services. The total return to a service operator can be thought of as the return in rural areas plus the return in urban areas. The analysis

below assumes first that the demand is not interrelated (dependent on roaming, network effects, or economies of scale). Subsequently, these features are added to the analysis.

As discussed above, a satellite operator will have large fixed costs. To ensure the ability to cover those costs, the operator will need a substantial number of customers. It is quite possible that rural customers alone will be insufficient to cover the marginal cost as well as a sufficient contribution to cover the large fixed costs. Simply because there are more customers in urban areas, the opportunity to make contributions to cover the fixed costs of the satellite may be greater. In addition, spectrum is scarcer in urban areas so that service in urban areas may provide higher value as well. If the satellite operator can increase the number of urban customers through any of several spectrum conserving mechanisms or increase the value of urban service, it can provide greater consumer welfare and more intensive use of the spectrum. This can help it to cover fixed costs of the satellite system.

Providing attractive services for urban customers becomes even more important if rural and urban demands are interrelated. Urban coverage may contain numerous and significant holes. Coverage holes can occur because of building blockages, or an inability of signals to penetrate buildings. Because of these holes, a system may not be able to provide its advertised or desired "ubiquitous" coverage. If a selling point of a system is coverage anytime, anywhere, then a businessperson in Manhattan would be distressed to find the wireless communication device unable to function in her office and consequently might not trust the coverage in remote areas. Depending on the demand for service, holes in Manhattan could make the service in remote areas significantly less attractive. For example if a substantial part of rural demand is due to "roaming," then rural demand would be lower if service in urban areas were not high quality. A satellite system alone may not be able to provide the same level of coverage that a hybrid system could. The flexibility to deploy a hybrid system, with terrestrial and satellite links, may substantially improve the customers' service and the efficiency of the system.

In addition, there may be benefits to all customers from increased use of the network technology. Manufacturers of network equipment may be able to realize economies of scale if demand is larger. For example, rural subscribers may benefit from the adoption of network services by urban customers because it reduces equipment costs. If a large number of customers use the same technology, there may be more investment in the development of enhanced versions of the user equipment and complements to the equipment. One of the reasons cited for the dominance of Windows as an operating system is the abundance of applications written to operate in the Windows environment. More applications are written for the Windows environment than for other operating systems because there are more Windows users. If there are more users with MSS end user equipment because of attractive service in urban areas, then the rural customers may benefit from lower prices and more abundant supply of equipment and accessories. Satellite providers may be able to benefit from the network effects if they provide attractive enough service. The operators will be able to make the tradeoff in determining the additional cost of manufacturing equipment capable of operating in satellite mode and terrestrially compared to the benefits they get from a larger market. Only with the flexibility to offer different kinds of service will the licensees be able to make the appropriate choice of service and technology.

IV. Application to 2 GHz MSS

The Commission proposes to authorize New ICO and other MSS operators to provide an integrated satellite-terrestrial service in which the "ancillary terrestrial components," or "ATCs," use the same 2 GHz MSS spectrum that the satellite component uses. The general analysis above is perfectly applicable to the Commission's ATC proposal. If New ICO is able to provide service to rural areas and urban areas using the same spectrum in different ways that serve consumers and does not create interference for other users, then there is no public policy reason to interfere with efficient pro-consumer use of spectrum. In fact, there are good policy reasons to support spectrum flexibility in addition to the general spectrum policy reasons. Additional flexibility for systems that have the potential to provide service to rural areas can help to bridge the digital divide efficiently and to reduce government involvement and subsidy programs.

New ICO has also suggested an innovative way to implement the Commission's proposal, by coordinating and integrating satellite and terrestrial systems to provide service to customers. This innovative service idea can only come to fruition through flexible use of spectrum allowed by the Commission. There are likely to be many different innovations in the future of telecommunications systems and those innovations are more likely to occur in an environment where the innovator does not have to disclose innovations to the Commission and ask for permission to modify its business plans. In this case, New ICO has an innovation and the FCC rules require it to get permission to modify its proposed service. Modification of the rules will not only permit innovation in the 2 GHz MSS band, but will also stimulate innovation in the future as other entrepreneurs will see the chance to implement their visions also.

The Commission proposes to allow terrestrial use of the 2GHz MSS spectrum on an ancillary basis only after the construction and commencement of commercial operation of satellite service. New ICO hopes that this ancillary service will help it to fill coverage holes in urban areas and increase capacity in both urban and rural areas (by freeing spectrum that would otherwise be used on satellites to cover urban areas for use in rural areas). New ICO states that it plans a fully integrated system to insure coverage and to minimize interference problems. As a single integrated provider on this spectrum, New ICO should be able to internalize interference concerns as well as dynamically manage the spectrum to insure most efficient usage. At the same time, New ICO should face competition from other MSS providers (who would also have the right to offer similar integrated terrestrial/satellite services) and many other wireless and wireline providers.

Under the Commission's ATC proposal, New ICO and other MSS operators could provide global satellite coverage with enhanced coverage in urban areas provided by terrestrial towers. It is my understanding that the Commission has licensed this spectrum to MSS licensees on a typical satellite sharing basis to avoid mutual exclusivity. The addition of a non-interfering terrestrial adjunct to any of the satellite licensees should increase the potential usefulness of that spectrum in a system like that contemplated by the ATC proposal.

There may be concern that adding ancillary terrestrial capabilities to the satellite licenses will cause the terrestrial component to be the primary use and create equity concerns. Concern

for the promotion of satellite technology and use of this spectrum should be ameliorated by the Commission's proposal that ancillary terrestrial use be authorized only after the primary satellite system has been launched and commercial operation has begun. The significant upfront and sunk costs of satellite systems increase the likelihood that the licensees would operate their satellite systems, especially in underserved rural areas that will be more expensive to serve by terrestrial means. In any case, to prohibit terrestrial use would diminish the usefulness of the spectrum.

