

**Before the
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554**

In the Matter of)
)
Flexibility for Delivery of Communications by) IB Docket No. 01-185
Mobile Satellite Service Providers in the 2 GHz)
Band, the L-Band, and the 1.6/2.4 GHz Bands)

**REPLY TO OPPOSITION TO PETITION FOR RECONSIDERATION AND
CLARIFICATION OF INMARSAT VENTURES PLC**

Inmarsat Ventures plc (“Inmarsat”) hereby files this reply to the opposition of Mobile Satellite Ventures Subsidiary LLC (“MSV”) to the *Inmarsat Petition* in this proceeding.¹ As Inmarsat stated in its petition, its primary concern has been ensuring that the deployment of an ancillary terrestrial component (“ATC”) in the L-band does not cause harmful interference into Inmarsat’s mobile satellite service (“MSS”) operations.² To this end, Inmarsat requested several administrative clarifications as well as the recalculation of two of the limits adopted by the Commission in the *Order*.³ Aeronautical Radio, Inc. and Air Transport Association of America support the *Inmarsat Petition*,⁴ while MSV objects broadly to Inmarsat’s requests. Inmarsat’s requests are well founded and, for the reasons discussed below, the Commission should reject the objections of MSV.

¹ See *Petition for Reconsideration and Clarification of Inmarsat Ventures plc*, IB Docket 01-185 at 2 (filed July 7, 2003) (the “*Inmarsat Petition*”).

² See *Inmarsat Petition* at 2. See also *MSV Consolidated Opposition to and Comments on Petitions for Reconsideration*, IB Docket No. 01-185 at 3 (filed Aug. 20, 2003) (the “*MSV Opposition*”).

³ See *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 Bands, Report and Order*, 18 FCC Rcd 1962, FCC 03-15, IB Docket 01-185 (February 10, 2003) (the “*Order*”), amended by *Errata* (March 7, 2003).

⁴ ARINC and ATA *Comment on Petitions for Reconsideration*, IB Docket No. 01-185 at 2 (filed Aug. 20, 2003).

DISCUSSION

I. INMARSAT'S REQUESTED MODIFICATIONS WOULD PROMOTE COMPLIANCE WITH THE COMMISSION'S RULES

A. Important Restrictions on ATC Should Be Reflected in the Service Rules

In its petition, Inmarsat requests that certain restrictions adopted in the *Order* be memorialized in the ATC service rules. This would provide ATC and MSS operators with a single point of reference for the rules governing the deployment of ATC and forestall confusion over, and inadvertent oversight of, relevant requirements currently set forth in the *Order* but not reflected in the Commission's Rules. In particular, Inmarsat requests that the ATC service rules reflect the following limitations imposed by the Commission: (i) that the maximum EIRP at the edge of a cell is limited to -18 dBW;⁵ and (ii) that the maximum number of simultaneous transmitting ATC mobile terminals ("MTs") permitted in the U.S. is no more than 90,000.⁶

As discussed in the *Inmarsat Petition*, Inmarsat is concerned that the 18 dB link margin for structural attenuation assumed by the Commission not be used either during outdoor operations or to extend edge-of-cell coverage. The Commission addressed the second concern in the *Order* but included a typographical error in the paragraph dealing with the issue. Inmarsat requested that the Commission correct paragraph 142 of the *Order* so that the last sentence would read "MSS licensees shall not extend the coverage area of any ATC cell beyond the point where an ATC MT could operate at the edge of coverage of the ATC cell with a maximum EIRP of -18 dBW" (as opposed to " -10 dBW") and that this limitation be reflected in the ATC service rules.⁷ MSV agrees that the " -10 dBW" is a typo and that " -18 dBW" is the correct value⁸ but

⁵ *Inmarsat Petition* at 10-11; see also *ATC Order* at ¶ 142.

⁶ *Inmarsat Petition* at 12; see also *ATC Order* at ¶ 188.

⁷ See *Inmarsat Petition* at 10-11.

⁸ See *MSV Opposition* at 6, fn.12.

objects to incorporating this protection into the ATC service rules, arguing that the Commission has “codified this principle in Section 25.253(a)(8).”⁹

In the *Order*, the Commission discusses the requirement to limit “edge of coverage” ATC operations separately from the general link margin structural attenuation requirement. Where there are two specific limitations that ATC operators must follow, it serves the interests of all parties to ensure that the operators are provided with clear notice of both restrictions. Therefore, because the “edge of coverage” restriction mandated by the *Order* is not explicitly codified in Section 25.253(a)(8), it should be incorporated into the ATC service rules.

