

COPY

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

In the Matter of)
)
Motient Services, Inc.)
)
and)
)
Mobile Satellite Ventures Subsidiary LLC)
)
Application for Assignment of Licenses and)
For Authority to Launch and Operate a)
Next-Generation Mobile Satellite Service)
System)

File No. SAT-ASG-20010302-00017

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RESPONSE OF INMARSAT VENTURES PLC

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Summary

Mobile satellite service (MSS) in the L-Band provides critical public safety services and also is well suited to serving consumers in underserved remote and rural areas. The Commission must therefore reject proposals by Motient and TMI on the one hand and the terrestrial wireless industry on the other to take some or all of the MSS industry's spectrum for terrestrial wireless services.

Terrestrial wireless carriers urge the Commission to declare the MSS industry dead and put all of the L-Band up for auction. As both Inmarsat and the Applicants have stated, reallocation of the band would deprive the public of critical public safety service and would leave rural customers without access to advanced services that terrestrial carriers cannot or will not provide. Moreover, reallocation of L-Band MSS spectrum would also violate the international obligations of the U.S. Government and would reverse long-standing U.S. policy of promoting MSS.

A partial reallocation of the L-Band to terrestrial use would be similarly devastating. The Applicants argue that their own proposed terrestrial operations in the L-Band will not cause harmful interference to Inmarsat or other users of the band. This claim is unfounded. As Inmarsat demonstrated in its initial filing in this proceeding, the Applicants could not serve any significant number of terrestrial customers without causing massive interference to other users of the L-Band. In response to Inmarsat's careful, conservative engineering analysis, the Applicants rely on a series of overly-optimistic assumptions that simply do not reflect real world conditions. Furthermore, the Applicants' analysis ignores the fact that the L-Band is already saturated, a fact that Motient has repeatedly stressed in other proceedings. For this reason, the Applicants'

proposed terrestrial system would severely restrict frequency reuse within the band, thus making all MSS operators less efficient.

The Applicants continue to claim that their proposed terrestrial service is necessary in order to maintain a financially viable U.S. MSS system. But the Applicants can improve their efficiency without disrupting the operations of other service providers and without undertaking a massive investment in building their own terrestrial wireless infrastructure. More importantly, however, the Applicants have failed to demonstrate any entitlement to extraordinary or special treatment from the Commission that would justify the broad waivers of FCC rules their proposal would require. Other parties such as Inmarsat are eager to begin providing pure L-Band MSS service. The Commission is under no obligation to sacrifice either those parties or their services simply for the benefit of the Applicants.

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Attachment A – Supplemental Engineering Exhibit

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RESPONSE OF INMARSAT VENTURES PLC

Inmarsat Ventures plc (“Inmarsat”), by counsel and pursuant to Section 25.154 of the Commission’s rules, hereby submits its response to the “Consolidated Opposition to Petitions to Deny and Reply To Comments” filed in the above-captioned proceeding by Motient Services, Inc. (“Motient”), Mobile Satellite Ventures Subsidiary LLC (“MSV Sub”) and TMI Communications and Company, Limited Partnership (“TMI”) (collectively, the “Applicants”).¹

As Inmarsat stated in its “Partial Petition to Deny” the captioned application on April 18, 2001, the Applicants’ proposed terrestrial service would cause unacceptable interference to L-Band MSS operations and is inconsistent with FCC rules.² Inmarsat also noted that if the Applicants wish to deploy a hybrid terrestrial/satellite service, dual-

¹ On May 11, 2001, the Commission granted Inmarsat’s Motion for Extension of Time to establish May 21 as the due date for responses to replies and oppositions. *See* Inmarsat Ventures, plc, Motion for Extension of Time, File No. SAT-ASG-20010302-00017 (filed May 10, 2001).

² Inmarsat at 4 *et seq.*

band technology already is capable of accommodating such service.³ Inmarsat did not oppose the Applicants with respect to the proposed transfer of assets and licenses to MSV Sub and the grant of authority to construct a next generation MSS system.