Although auctions are generally good for consumer welfare, they are not an end in themselves. The primary goal of spectrum policy should be to get spectrum licenses into the hands of those licensees that value it most highly and will ultimately provide the services consumers demand most highly. Auctions are generally the way to award new spectrum, but in certain cases consumer welfare may be increased by rapidly awarding spectrum rights to the market. For example, I have explained above that simply awarding additional flexibility to license authorizations without auction when there is a single licensee able to use the rights is likely to increase consumer welfare relative to a system of trying to extract payment for such rights. In this case, the Commission has awarded licenses to MSS providers and the Commission should grant the flexibility to provide terrestrial service in conjunction with the satellite rights since it appears it would be difficult for anyone other than the satellite licensee to coordinate the spectrum use.

The Commission should use its ability to grant spectrum flexibility to encourage New ICO and other MSS operators to provide narrowband and broadband access to rural areas at a reasonable cost. Much of the Commission's 2 GHz order stated concern with and proposed mechanisms to address service to rural and unserved areas.[11] Flexibility and the resultant innovation should help provide service to rural and unserved areas.

The current universal service scheme to provide subsidized access in high cost areas is extremely expensive. If a more efficient provider can provide competition to the high cost wireline telephony providers, there will be substantial benefits. First, rural consumers will receive the benefits of competition in service provision. Second, it may save hundreds of millions of dollars in universal service transfers because of the potential for cost reductions. This competition may be even more important in the future as political demand builds to subsidize broadband service into rural high-cost areas. To the extent that service can be provided at attractive prices without a subsidy, we eliminate the need for excessive taxes on urban customers (many of whom are poor) and we reduce the need for regulation overall.

There are clearly many ways to provide satellite coverage in rural areas and terrestrial coverage in urban areas. One example would be the use of dual band equipment. Clearly this is one alternative. But it would be a large policy mistake for the Commission to require that this solution be adopted. There are many possible problems with such a solution and it may be impossible to implement. There also may be technical problems that make New ICO's solution impractical eventually. The best answer for the Commission is to ensure that interference

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[11] *See* "In the Matter of The Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band," released August 25, 2000, especially section II.A.1.d.

concerns are addressed and that the spectrum be licensed expeditiously so that the licensees can be free to invest and bring their services to market.

V. Conclusions

The Commission's proposal to increase the usefulness of the spectrum could be a big gain for consumers. If the New ICO system works as described, consumers overall would gain from the introduction of an additional competitor in the marketplace. Rural customers would gain because they would have access to a new source of high-speed bandwidth where none existed before. This would allow these customers to join the digital age. Allowing additional flexibility would also benefit urban customers. They would get better service from the spectrum because the MSS companies would target them with attractive services delivered both terrestrially and via satellite. They would also benefit from the reduction in the steady upward pressure on universal service funding that falls on the backs of urban subscribers.

Some of these gains might arise without the modification to the licenses. But there is no cost to allowing the modifications. Without the modifications, the spectrum could lie uselessly fallow, and there would be a risk that none of the satellite benefits would be realized because the satellites would not launch or would not realize the beneficial network effects, and be stuck in a low-level equilibrium rather than a high level equilibrium with lots of customers and vibrant service. To take this risk with no offsetting benefit makes no sense.

APPENDIX B

Reply to the "Comments of the Boeing Company" 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

1. Introduction

In its comments to the NPRM,[1] Boeing generally supports the additional flexibility requested by ICO as a Mobile Satellite System (MSS) operator. Additionally, Boeing states that the additional flexibility in the license should not undermine the capability of other MSS networks to operate or to acquire additional spectrum for future operations.

Boeing goes on to provide specific interference calculations for each of the sharing scenarios.

ICO has reviewed the calculations for all proposed interference cases, summarized in the following, and concluded that no interference concern exists due of out of band emissions into the Boeing User Terminals (UTs).

It is, indeed, ICO's intention to demonstrate that the out of band emissions from the ATC will not adversely affect any other MSS service and that the Boeing case, because of the specific application to aeronautical UTs, offers additional margins with respect to standard MSS services.

2. Summary of ATC Sharing Modes

Forward Band Sharing:

- ATC Base Station transmitting in the Satellite Downlink / Satellite Component (SC) UT Receive Spectrum.
- ATC UT* transmitting in the Satellite Uplink / SC UT* Transmit Spectrum.

Reverse Band Sharing:

- ATC Base Station transmitting in the Satellite Uplink / SC UT Transmit Spectrum.
- ATC UT transmitting in the Satellite Downlink / SC UT Receive Spectrum.

Uplink Duplex

- Both ATC Base Station and ATC UT transmitting in the Satellite Uplink / SC UT Transmit Spectrum.

Downlink Duplex

- Both ATC Base Station and ATC UT transmitting in the Satellite Downlink / SC UT Receive Spectrum.

* The terms ATC UT and SC UT are utilized here for simplicity and shall be interpreted as ATC part and SC part of the dual-mode UT respectively.

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[1] See *Comments of The Boeing Company*, IB Docket No. 01-185 (filed Oct. 22, 2001) at i.

3. Comments on Boeing Interference Calculations

While the calculations proposed by Boeing in Appendix A to its comments are substantially correct, there are three points requiring explanations and corrections according to the review conducted by ICO.

3.1 Interference Frequency

For all interference cases, Boeing indicates that the frequency used for transmission by the ICO ATC, both for the Base Stations and the UTs, is 2 GHz.[2]

In reality, for the sharing cases of ATC Base Station transmitting in the Satellite Downlink spectrum (Forward Band Sharing and Downlink Duplex) and ATC UT transmitting in the Satellite Downlink spectrum (Reverse Band Sharing and Downlink Duplex), the correct frequency to use should be 2.185 GHz rather than 2 GHz.

The different frequency causes an increase in the free space losses associated with the interfering ATC signal and reduces the separation required between ATC components (Base Stations and UTs respectively) and Boeing UTs.

3.2 Boeing UT Antenna Pattern

The link budgets included in the FCC filing[3] from Boeing indicate that Boeing's UTs will use a moderately directive antenna with peak gain of 4.5 dB at zenith and 0 dB at approximately 24° elevation, which represents the lowest service elevation for their system. Boeing's comments mention that the actual gains would depend significantly on the geometry.[4]

The ATC UT will have approximately 0° elevation with respect to the Boeing UTs. It is reasonable to assume that the baseline Boeing UT antenna will provide significant discrimination between the useful signal and the unwanted ATC UT interference.