Similarly, Inmarsat, in its petition, requests that the Commission’s requirement that ATC operators limit “peak traffic to no more than 90,000 ATC MTs”¹⁰ be reflected in the ATC service rules. In addition, Inmarsat sought clarification that the 90,000 limit on simultaneous mobile terminal transmissions is an aggregate limit on all ATC operations in the L-band and not a separate limit for each licensed ATC system in the L-band.

MSV objects to Inmarsat’s requests by asserting that there is no basis for Commission to restrict the number of simultaneously transmitting ATC MTs.¹¹ MSV’s comment is completely non-responsive to Inmarsat’s request to incorporate a clear mandate by the *Order* into the ATC service rules.¹² In the interest of providing clear notice to all parties of the obligations incumbent upon ATC operators, Inmarsat urges the Commission to incorporate the 90,000 ATC MT limit in the ATC service rules.

⁹ See *id.* at 5-6.

¹⁰ *Order* at ¶ 188.

¹¹ See *MSV Opposition* at 9.

¹² MSV did not challenge the limit in its petition for reconsideration and it is untimely to challenge the restriction in its opposition. Regardless, the Commission provided ample reasons for establishing a 90,000 limit on simultaneous mobile terminal transmissions in the *Order*. See *Order* at ¶ 188 and App. C2 § 2.1.1. MSV’s protests are unfounded as well as irrelevant.

B. Public Notice of All ATC Applications and Waiver Requests Is Appropriate

Inmarsat applauds the *Sua Sponte Order* in which the Commission established that initial ATC applications will be placed on notice for public comment.¹³ Inmarsat urges the Commission to require that ATC applicants provide a full description in their application of the ATC architecture that they intend to use to comply with the Commission's rules, including how they would meet the 18dB link margin for structural attenuation requirement and use the link margin only for indoor service.¹⁴ MSV states that "how [ATC operators] will design their networks with 18 dB of link margin for structural attenuation is best addressed in reviewing a specific application for ATC authority."¹⁵ Inmarsat agrees and simply asks that the ATC service rules clearly require ATC applicants to provide sufficient detail in their applications so that interested parties will be able to comment on a substantive proposal.

The juxtaposition between the *MSV Application*¹⁶ and Appendix A to the *MSV Opposition* demonstrates the need for imposing a disclosure obligation on ATC applicants. Only after Inmarsat advocated for full disclosure did MSV feel the need to submit more than a perfunctory discussion of link margin allocated to structural attenuation.¹⁷ Unless the Commission requires a full description in an application of how a proposed ATC system will meet the ATC service rules, applicants may pay lip service to the rules without providing sufficient detail regarding their ATC system or considering how or if they will be able to comply

¹³ See *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 Bands, Order on Reconsideration*, FCC 03-162, IB Docket 01-185 at ¶ 14 (July 3, 2003) ("*Sua Sponte Order*").

¹⁴ See *Inmarsat Petition* at 11.

¹⁵ See *MSV Opposition* at 4-5.

¹⁶ *In the Matter of Mobile Satellite Ventures Subsidiary LLC*, Application for Minor Modification and Amendment, File Nos. SAT-MOD-20030694-00110, SAT-MOD-20030694-00111, SES-MOD-20030604-00874 (filed June 4, 2003) ("*MSV Application*").

¹⁷ Cf. *MSV Application* at 13 with *MSV Opposition*, Exhibit A.

with the ATC service rules. The public will not have the opportunity to comment in a meaningful manner and the processing of applications may be significantly delayed if the Commission determines that additional information needs to be filed.

MSV also objects to Inmarsat's request that the Commission place waiver or modification requests on public notice.¹⁸ As with the initial application, it is in the public interest for there to be transparency in the processing of waiver requests. The ATC service rules are a complex mesh that the Commission designed to protect MSS operations from interference from ATC operations. To the extent that an operator seeks waiver of any of these rules, MSS operators should have notice and the opportunity to evaluate and comment on the potential interference impact on their operations.