Nearly all of the other commenters, including satellite service providers, wireless service providers, equipment manufacturers and end users, agreed with Inmarsat that the terrestrial L-Band service proposal is not consistent with current rules. They further demonstrated that the Applicants' alternate request for waiver of the rules is both legally deficient and factually misleading. Terrestrial wireless carriers went further, however, and jumped to self-serving conclusions not supported by the record. They claimed that L-Band MSS service has failed as a whole and concluded that the Commission should therefore initiate a rulemaking to reallocate L-Band spectrum for 3G CMRS or some other wireless service.

The Applicants submitted their Consolidated Reply to the comments of Inmarsat and the other parties on May 7, 2001.⁴ Like Inmarsat, the Applicants strongly oppose the reallocation of L-Band spectrum to terrestrial services, noting the critical importance of continued satellite-based service to rural telecommunications, including advanced telecommunications capability.⁵ The Applicants also cite the public interest harm that would result from reallocation due to disruption of critical safety services.⁶

In response to Inmarsat's well documented technical arguments, however, the Applicants claim that their proposed in-band terrestrial operations will not cause

³ *Id.* at 3-4. Dual band technology allows the same terminal to use wireless spectrum for terrestrial applications and satellite spectrum for satellite operations. As Inmarsat noted, Motient and others already have developed such technology and services.

⁴ Inmarsat also submitted a reply to the comments of the wireless carriers on that date.

⁵ Consolidated Reply at 5.

⁶ *Id.* at 7

interference to other L-Band and adjacent band satellites or reduce the potential for frequency reuse.⁷ They further assert that terrestrial operations will not affect sensitive mobile terminals and will not cause harmful interference to GPS receivers.⁸ Finally, the Applicants claim that use of dual-band technology to support combined terrestrial and satellite operations is not spectrum efficient and somehow doomed Iridium and Globalstar to failure.⁹

Inmarsat agrees, of course, that the proposed reallocation of L-Band spectrum to terrestrial service would have a devastating impact on critical domestic and international satellite operations. In this respect, the Applicants' arguments are fully consistent with Inmarsat's.

The Applicants' latest assertion that their proposed terrestrial operations in the L-Band pose no threat of harm to other satellite service providers, however, is simply wrong. As demonstrated herein, in contrast, Inmarsat's original interference analysis is not only technically sound, but was based on conservative assumptions as to the harm the Applicants' system would cause. The Applicants' alternative analysis contains several key omissions and relies on overly optimistic assumptions. In addition, the Applicants have provided no evidence to support their assertion that dual-band operations are not feasible.

⁷ *Id.* at 13 and Technical Appendix.

⁸ *Id.* at 15.

The simple fact remains that there is no place in the L-Band for terrestrial operations. The band must be preserved for the critical satellite services provided by Inmarsat and others.

I. L-Band Terrestrial Service, In Any Form, Will Not Serve the Public Interest.

A. Reallocation of the L-Band to Terrestrial Service.

The Applicants devote a significant portion of their Consolidated Opposition to refuting the proposals of the wireless carriers to reallocate all or part of the L-Band to terrestrial services. As the Applicants note, satellite service remains a critical part of the solution to rural America's lack of sufficient access to telecommunications services, particularly advanced telecommunications capability.¹⁰ The Applicants also correctly state that reallocation of the band to terrestrial service would raise difficult international coordination issues.¹¹ Of course, Motient and TMI are not the only MSS providers in the world. Rather, multiple MSS systems licensed by Japan, Mexico, Russia and the United Kingdom will continue to operate in or near North America regardless of what action the Commission takes here. Finally, the Applicants note that reallocation of the L-Band to terrestrial service would be in derogation of the International Table of Frequency Allotments and therefore would violate U.S. treaty obligations.¹² This would also stand in stark contrast to longstanding U.S. support for development of the global MSS industry.

Inmarsat agrees with the Applicants that reallocation of the L-Band would not

⁹ *Id.* at footnote 16.

¹⁰ *Id.* at 5,10.

¹¹ *Id.* at 11.