For the ATC Base Station, depending on the distance from the Boeing UT and consequent elevation angle, some discrimination may also exist. Since the Boeing UT will be allowed to operate very close to an ATC Base Station (high elevation angle), ICO is assuming no antenna discrimination for this case

ICO has fitted an existing aeronautical antenna radiation pattern to the Boeing UT antenna performance for elevation angles between 24° and 90°.

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2 See *Comments of The Boeing Company*, IB Docket No. 01-185 at Appendix A pages 3, 4, 5, and 6.

3 *See The Boeing Company Application for Authority to Construct, Launch and Operate a Non-Geosynchronous Satellite System in the 2 GHz Mobile-Satellite Service and the Aeronautical Radionavigation-Satellite Service , FCC File No. 179-SAT-P/LA-97(16), Appendix 1-A.*

4 *See Comments of The Boeing Company, IB Docket No. 01-185, Appendix A Note under Table 1 "This analysis uses an antenna gain for the Boeing user terminal of 0 dB. The actual gain would depend significantly on the geometry"*

Figure 1 provides the details of the fitting and shows that, based on the extrapolated performance at low elevation angles, a discrimination of at least 7 dB (with respect to the gain at 24°) can be assumed for interference from the ATC UT into the Boeing UT.

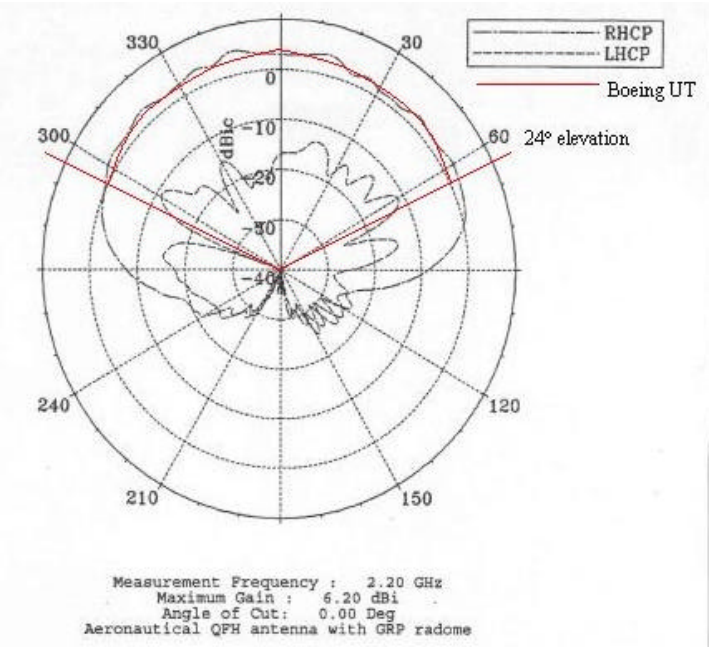

Figure 1: **Boeing User Terminal Antenna Fit** (measured results of a 2.2 GHz conical QFH aeronautical antenna with radome).

3.3 ATC Voice Activation and Power Control

Voice activation and power control techniques are part of the system design for the ICO ATC. They are required in order to optimize the use of power and maximize the system capacity.

These techniques will improve the average out of band emissions from both ATC Base Stations and User Terminals.

The effects of Voice Activation and Power Control should be accounted for in a more accurate interference calculation.

4 Comments on ATC Performances

Boeing interference calculations correctly make reference to ICO's March 8, 2001 *ex parte* filing[5] to derive expected out of band emissions for the ICO ATC. However, due to the fairly large natural frequency separation between the ICO ATC carriers and any other MSS system's UTs, as well as certain planned additional filtering and other mitigating techniques, the correct value to utilize for interference analysis is substantially lower, as will be explained herein.

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[5] See *Ex parte Filing of New ICO*, filed March 8, 2001 at Appendix B, Table 4.

The usage of MSS frequency bands for the ATC will require ICO to develop certain new RF hardware with respect to what typically is in use for today's terrestrial systems, allowing better out of band emission performance to be achieved. This, coupled with the natural frequency separations mentioned above, will allow the design of non-interfering systems with or without ATC.

Although ICO is not advocating new out-of-band emission regulations at this time, we are confident that this type of potential interference will not be a problem.

Besides the natural spectrum roll off (explained herein) due to spectrum separation between systems, additional techniques may be adopted to reduce out of band interference; these include but are not limited to a combination of:

- Additional transmit RF filtering
- Use of highly linear amplifiers (CDMA systems use linear amplifiers)
- Use of cleaner Local Oscillators (LO) and/or LO output filters
- Use of guard-bands

4.1 ATC Guard-bands and Filtering

ICO has explained in our NPRM response[6] the approach to be used for spectrum sharing between ATC and SC.

It was stated that, although ICO intends to maximize the amount of spectrum shared by ATC and SC, a small amount of dedicated spectrum will be allocated to SC carriers (*e.g.*, for common control channels) to allow for proper operations.

The approach proposed by ICO is summarized in Figure 2.