C. Transparency in ATC Deployment Is Critical

MSV urges the Commission to reject Inmarsat's attempts to obtain greater transparency in the deployment of ATC operations. In order to aid in Inmarsat's analysis of whether ATC, as deployed, would cause harmful interference into its MSS network, Inmarsat requests that the Commission (i) release a public notice regarding the start of the 18-month phase-in period of an ATC system and (ii) require that ATC operators periodically report on the location of ATC base stations and the number of MTs deployed.¹⁹ Stunningly, MSV objects to these requests on the grounds that the information is "commercially sensitive."

As the Commission notes the purpose of the 18-month phase-in period is to "permit Inmarsat and MSV to study whether any interference has resulted, giving enough time to observe any seasonal variations and to analyze the results of the study."²⁰ Unless Inmarsat is

¹⁸ See *Inmarsat Petition* at 23; cf. *MSV Opposition* at 12.

¹⁹ See *Inmarsat Petition* at 23-24.

²⁰ *Order* at ¶143.

provided notice of when the period begins, it will be unable to study the interference caused by ATC operations as contemplated by the *Order*. Moreover, if Inmarsat does not know where and to what extent ATC is being deployed, its interference analysis will be greatly hindered. The information sought by Inmarsat is reasonable and narrowly tailored to allow Inmarsat to conduct its interference analysis. MSV argues that information on its ATC deployment is commercially sensitive. This claim is highly suspect. To the extent MSV is rolling out a new service, one would assume that it is in MSV's best interest to let the public know when and where it is available.²¹ Inmarsat asks for little more.

II. INMARSAT'S REQUESTED RECALCUATIONS OF ATC PROTECTION LIMITS ARE FULLY SUPPORTED

In its petition, Inmarsat urges the Commission to recalculate (i) the number of permissible MSV ATC base stations operating per channel based on a corrected value for MSV's next generation satellite antenna gain²² and (ii) the degree of protection appropriate for Inmarsat's mobile earth terminals ("METs") based on two interference sensitivity reports produced by manufacturers of Inmarsat METs.²³

A. MSV's Objections to Inmarsat's Proposed Recalculation of the ATC Uplink Band Interference Protections Are Non-responsive

In analyzing the number of ATC base stations that should be permitted to operate per channel, the Commission calculated the level of self-interference that an ATC operator would cause its own MSS system. In its analysis, the Commission used MSV's average satellite antenna gain (41 dBi) as opposed to the peak gain (42.5 dBi). Inmarsat asserts in its petition that

²¹ MSV suggests that Inmarsat seeks the information to gain a competitive advantage. *See MSV Opposition* at 12. As Inmarsat has stated in the past, it has no plans to provide an ATC service. Inmarsat's interest is purely to determine whether ATC, as deployed, causes harmful interference to its MSS operations.

²² *See Inmarsat Petition* at 12.

²³ *See id.* at 16-17.

the appropriate value to use is the peak gain. MSV does not contest this, but instead makes the non-responsive argument that the Commission should (i) force Inmarsat to accept a 6% $\Delta T/T$ increase in interference into its satellites from ATC operations and (ii) permit MSS/ATC operators to dramatically increase the level of self-interference they can generate into their satellites.²⁴ This proposal is merely a reiteration of MSV's petition for reconsideration.²⁵ Inmarsat has fully responded to the *MSV Petition* in the *Inmarsat Opposition*,²⁶ which is incorporated by reference. For the sake of completeness, however, Inmarsat urges the Commission to reject the radical revision to the *Order* proposed by MSV in its opposition and petition for the following reasons.

MSV throughout this proceeding represented that it would cause no more than a one percent contribution to the interference into Inmarsat's satellites.²⁷ The Commission and Inmarsat relied upon this representation in their interference analyses. This level of interference makes sense given that ATC is a secondary service. The interference margin in satellite systems is very limited and does not normally take into consideration interference due to a non-conforming terrestrial use such as ATC. Instead, it is appropriately used to coordinate between satellite systems. So long as ATC is a relatively small component of the interference caused by a MSS/ATC network, Inmarsat can coordinate its satellite network with MSV and other operators without having to make a significant allowance for the interference contribution from ATC. This

²⁴ See *MSV Opposition* at 6-7.

²⁵ See *MSV Petition for Partial Reconsideration and Clarification*, IB Docket No. 01-185 at 10-13 (filed July 7, 2003) (“*MSV Petition*”).

²⁶ See *Inmarsat Opposition to Petition for Partial Reconsideration and Clarification of Mobile Satellite Ventures LLC*, IB Docket No. 01-185 at 8-14 (filed Aug. 20, 2003) (“*Inmarsat Opposition*”).