¹² *Id.* at 12.

serve the public interest due to the insurmountable damage such action would cause both in the United States and globally. The Commission has long recognized the benefits of satellite service, particularly to customers in rural and remote areas, as well as aeronautical and maritime customers.¹³ Contrary to the claim of AT&T, terrestrial service providers simply do not have the economic or technical ability or incentive to match such ubiquitous coverage. Therefore, reallocation of the band can only harm the public interest, not serve it.

In addition, reallocation of the band would lead to impossible international coordination problems. As the Applicants correctly note, the international L-Band frequency coordination process has resulted in the partition of the band into small slivers of spectrum.¹⁴ Each international L-Band system operates within these slivers, which are scattered across the band. As Inmarsat noted in its Partial Petition to Deny, the systems attempt to employ frequency reuse techniques wherever possible.¹⁵ Furthermore, the amount and location of spectrum available to any single operator is not constant, but is subject to change based on negotiations among all of the operators. This shifting patchwork arrangement would raise impossible coordination obstacles to any U.S. terrestrial service providers attempting to enter the band. None of the wireless carriers discussed this issue in their comments.

Also, as both the Applicants and Inmarsat noted, the United States was one of the primary proponents of the international L-Band allocation, recognizing the crucial role such allotment would play in the provision of aeronautical and maritime safety services.

¹³ See, e.g., Establishing Rules and Policies for the Use of Spectrum for Mobile Satellite Services in the Upper and Lower L-Band, *Notice of Proposed Rulemaking*, 11 FCC Rcd 11675 (1996).

¹⁴ *Id.*

¹⁵ Inmarsat Partial Petition to Deny at 8.

No party has shown any good cause why the abandonment of a U.S. treaty obligation crucial to international safety communications would serve the public interest.

B. The Applicants' L-Band Terrestrial Service Proposal.

While Inmarsat agrees with the Applicants that the public interest would best be served by maintaining the L-Band MSS allocation, Inmarsat believes that the Applicants too readily treat the preservation of L-Band MSS and the preservation of Motient's own business as identical. For example, the Applicants argue that owing to the "tremendous" risk it has undertaken and the "tremendous" resources it has expended, Motient "deserves" the Commission's continued support in the form of consent to the Applicants' terrestrial service proposal.¹⁶ The Applicants also ask rhetorically "[w]hy should the Commission require MSV's spectrum to be used inefficiently?"¹⁷ Indeed, the Applicants' basic argument is that the Commission can only fulfill its commitment to the use of satellites to meet the need for mobile service in America by preserving Motient's financial viability at any cost.

First, Motient is far from alone. Prior to the proposed merger, both TMI and SatCom Systems, Inc., fought long and hard to serve the U.S. market via a Canadian-licensed satellite against fierce opposition from Motient, eventually winning authorization to do so.¹⁸ Also, as noted in its prior comments and in several pending proceedings, Inmarsat is in the final stages of satisfying all the requirements of the ORBIT Act, thus clearing the way for Inmarsat to begin providing full domestic MSS to

¹⁶ Consolidated Opposition at 8.

¹⁷ *Id.* at 9. The terrestrial wireless industry clearly views Motient's startling admission that it operates inefficiently, and similar statements contained in its application, as fully justifying reallocation of the L-Band. But the fate of the global MSS industry cannot be tied to the prospects of one operator.

¹⁸ In the Matter of the Application of SatCom Systems, Inc., and TMI Communications and Company, L.P., Order and Authorization, 14 FCC Rcd 20798 (1999), *aff'd sub. nom.* AMSC Subsidiary Corp. v. FCC, 216 F.3d 1154 (D.C.Cir., 2000) ("*TMI Order*").

the United States.¹⁹ Further, as the comments of KITComm demonstrate, there are yet other providers eager to access the market. Thus, the success of the MSS industry in the United States does not depend on Motient alone – other providers are lined up to offer their services as well.