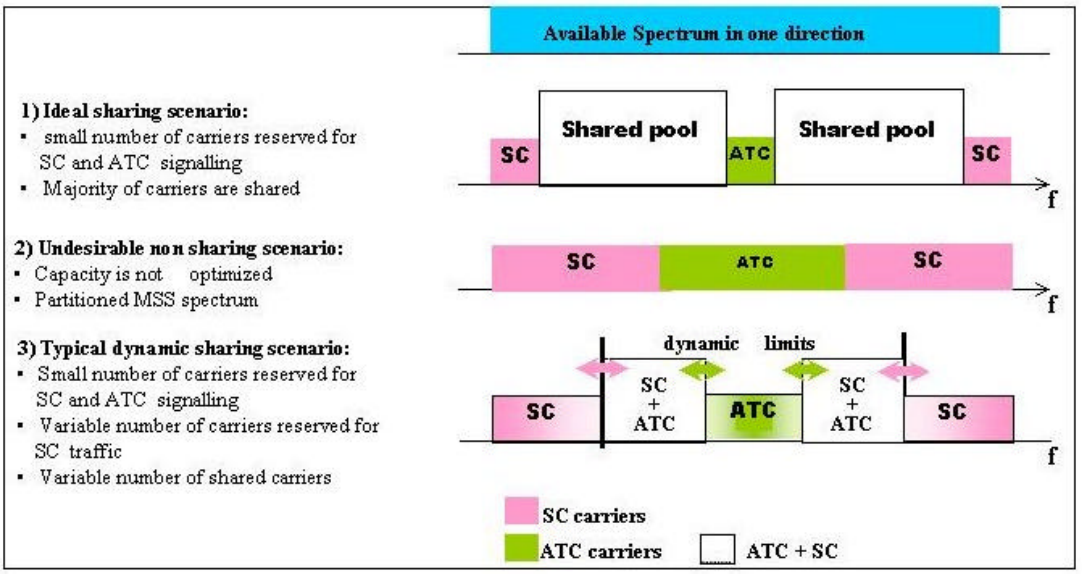

Figure 2: ICO SC and ATC Sharing Concepts

[6] See *Comments of New ICO Global Communications,* IB Docket No. 01-185, page 35 and Appendix B.

Frequency bands specifically dedicated to the SC component will be located at the edges of the spectrum allocated to ICO. In this manner, the SC bands serve as "guard-bands" between ICO and other MSS systems.

Note that out of band emissions from ICO's ATC base stations into ICO UTs (or vice versa) are not a concern, because the emissions are significant only at very close range.

When ICO's UTs are in the close vicinity of an ATC Base Station, they will operate in ATC mode, rather than SC mode. The spectrum in close proximity of the ATC carriers, where higher out of band emissions occur, will be used for SC UTs outside a predefined minimum distance from the ATC Base Station (e.g. some km) and ATC UTs. Spectrum outside that band will be used for SC UTs that are close to the base stations, but not close enough to operate in ATC mode. Shared Spectrum will be re-used by the SC outside the exclusion areas around the ATC base and UTs.

The concept for spectrum sharing between ICO ATC and ICO SC is presented in Figure 3.

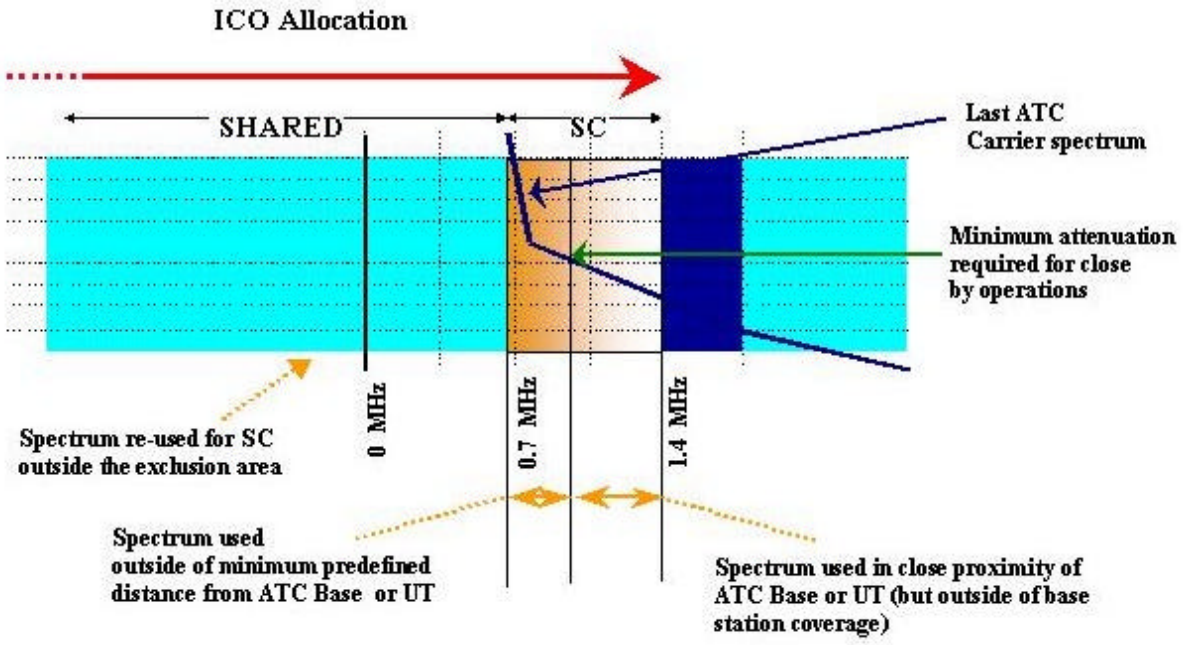

Figure 3: ICO Spectrum re-use approach between ATC and SC

Once the "guard-bands" are created by means of locating SC dedicated frequency bands at the edge of the ICO spectrum, additional filtering can be introduced in both the ATC UT and ATC Base Station.

With respect to out of band interference into the Boeing or other MSS systems, Figure 4 shows how the required OOB rejection is obtained for the ATC base Station and accounted for in the interference calculations when the aforementioned "guard-bands" and filtering are introduced. Figure 5 shows the same concept for reduction of out of band emissions applied to the ATC UT.