²⁷ See, e.g., Letter from MSV to Secretary, FCC, *ex parte* entitled “*MSV's Next Generation Satellite System Coordination and Interference Considerations*,” IB Docket No. 01-185 at 5 (filed February 6, 2002).

ensures that there is no loss of spectrum efficiency for the MSS systems operating in the L-band.

If ATC operations caused significant levels of interference, this effect could not be ignored in satellite coordination and frequency reuse between satellite systems would be degraded. Moreover, there would be a tremendous corresponding increase in the level of self-interference into the MSS/ATC operator's satellite system. As a result, either the quality of the satellite service of the MSS/ATC operator would degrade sharply or the operator would need to seek additional spectrum as a result of its non-conforming operations. The first result is contrary to the intended ancillary nature of ATC and the second result is contrary to the dictates of both the Mexico City MOU and the *Order*.²⁸ MSV's proposal therefore should be rejected.

In a footnote, MSV also proposes that co-channel limits should not be imposed on non-co-channel ATC operations in the L-band.²⁹ This issue, however, was considered and rejected in the *Order*. The Commission noted that “[i]n a dynamic environment, such as L-band MSS, we are concerned that determining the co-channel interference that arises from fluctuating and geographically discrete operations might require our continued oversight over many years with no foreseeable end” and therefore the Commission imposed co-channel limitations upon the entire L-band.³⁰ MSV asserts that it is willing to “assume the risk” that some of its “non-co-channel” operations may become subject to co-channel restrictions in the future. However, as Inmarsat has stated in the past, with the launch of its next-generation satellite, Inmarsat-4, co-channel interference will be an issue for most of the channels over which MSV intends to provide ATC service.³¹ Finally, it is highly doubtful that once deployed MSV would be willing

²⁸ See *Order* ¶ 215.

²⁹ See *MSV Opposition* at fn. 13. MSV did not raise this issue in its petition for reconsideration and should not be allowed to raise this new issue in its opposition.

³⁰ See *Order* at ¶¶ 146-147.

³¹ See, e.g., *Quantification of Harmful Co-Channel L-Band Uplink Interference into*

to restrict the growth of its ATC operations because of its obligations under the Mexico City MOU. Instead, MSV would have an even greater incentive to stall coordination efforts – as it has done for the past four years. The Commission was correct to apply co-channel restrictions across the L-band and Inmarsat urges the rejection of MSV’s untimely request.

B. MSV’s Criticisms Of The NERA And Honeywell Reports Are Unfounded

In its opposition,³² MSV criticizes the interference sensitivity tests performed by NERA and Honeywell.³³ With respect to its comments on NERA’s report, MSV raised virtually the same arguments in its comments³⁴ on the Notice of Inquiry issued by the Commission regarding receiver standards.³⁵ Inmarsat responded to those comments³⁶ but in the interest of completeness explains again in the attached Technical Annex³⁷ why MSV’s criticisms are unfounded. The only new issue raised by MSV is that the modulation parameters NERA used for the interfering carriers are somewhat different from those that will be used by the ATC transmitters.³⁸ As discussed in the Technical Annex, whether or not this is true is irrelevant as it would not have any significant effect on NERA’s results.

Inmarsat-4 From MSV ATC Uses, Versus MSV Mobile Earth Terminal Uses, Inmarsat ex parte, IB Docket No. 01-185 at 3 (filed May 9, 2002).

³² See *MSV Opposition* at 10-11 and Appendix B.

³³ See *Inmarsat Petition*, Exhibits A and B.

³⁴ See Comments of Mobile Satellite Ventures Subsidiary LLC, ET Docket No. 03-65 (filed July 21, 2003).

³⁵ See *Interference Immunity Performance Specifications for Radio Receivers, Notice of Inquiry*, ET Docket No. 03-65 (“NOI”) (March 24, 2003).

³⁶ Reply Comments of Inmarsat Ventures PLC, ET Docket No. 03-65 (filed August 18, 2003) (“*Inmarsat Receiver Standards Reply Comments*”).

³⁷ See Technical Annex at 1-2 attached hereto as Exhibit A. To the extent necessary, Inmarsat requests that the Commission waive its 10-page limitation regarding replies to oppositions to petitions for reconsideration to allow Inmarsat to respond to the technical annexes attached to the *MSV Opposition*. See 47 C.F.R. § 1.429(g). A waiver would serve the public interest by allowing the meaningful consideration of the issues discussed therein.