Second, the Commission has finally and explicitly rejected Motient's claim that it is entitled to continued regulatory protection from foreign competitors or to special treatment by the Commission. In the TMI case, the Commission stated clearly:

AMSC requests that we keep foreign carriers out of the U.S. market long enough for AMSC to use its monopoly power over U.S. customers to increase its traffic so significantly that it justifies its increased spectrum assignment. We find that such a *quid pro quo* would be inconsistent with United States market access commitments in the WTO agreement. If the United States is to obtain 20 megahertz of spectrum for its system, it should be done in the normal course of the international coordination process.²⁰

Thus, it is evident that the Commission is under no obligation to grant the Applicants' terrestrial proposal in order to preserve the benefits of L-Band satellite service in the United States. The Applicants have every right to attempt to provide such service in the most efficient and economical manner possible, and, indeed, Inmarsat encourages such efforts. For instance, Inmarsat does not object to the proposed merger between Motient and TMI, which the Applicants assert will achieve greater efficiencies. In addition, Inmarsat supports the Applicants' proposal to employ spot-beam technology on their next-generation satellite to increase efficiency. If the Applicants' current operations are as inefficient as they claim, then they should develop new, innovative products and services or else relinquish to other MSS operators some of the spectrum that

¹⁹ See, e.g., Comments of Inmarsat in the Matter of Report to Congress Regarding Implementation of the ORBIT Act, Report No. SPB-167 (filed April 27, 2001).

²⁰ *TMI Order*, 14 FCC Rcd at 20813.

they are now assigned but are not using. But the Commission does not owe the Applicants extraordinary or special treatment in order to maintain the service.

II. In-Band Terrestrial Operations Will Cause Unacceptable Interference to Satellite Operations and Limit Frequency Reuse.

One of the fundamental premises of the Applicants' proposed terrestrial service was that it would not cause harmful interference to co-channel or adjacent channel operations of other service providers. In its Partial Petition to Deny, Inmarsat refuted this assertion, providing a technical exhibit that demonstrated that even under favorable circumstances, the proposed terrestrial system would cause harmful interference even if the Applicants drastically limit the number of terrestrial carriers they employ. Under these circumstances, the Applicants' stated goal of attracting millions of subscribers would be impossible.

The Applicants have now responded to Inmarsat's analysis with a technical exhibit of their own. They state that Inmarsat overlooked a number of factors which, when taken into account, demonstrate that the Applicants' terrestrial service will not cause harmful interference to in-band satellite operations or degrade the amount of reusable spectrum.²¹ The Applicants also provide additional information which purports to show that terrestrial operations would not interfere with adjacent GPS band satellite transmissions or sensitive mobile earth stations.²²

As the attached Supplemental Engineering Exhibit explains, the Applicants' objections to Inmarsat's analysis are unfounded.²³ First, Inmarsat's analysis took full

²¹ Technical Appendix at 1-2.

²² *Id.* at 4, *et seq.*

²³ Supplemental Engineering Exhibit of Inmarsat Ventures, plc, attached hereto as Attachment A.

account of the factors Applicants identify to the extent they are relevant to the interference issue. Second, the Applicants' analysis itself is flawed because it relies on several overly optimistic assumptions regarding parameters such as interference margins, shielding and polarization isolation. Furthermore, as Inmarsat noted previously, Inmarsat's own initial analysis was not based on a worst-case scenario, but also employed relatively optimistic assumptions for some parameters. Using more realistic technical assumptions shows that preventing interference to other MSS operators would limit the number of terrestrial users the Applicants could serve to such an extent as to make this service effectively meaningless.²⁴

Furthermore, as the attached supplement shows, the Applicants fail to take into account a number of other extremely important factors regarding the cumulative effects of their proposal on overall MSS frequency use. For example, the Applicants state that they will employ guard bands to protect adjacent band GPS operations.²⁵ They ignore the fact, however, that such guard bands will decrease the spectrum available for terrestrial service, thus further limiting the number of carriers that could be deployed. In addition, as Inmarsat has noted previously, the Applicants' analysis of the effect of the terrestrial service on frequency reuse ignores the multiple MSS systems using the L-Band. Since satellite operator demands are already stretching L-Band capacity to its limits, the magnitude of the impact of a terrestrial system would be far greater than the Applicants' simple analysis suggests.