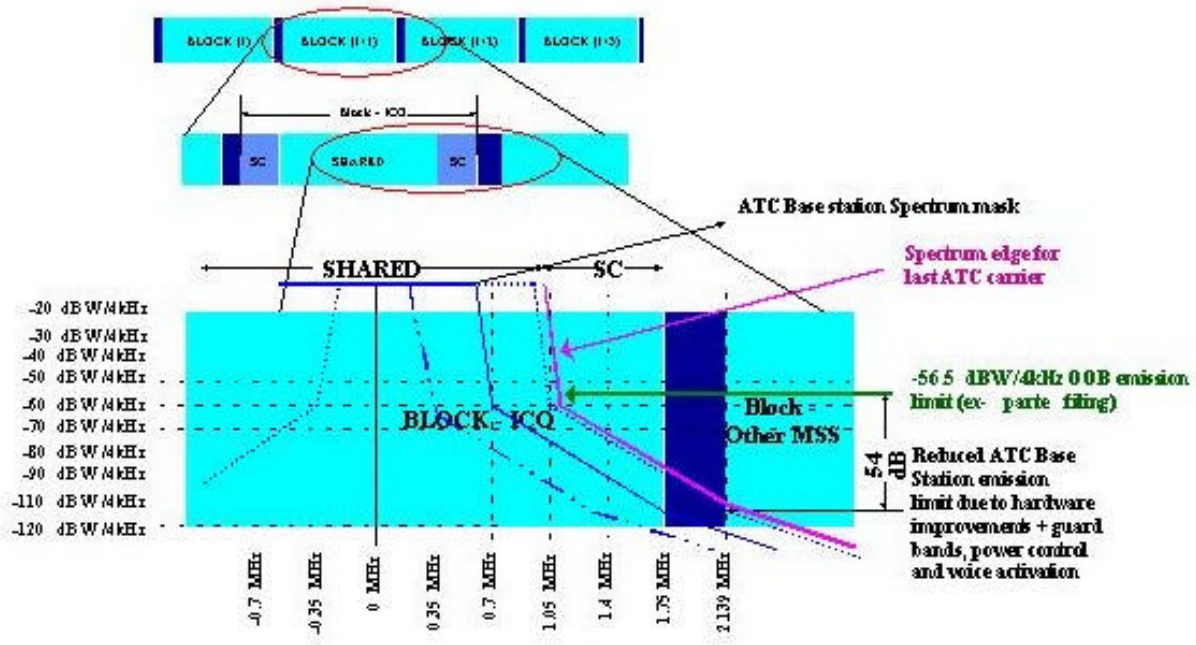

Figure 4: ATC Guard-bands and improved out of band emission concept (Base Station case)

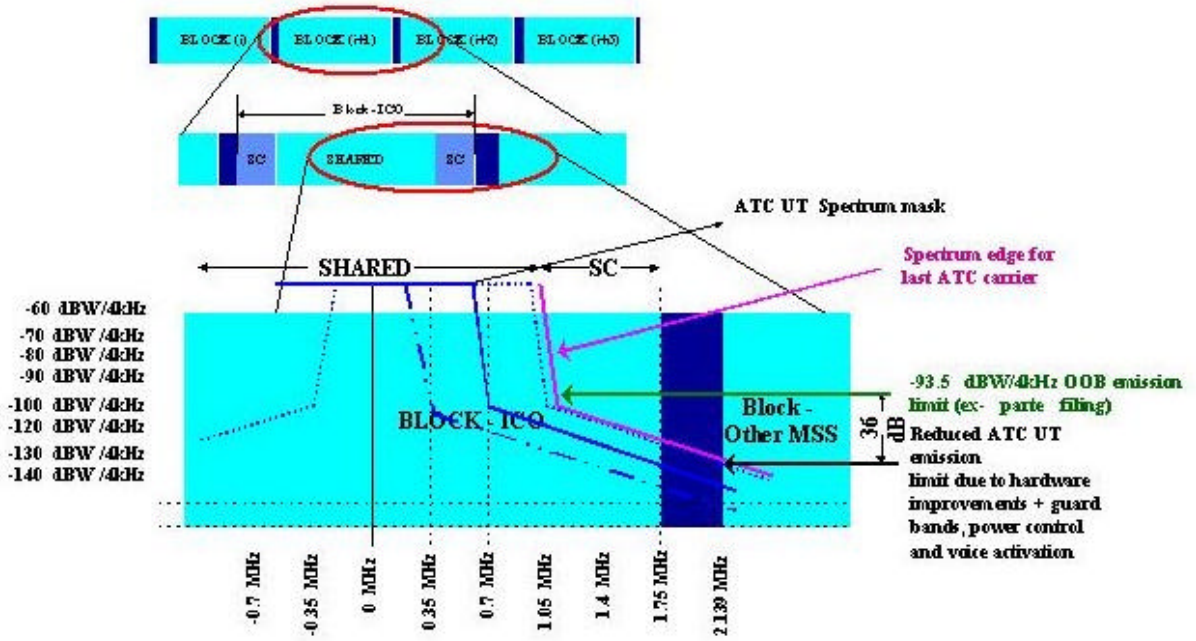

Figure 5: ATC Guard-bands and improved out of band emission concept (UT case)

5 Comments on ICO proposed distances and angle between ATC components and Boeing UT

For the purpose of deriving the additional attenuation values required for out of band emissions, ICO makes reasonably conservative assumptions for the distances and angle between the ATC Base Station/ATC UT and the Boeing UT.

ATC UT:

- ATC users in an airport building have the possibility of getting close to the Boeing UT installed on the airplane. This distance on average is chosen as 5 meters.
- 6 simultaneous users, as proposed by Boeing, are assumed to be standing at various locations within the airport building or outside it (all at the same 5 m distance from the Boeing UT);
- The elevation angle of the ATC User Terminals as seen by the Boeing UT is assumed to be an average of 0° among the 6 different ATC users.

ATC Base Station:

- ICO believes that it is unlikely a commercial airplane mounted UT would be closer than 20 meters from an ICO ATC Base Station.
- Assuming a height of 40 m for the ATC Base Station antenna and a distance on the ground of 20 m, the resulting range between ATC Base Station and a Boeing UT at 5 m above ground is approximately 40 m.
- Because of the high elevation angle that can occur between ATC Base Station and Boeing UT at close distance, no antenna discrimination is assumed.

6 Interference Analyses

Appendix A to the Boeing comments contains interference calculations and conclusions on possible concerns for the Boeing service, divided in accordance with the different spectrum used for transmission at the ATC Base Station and ATC UT.

The following table summarizes the assessment of the interference treat as perceived by Boeing based on their interference analyses:

Table 1: Boeing Appendix A Interference Assessment

	ATC Base Station Transmission		ATC USER Terminal Transmission	
Forward Band Sharing	?	21.9 km range	✓	25.01 dB margin
Reverse Band Sharing	✓	4.58 dB margin	?	0.76 km range
Uplink Duplex	✓	4.58 dB margin	✓	25.01 dB margin
Downlink Duplex	?	21.9 km range	?	0.76 km range

✓ Margin indicated by Boeing

? Concern over possible interference indicated by Boeing

Some of the cases are stated by Boeing not to be a concern from the interference point of view; that already clears the way for some of the operating concepts proposed by ICO for the ATC. Uplink Duplex ATC operating mode is clearly of no concern to Boeing.