³⁸ *MSV Opposition* at 10 and Appendix B.

NERA's tests of the interference sensitivity in their GAN terminals take the complete receiver chain into account, and give an actual "real world" benchmarking of receiver sensitivity and dynamic range. Comparatively, MSV's tests are based on a flawed test methodology that completely fails to address these issues. Based on the information Inmarsat already has provided in its opposition, it is clear that the test results presented by MSV must be disregarded as incomplete and misleading.

Regarding the Honeywell report, MSV claims that because its ATC base stations will not radiate continuous wave ("CW") interference the Honeywell report is not relevant.³⁹ As explained in the attached letter from Honeywell, insofar as amplifier saturation is concerned, there is no distinction between CW and the spread-spectrum interference radiated by MSV ATC base stations, as long as the interference signal is contained within the SATCOM receive bandwidth.⁴⁰ The "SATCOM receive bandwidth" here is the bandwidth of relevant part of the receiver chain of the Inmarsat aeronautical terminal. This bandwidth cannot be assumed to be narrower than the MSS L-band allocation. Any L-band ATC signal will be fully contained within this bandwidth. Hence, when the DO-210D 2.2.4.1.3 specification is properly viewed as a saturation specification, the CW requirement is completely applicable to any interference in this analysis. Thus, as explained in the *Inmarsat Petition* and Honeywell's letter attached hereto, the Commission should recalculate its rules protecting Inmarsat's aeronautical METs based on Honeywell's analysis that an appropriate threshold for aeronautical terminals is -72 dBm at 1 MHz frequency offset and for less than 1 MHz, the threshold is significantly lower.

³⁹ See *MSV Opposition* at 10.

⁴⁰ See Letter from E. F. Charles LaBerge, Senior Principal Engineer, Honeywell Aerospace Electronic Systems Laboratory, to Rohan Hiesler, Inmarsat, dated August 30, 2003, attached hereto as Exhibit B.

CONCLUSION

MSV's objections lack substance and should be rejected. For the reasons set forth above and in the *Inmarsat Petition*, Inmarsat urges the Commission to clarify the *Order* and modify the ATC service rules as Inmarsat proposed.

Respectfully submitted,

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September 2, 2003

EXHIBIT A

TECHNICAL ANNEX

Virtually all of Mobile Venture Satellite, LP's ("MSV's") criticisms raised in its opposition¹ are redundant of its comments² in the on Notice of Inquiry issued by the Commission regarding receiver standards.³ Inmarsat has already responded to MSV's attacks, and clarified that, contrary to MSV's accusations, NERA's report was complete and accurate.⁴ In particular, NERA adequately describes its measurement procedures⁵ and properly indicates that the overload threshold is referenced to the input of the receiver front-end.⁶ NERA also provides a

¹ See Mobile Satellite Ventures Subsidiary, LLP ("MSV") *Consolidated Opposition to and Comments on Petitions for Reconsideration*, IB Docket No. 01-185 at 10 and Appendix B (filed Aug. 20, 2003) (the "*MSV Opposition*")

² See Comments of Mobile Satellite Ventures Subsidiary LLC, ET Docket No. 03-65 (filed July 21, 2003) ("*MSV Receiver Standards Comments*").

³ See *Interference Immunity Performance Specifications for Radio Receivers, Notice of Inquiry*, ET Docket No. 03-65 ("*NOI*") (March 24, 2003).

⁴ Reply Comments of Inmarsat Ventures PLC, ET Docket No. 03-65 (filed August 18, 2003) ("*Inmarsat Receiver Standards Reply Comments*").

⁵ See *Inmarsat Petition* at Ex. A §§ 3.2.2. and 3.2.3.

⁶ See *id.* at Ex. A § 3.2.2. With reference to Figure 3.2.2, the vector analyzer block is used to calibrate C/No (as described in bullet 2 of the test procedure), and the IBM PC logs BER based on the terminal's calculation of bit errors since the sent data sequence is known *a priori*. The latter is described in bullet 3. Bullet 4 then explains that the level of the interfering signal (block named GSM) is increased until harmful degradation is experienced. Hence the referencing between overload threshold and the input level is obvious.

description of the general bit error rate⁷ and discusses the specific bit error rate used to determine the threshold.⁸

In addition to its repetitious criticisms, MSV notes that the modulation parameters NERA used for the interfering carriers are somewhat different from those that will be used by the ATC transmitters.⁹ Regardless of whether or not this is true, it would not have any significant effect on the results. As explained in the *Inmarsat Receiver Standards Reply Comments*,¹⁰ the judgment of NERA design engineers is that the two major contributors to the receiver sensitivity in their terminal designs are (i) excessive power levels causing saturation in the AD converters; and (ii) intermodulation harmonics created by downconverter nonlinearities, none of which are significantly affected by the modulation characteristics of the interfering carriers.