For all cases, and particularly for those remaining cases where the interference is stated to be a concern for Boeing, ICO has reviewed the interference calculations produced by Boeing and, based on the considerations in Sections 3, 4, and 5, would like to submit the following amendments to these calculations.

6.1 Interference Case #1: ATC Base Station Transmitting in the Satellite Downlink Spectrum

As shown by the interference budget in Table 2, the distance on the ground between the ATC Base Station and a Boeing UT or some other generic MSS UT, operating at the same time, can be reduced to about 19 m and 0 respectively (from Boeing's value of 21.9 km).

In addition, ICO believes it may be very challenging to achieve a Noise Temperature of 200 K for the Boeing UT. A higher noise temperature would reduce the distances further but this is not accounted for in the final calculated distance for the Boeing UT.

Table 2: ATC Base station Interference to Boeing and other MSS User Terminals(1)

Parameters	Unit	Boeing UT	Other MSS UT(2)
Frequency	***GHz***	~~2~~(3) ***2.185***	***2.185***
Noise Temperature, UT	K	200	***300***
Noise density, No, UT	dBW/Hz	-205.6	-203.8
Interference Criteria, Io/No	dB	-12.2	-12.2
Allowed Io, UT	dBW/Hz	-217.8	-216.0
specified OOB emission (ATC base)	dBW/4-kHz	-56.5	-56.5
Reference Bandwidth	KHz	4	4
OOB emission density	dBW/Hz	-92.5	-92.5
Antenna gain, UT	dB	0	0
Propagation loss required for ~ 20 m range for Boeing UT	***dB***	~~125.27~~(3) ***71.3***	***65.5***
Antenna discrimination	***dB***	***0***	***0***
additional, ICO estimated, OOB attenuation(4)	***dB***	***54***	***54***
Range	***m***	***40.0***	***20.6***
Distance on the ground	***m***	***19.3***	***0***
Additional margin for Boeing UT Noise temperature degradation to 300 K	***dB***	***1.8***	***N.A***

(1) The locations of the table in ***bold italics*** are either new entries or modified entries with respect to Appendix A of *Comments of The Boeing Company,* IB Docket No. 01-185.

(2) The parameters for other MSS UTs are based on achievable performance data for MSS UTs.

(3) The figures provided in ~~red~~ are that originally provided by Boeing in Appendix A of *Comments of The Boeing Company,* IB Docket No. 01-185.

(4) Additional attenuation is contributed by factors such as improved ATC hardware components, guard bands, voice activity factor, and power control advantage. Applies when radiating in SC downlink bands.

6.2 Interference Case #2: ATC User Terminal Transmitting in the Satellite Downlink Spectrum

As shown by the interference budget in Table 3, the distance on the ground between the ATC UT and a Boeing UT or a generic MSS UT, operating at the same time, can be reduced to about 4.9 m and 2.0 m respectively (from Boeing's values of 0.76 km).

Also in this case ICO believes it may be very challenging to achieve a Noise Temperature of 200 K for the Boeing UT. A higher noise temperature would reduce the distances further but this is not accounted for in the final calculated distance for the Boeing UT.

Table 3: ATC UT Interference to Boeing and other MSS User Terminals(1)

Parameters	Unit	Boeing UT	Other MSS UT(2)
Frequency	***GHz***	~~2~~(3) ***2.185***	***2.185***
Noise Temperature, UT	K	200	300
Noise density, No, UT	dBW/Hz	-205.6	-203.8
Interference Criteria, Io/No	dB	-12.2	-12.2
Allowed Io, UT	dBW/Hz	-217.8	-216.0
OOB emission (ATC UT)	dBW/4-kHz	-93.5	-93.5
Number of users		6	3
Reference Bandwidth	kHz	4	4
OOB emission density	dBW/Hz	-121.7	-124.7
Antenna gain, UT	dB	0	0
Required Propagation loss for ~ 5 m range for Boeing UT	***dB***	~~96.05~~(3) ***53.1***	***45.3***
Antenna discrimination	***dB***	***7***	***0***
additional, ICO estimated, OOB attenuation(4)	***dB***	***36***(5)	***46***

Table 3: ATC UT Interference to Boeing and other MSS User Terminals[1]			
Parameters	**Unit**	**Boeing UT**	**Other MSS UT[2]**
Range	***m***	***4.9***	***2.0***
Distance	***m***	***4.9***	***2.0***
Additional margin for Boeing UT Noise temperature degradation to 300 K	***dB***	***1.8***	***N.A.***

(1) The locations of the table in ***bold italics*** are either new entries or modified entries with respect to Appendix A of *Comments of The Boeing Company*, IB Docket No. 01-185

(2) The parameters for other MSS UTs are based on achievable performance data for MSS UTs. The interference calculation is based on one ICO UT interfering with other MSS UT.

(3) The figures provided in ~~red~~ are that originally provided by Boeing in Appendix A of *Comments of The Boeing Company*, IB Docket No. 01-185

(4) Additional attenuation is contributed by factors such as improved ATC hardware components, guard bands, voice activity factor, and power control advantage. Applies when radiating in SC downlink band.

(5) With 46 dB of additional attenuation, as required for other MSS UT's, the distance between the ATC UT and Boeing UT can be brought down to 1.6 meters.

6.3 Interference Case #3: ATC Base Station Transmitting in the Satellite Uplink Spectrum

Boeing analysis shows an interference margin of 4.6 dB. Considering factors such as power control, voice activation and ATC base antenna elevation discrimination would further increase this interference margin to 14.6 dB.

6.4 Interference Case #4: ATC User Terminal Transmitting in the Satellite Uplink Spectrum

In case of interference from ATC user terminals, Boeing computes the Interference margin as 25 dB. Including factors such as power control, voice activity factor and ATC UT antenna discrimination would lead to an even larger interference margin.

7 Conclusions

Based on the revised calculations in Section 6, ICO has no concern over possible out of band interference problems caused by the ATC to any other MSS services operating in adjacent bands.

The Boeing system in particular will enjoy extensive margins for interference and appropriate separation distances.

The following table, revised on the basis of ICO calculations, shows that ample margins exist for all ATC operating modes and that no interference will occur to the Boeing or other MSS systems because of ICO ATC operations.

Table 4: ICO ATC Interference Assessment for Boeing UT				
	ATC Base Station Transmission		**ATC USER Terminal Transmission**	
Forward Band Sharing[1]	✓	**< 20 m range**	✓	**> 25 dB margin**
Reverse Band Sharing[2]	✓	**> 14.6 dB margin**	✓	**< 5 m range**
Uplink Duplex	✓	**> 14.6 dB margin**	✓	**> 25 dB margin**
Downlink Duplex[1],[2]	✓	**< 20 m range**	✓	**< 5 m range**

✓ Margin identified by ICO

(1) See Table 2: ATC Base station interference to Boeing and other MSS user terminals

(2) See Table 3: ATC UT interference to Boeing and other MSS user Terminals

APPENDIX C

Reply to the "Comments of the Society of Broadcast Engineers, Inc."
in the matter of:

Terrestrial MSS Operations for the Mobile Satellite Service

1. Introduction

In its comments to the NPRM, the Society of Broadcast Engineers, Inc. (SBE) is comfortable with the MSS UT transmissions in the 1990 MHz to 2025 MHz frequency band[1] and this would mean that the comparatively lesser power ATC UTs also do not pose a threat to the BAS sites. Thus the concerns addressed by SBE are only applicable to ATC base station transmissions in Uplink Duplex and Reverse Band sharing modes of operation.

2. Comments on the Feasibility of Duplex sharing modes

SBE questions the feasibility of the uplink duplex and downlink duplex modes of ATC operation due to the possibility of self-interference between the transmitter and receiver of the ATC handset. 18 MHz separation is assumed between the Transmit and Receive frequencies and SBE concludes that such a duplexer would be bulky, expensive and would result in yet another Iridium-style "brick" telephone that would not be acceptable to users.[2]

ATC operation in any of the duplex modes mentioned above relies on the number of spectrum blocks ICO will ultimately be able to use and the frequency separation between these blocks. In duplex mode, ICO would use blocks that are at the upper and lower edges of the MSS allocation. Preliminary analysis of a duplexer for ATC handsets operating in any of the duplex modes indicates that a minimum of 15 to 20 MHz is easily sufficient to fulfill the duplexer requirements at reasonable cost and size. E-TACS handsets employed a duplexer with separation of 12 MHz at an operating frequency of 900 MHz. Technology has improved since the days of the E-TACS system and it is possible to get even closer duplex separation than 20 MHz at the ICO operating frequencies of 2000 MHz and 2200 MHz.

3. Comments on "single antenna"

SBE concludes incorrectly that ICO proposes a single antenna design for the SC/ATC dual mode UT, which would lead to increased interference between the ATC and SC part of the ICO MSS system. SBE believes that this problem could be mitigated by placing the ATC cells closer, but is concerned about "brute force overload (BFO)" generated by this to the BAS sites.

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1 See *Comments of the Society of Broadcast Engineers, Inc.* IB Docket No. 01-185 at para. 18.

2 Id. at para. 16.

ICO is well aware of the antenna designs that are being used in terrestrial cellular and satellite mobile handsets. ICO intends to use electrically separate antennas for the ATC part and SC part due to different polarisation and radiation pattern requirements.[3]

4. Comments on In Band emission levels and keep-away distances.

SBE comments that the signal power from ATC base stations would get in through the filter sidelobes of the BAS equipment and in order to avoid this interference they propose "keep-away" distance between the ATC bases and BAS equipment.[4] It is clear that this interference occurs only in Reverse Band and Uplink duplex modes of sharing only.

With appropriate guard bands, the sidelobe suppression of an off-the-shelf additional filter/LNA module for the current BAS equipment offers >120 dB rejection. This would mean that the allowed interferer level for achieving –3 dB I/N is +30 dBm.

With ATC base station maximum power of 57 dBm and 20 dBi gain antenna for the BAS receiver, the keep-away distance is down to 2.7 meters against the SBE prediction of 2.6 kilometers.

5. Comments on Adjacent Band emissions.

SBE comments[5] discuss the impact of adjacent-channel interference from the ATC base stations operating in the Uplink duplex and reverse band modes of operation. SBE states that the maximum adjacent channel interference that can be accommodated by a BAS receiver is –90 dBm.

The out of band emissions from the ATC base station are –56.5 dBW/4kHz[6] for offsets greater than 750 kHz from the center. From the above it can be seen that the proposed ATC would generate 13.5 dB less interference power compared to allowed out-of-band emissions that are generated by FS stations operating above 2110 MHz, immediately above the BAS band. These FS station are constrained not to generate more than –43 dBW in any 4 kHz outside their authorized band. In this respect, it should be noted that the points raised by SBE in paragraph 24 of their comments are completely baseless. The out-of-band level of –56.5 dBW/4 kHz does not include any "25 dB of elevation pattern discrimination" as wrongly assumed by SBE. It is clear from Section 6.1 of Appendix B of ICO's March 8, 2001 *ex parte* submission that when these 25 dB are included the out-of-band levels are reduced to –81.5 dBW/4 kHz. This additional attenuation is justifiable only when considering interference into satellite receivers of other MSS operators.

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[3] SC part uses circular polarisation while ATC part uses linear polarisation. SC part uses antenna with conical radiation pattern towards the sky while ATC uses doughnut shaped antenna pattern.

[4] See *Comments of the Society of Broadcast Engineers, Inc.* IB Docket No. 01-185 at para. 18, 19,20, 21, and 22.

[5] See *Comments of the Society of Broadcast Engineers, Inc.* IB Docket No. 01-185 at para. 23 and 24.

[6] Id. at Table 4

The current PCS systems operating in the 1850 – 1900 MHz band, which are immediately below the existing BAS band, are allowed to radiate -43 dBW/MHz outside their authorized band.[7] This emission limits translate to –67 dBW/4kHz, which is 10.5 dB lower than the –56.5 dBW/4 kHz values mentioned in ICO's *ex parte* filing. The extra attenuation can easily be achieved by use of guard bands as already described.[8]

6. Conclusions

With reference to the in-band signals from ATC generating "brute force overload" to the BAS receivers, SBE concludes that a keep-away distance on the order of a few kilometers may be required between the ATC towers and BAS equipment. After a careful review and analysis it has been found that with the use of appropriate BAS receive filters and guard bands this keep-away distance can be reduced to < 3 meters.