As for the excessive power level, it should be noted that, given the frequency offsets discussed, the main contributor will not be the interferer's out-of-channel emissions (to which MSV refers), but rather the high powered mainlobe passing through the initial stages of receive filters. Thus, this damaging effect will not be alleviated by reduced out-of band emissions. With regards to intermodulation effects, which have not been addressed by MSV so

⁷ See *id.* at Ex. A. The general bit error rate of the GAN service is dependent on a number of factors such as GAN system design and actual link conditions (including power levels configured in the network). GAN system definition and operation is based on link budgets that defines a required C/No of 53.2 dBHz at the terminal to provide BER < 10⁻⁶. It is clearly described how this C/No value is calibrated, thereby producing a near-zero BER (<10⁻⁶).

⁸ See *id.* at Ex. A § 3.2.2. NERA measured the level when bit errors starts to occur, *i.e.* when going from the state of a near zero BER to the state of experiencing frequent bit errors real time (BER >> 10⁻⁶). The GAN demodulator is based on turbo decoding which is characterized by a steep BER degradation curve, so the described method is adequate to determine the level of harmful interference.

⁹ *MSV Opposition* at 10 and Appendix B.

¹⁰ *Inmarsat NOI Reply Comments*, Technical Annex § 4.

far, the NERA test report¹¹ has already documented that those damaging effects are almost independent of the frequency offset to the interfering carriers, and again it is clear that it is the high-powered mainlobes of the interferers that create the problems. NERA has confirmed to Inmarsat that changing the interferer modulator parameters to those planned for ATC is highly unlikely to have any significant impact on the results or conclusions from their tests.

To conclude, MSV does not add much new substance to their previous criticism of NERA's GAN tests, which Inmarsat have already responded to and debunked. The only new argument, that unwanted emissions distort the NERA test results, does not affect the comments and conclusions derived from NERA's GAN tests, which Inmarsat have previously presented in its petition and the *Inmarsat Opposition*.

¹¹ *Inmarsat Petition*, Exhibit A, § 4.2.

EXHIBIT B

August 30, 2003

Mr. Rohan Hiesler
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Dear Rohan:

You have asked me to respond to the *Consolidated Opposition to and Comments on Petitions for Reconsideration* submitted to the FCC by Mobile Satellite Ventures Subsidiary LLC (MSV), dated August 20, 2003. In particular, you have requested that Honeywell respond to MSV assertions in paragraph I.E, page 10, and Appendix B of that document. These assertions claim that the RTCA requirement referenced in our previous letter, dated July 7, is "irrelevant" because it refers to a continuous wave (CW) interfering signal. In particular, the MSV document states:

The letter Inmarsat provides from Honeywell purporting to explain that the RTCA standard for the overload threshold of an Inmarsat airborne MET is -72 dBm, not -50 dBm as the Commission assumed, is also misleading and irrelevant because it refers to a section of an RTCA specification that applies only to continuous wave (CW) interference See Appendix B. ... Thus the Honeywell letter is simply not relevant to the issue of potential overload interference from L-band ATC base stations. [*Consolidated Opposition*, pg. 10].

The MSV document correctly notes that the RTCA requirement of -72 dBm applies to a CW signal, and Honeywell does not contest this point. Honeywell also accepts as true the MSV contention that their spread-spectrum signal is not CW interference. However, their conclusion that the RTCA requirement is therefore irrelevant fails to recognize several key factors that must be considered in the interference analysis of the very sensitive radio frequency receivers required for compliance with RTCA DO-210D, including Change 1 and Change 2.