Nominal guard bands are sufficient to meet the requirements of adjacent channel emission levels equivalent to those of PCS and FS systems, which are currently operating in adjacent bands to the BAS.

It has been noted that the "brute force overload" and adjacent band interference concerns are applicable only for the reverse band and uplink duplex mode of operation of ATC.

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7 See S*ection 24.238 of Commission Rules.*

8 See *Reply comments of New ICO Global Communications,* IB Docket No. 01-185, Appendix B.

APPENDIX D

Reply to the "Comments of the Wireless Communications Division of the Telecommunications Industry Association" in the matter of:

Flexibility for delivery Of Communications by Mobile Satellite Service Providers In the 2GHz Band, the L – Band, and the 1.6/2.4 GHz Band

1. Introduction

WCD argues that terrestrial use of spectrum will be accompanied by segmentation, using arguments that generally show a lack of understanding of ICO's proposed ATC concept.

2. Comments on "Satellite and Terrestrial Operations must be spectrally Separated"

WCD claims that the technical appendix of ICO's *ex parte* filing clearly shows that ICO is intending to segregate spectrum.[1] The *ex parte* filing repeatedly mentions the techniques that are proposed to mitigate the potential interference, thereby enabling the spectrum to be shared in various modes.[2] WCD sees ICO's reference to dual-mode handsets as a clear indication of spectrum segregation, but a handset that is required to be operational in, for example, CDMA and TDMA systems, must be dual-mode even if it works in only one set of frequencies. ICO handsets will be dual-mode/single-band whereas the dual-mode handsets deployed by Globalstar and Iridium are dual-mode/dual-band. ICO believes that the approach followed by Globalstar and Iridium is spectrally inefficient.

WCD also infers band segmentation from ICO's reference to non-overlapping spectrum for the satellite and terrestrial components of the MSS network.[3] ICO's filing clearly states that the intention is to initially assign non-overlapping spectrum in cases where interference would limit the operation, while at the same time controlling the number of overlapping assignments at any one time to limit interference.[4] This would permit an initial non-overlapping spectrum allocation to be changed to an overlapping spectrum during the course of a call.

ICO believes that a dual-mode/single-band handset can successfully operate on both the satellite and terrestrial components of an MSS system which shares spectrum. In ATC coverage areas, the broadcast signals transmitted by the ATC base stations are sufficient in order to be received by a handset interfered by narrow-band, low power TDMA interference from the satellite system. When the handset is out of ATC coverage (or even when within), no longer receiving the ATC broadcast signals with sufficient energy, it will be able to search and acquire

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1 See *Comments of the Wireless Communications Division of the Telecommunications Industry Association*, IB Docket No. 01-185, page 2.

2 See *Ex Parte* Filing of New ICO, Appendix B, pages 3,5,6, and 7.

3 See *Comments of the Wireless Communications Division of the Telecommunications Industry Association*, IB Docket No. 01-185, page 3.

4 See *Ex Parte* Filing of New ICO, Appendix B pages 3,4,6, and 7.

the narrow-band TDMA signals from the satellite. It should be noted here that, as has been explained previously,[5] ICO will have a certain number of dedicated SC common control channels. These channels ensure communication is possible when, for example, a user is outside communications range of an ATC tower, wishes to communicate via the SC path, but is still subject to interference from the tower. These dedicated control channels enable calls to be set up on other communications channels that are available in a particular location and time. Calls are set up on channels which, at that time and place, have been assigned to the SC component.

ICO agrees with WCD regarding the incompatibility between the CDMA and FDMA/CDMA technologies,[6] but does not believe that this is a disadvantage. In fact we believe that this is an advantage in terms of reducing interference to the ATC, reducing interference to the SC, and enabling a dual-mode handset to differentiate between ATC and SC without resorting to spectrum segregation. The interference is reduced due to CDMA spreading. When applied to a CDMA system of 1.25 MHz bandwidth and TDMA system of 25 kHz bandwidth, the spreading advantage can be as high as 17 dB.

WCD argues that the solution to avoid the 32-km exclusion distance between the ATC base stations and the SC UTs is to segregate the spectrum.[7] It is true that in areas around the ATC Base stations operating in Forward, Uplink Duplex and Downlink Duplex modes, there is a requirement for non-overlapping spectrum to be allocated. The rest of the satellite spotbeam can be allocated with overlapping spectrum. Even when non-overlapping spectrum is allocated locally in a geographic region, the same spectrum is re-used elsewhere in the ICO system. This usage is configured in a way to change dynamically with respect to traffic load and demand on the ATC and SC components.

WCD sees the ATC proposal as a replication of what has already been done by Globalstar and Iridium.[8] WCD ignores the integrated MSS Network Management System proposed by ICO.[9] ICO's comments on the NPRM explained in detail the concept of SC/ATC Dynamic Resource Management.[10] This clearly explains the complex resource management system that ICO has already developed for its satellite-only system, and how this can be extended to support the dynamic resource management requirements of the integrated SC/ATC system.

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5 See *Reply comments of New ICO Global Communications,* IB Docket No. 01-185, Appendix A, page 4.

6 See *Comments of the Wireless Communications Division of the Telecommunications Industry Association*, IB Docket No. 01-185, page 4.

7 Id. page 5.

8 Id.

9 See *Ex Parte* Filing of New ICO, Appendix B pages 13,14,15,16,17,18,19, and 20.

10 See *Comments of New ICO Global Communications,* IB Docket No. 01-185, Appendix B.

3. Conclusions

ICO is making efficient use of the CDMA and FDMA/TDMA networks in order to share spectrum, and also to allow the usage of dual-mode/single-band handsets. The integrated dynamic resource management system can handle the complex task of making sure that the spectrum is shared within the limits of co-channel interference and also ensuring the dynamic allocation and re-allocation of spectrum.