1. MSV's contention that the CW interference requirement is irrelevant is based on the fact that all signals from an MSV ATC station will be spread-spectrum in nature. The contention that the receiver reaction to spread-spectrum signals is fundamentally different from its reaction to CW signals is, in turn, founded on the well-known fact that the peak power spectral density provided by a spread-spectrum signal is well below that of a CW signal. The effect of spread-spectrum signals on narrowband receivers is, therefore, usually considered as noise-like. Honeywell recognizes that the ATC emissions are spread-spectrum. The conclusion that the effects are noise-like, however, requires an additional implicit assumption on MSV's part.
2. For the interference effects to be considered noise-like, the victim receiver must be operating in a linear region. Put simply, linear operation means that the receiver response to the sum of the desired and undesired (interference) signals must be exactly the same as

the sum of the responses of the receiver to each signal individually. The difference (in decibels) in level between two signals that are simultaneously present and linearly processed is known as the instantaneous dynamic range of the receiver.

3. The RTCA requirement to operate with a -72 dBm interfering signal is essentially a requirement on the minimum acceptable instantaneous linear dynamic range of the input signals processed beyond the front end low noise amplifier (LNA). This point is specifically noted in our July 7 letter, which states "Other stages or components of a SATCOM receiver down-stream from the LNA are susceptible to saturation at a lower level [than the -50 dBm specified for the LNA]."
4. If the bandwidth of the victim amplifier is at least as wide as the spreading function, the determining factor for amplifier saturation is the total power at the amplifier input. Thus, insofar as amplifier saturation is concerned, there is no distinction between CW and spread-spectrum interference. It is easy to see that the peak-to-peak voltage swing at the amplifier output does not differ between a constant amplitude CW tone and a constant amplitude wideband direct sequence spread-spectrum signal centered at the same radio frequency. It is this maximum peak-to-peak voltage swing at the amplifier output that determines the amplifier saturation level. Thus, when properly viewed as a saturation specification, the CW requirement of DO-210D, 2.2.4.1.3 is perfectly relevant and should be the determining factor in any interference analysis, as noted in our July 7 letter.
5. RTCA DO-210D establishes no requirements whatsoever about the internal configuration of the SATCOM receiver necessary to achieve the specified performance. Thus, the only assumption that can be made about any amplifier down-stream of the LNA is that it is presented with a signal whose bandwidth is no greater than total SATCOM receive bandwidth. This bandwidth, in turn, is far greater than spreading bandwidths proposed by MSV. Thus, without additional details of the specific receiver design, any interference analysis must assume that the determining factor is the total interference power of -72 dBm, independent of the spreading function. Simply put, CW and spread-spectrum interference will have the same effects on the amplifier saturation.

Therefore, far from being irrelevant as claimed by MSV, the -72 dBm CW interference requirement is the determining factor in the level of interference that can be accepted, provided that the interference is at least 1 MHz away from a tuned Inmarsat channel.

If, however, the MSV-induced interference is within +/-1 MHz of a tuned Inmarsat channel, then the applicable requirement is given in DO-210D, Change 2, Section 2.1.9. In this case, saturation is not the issue, and the interference effect directly on the final signal processing becomes the limiting factor. Acknowledging that the MSV signal is spread-spectrum, the broadband requirement of Change 2, 2.1.9, is -184.9 dBm/Hz, which is far more severe than the -72 dBm established by the saturation requirement.

The FCC, in Appendix C2, Section 2.2.3.2 of FCC Order 03-15 shows an analysis summarized in Table 2.2.3.2.A. As noted in our July 7 letter, this analysis concludes that an AES would have a 10 dB margin with respect to the -50 dBm saturation level for the front-end LNA. As claimed in our July 7 letter, and further substantiated by the five points discussed above, the -72 dBm level

imposed by RTCA DO-210D, Section 2.2.4.1.3 for emissions more than 1 MHz removed from the active Inmarsat channel should be applied to these analyses. This implies that the analysis of FCC Order 03-15 should correctly show a 12 dB deficit instead of a 10 dB margin.

MSV's superficial statements [paragraph I.E, page 10 and Appendix B] in the Opposition document ignore all of the relevant points mentioned above, and, therefore, are simply incorrect. The -72 dBm level, when properly viewed as a saturation specification, is perfectly applicable to spread-spectrum signals of the type proposed by MSV for use in their ATC application. The FCC Order should be modified to use an analysis based on -72 dBm



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CERTIFICATE OF SERVICE

I, Alexander Hoehn-Saric, hereby certify that on this 2nd day of September, 2003, the foregoing "Reply To Opposition to Petition For Reconsideration And Clarification Of Inmarsat Ventures plc" was filed electronically on the FCC's Electronic Comment Filing System and a copy via first class mail, postage pre-paid, upon the following:

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