Finally, the Applicants make several assertions regarding co-channel and adjacent band interference that simply are not supported by hard numbers. For instance, their

²⁴ See Attachment A at Table 1.

²⁵ Consolidated Opposition at 15.

theoretical claims regarding the lack of terrestrial interference to adjacent band satellite operations are directly refuted by Inmarsat's actual experience with this problem. Inmarsat has experienced problems over the years with desensitization of its receivers in Tokyo Bay due to Japanese terrestrial system operations in the band immediately below the satellite downlink band. Again, the Applicants' analysis of this interference scenario makes a number of overly optimistic assumptions. Also, while the Applicants contend that their radio resource proprietary management algorithm will make frequency reuse within their own system possible, they do not provide any technical details to substantiate this claim.

In short, the Applicants fail to demonstrate that their proposed terrestrial service will not cause harmful interference to L-Band satellite operations. For this reason, if for no other, the Commission should reject the Applicants' proposal.

III. The Commission Should Promote Maximum Spectrum Efficiency.

Finally, the Applicants dismiss the suggestion by Inmarsat and others that they could employ dual-band technology already in existence if they believe that terrestrial service is a key component of their operations, and that such a solution would be more efficient than the Applicants' L-Band proposal.²⁶ Their only argument in support of this position is that the business failures of Iridium and Globalstar were the direct result of their attempts to employ dual band technology. This assertion is totally unsupported by any evidence and makes no sense. Furthermore, the Applicants failed to respond to

²⁶ Consolidated Opposition at 9.

Inmarsat's observation that Motient itself has enjoyed some success with a hybrid terrestrial/satellite system already.²⁷

First, it should be emphasized again that spectrum efficiency would not be improved by adoption of the Applicants' proposal. In order to accurately assess the merits of a proposal such as the Applicants', the Commission must look to the impact that proposal will have on *all* affected parties, not just the applicant itself. As has been noted many times, the L-Band is saturated with operators dedicated to providing the pure MSS services for which the band was allocated. The introduction of a terrestrial service would interfere significantly with some or all of those services, thereby harming the public interest by reducing the amount of MSS spectrum available in the L-Band. As Inmarsat's analyses have shown, the L-Band must be used either for satellite or terrestrial service, not both. As the Applicants agree, MSS is an invaluable and irreplaceable service. Thus, the Applicants' proposal would not represent the most efficient use of the spectrum the Commission must manage.

Further, the Applicants provide no evidence that the troubles of Iridium and Globalstar were the result of their attempts to employ dual-band equipment. In fact, even a casual reading of the trade press indicates that the cost of Iridium's equipment and service, unreliability of its satellite service and the broad availability of terrestrial service were all major factors in problems faced by Iridium and other "Big LEO" systems. It strains credulity to suggest that Iridium failed *because* it offered customers the ability to use a cellular system where such service was available, thus reducing airtime charges. It seems far more likely that Iridium failed *despite* this fact.

²⁷ Inmarsat Partial Petition to Deny at 4, footnote 11.

Similarly, the Applicants provide no reason to believe that they could not deploy a dual-band system much more easily and efficiently than the hybrid system they propose. The terrestrial wireless industry in the United States is quite competitive, with six nationwide operators. Although the Commission has not required these operators to allow resale of their service, there are millions of customers who are served by wireless resellers, the largest of which is WorldCom. A dual band system would allow the Applicants to take advantage of the massive investment in terrestrial infrastructure that CMRS providers have already made and obviate the necessity for the Applicants to duplicate this investment.²⁸ The Applicants do not explain why none of the six nationwide wireless carriers would be willing to enter into a relationship with them that promises to dramatically increase usage of their network, if the projections contained in the application are accurate. The Commission should not assume that the wireless industry will, in effect, engage in a concerted refusal to deal with Motient in violation of U.S. antitrust laws, and that the Applicants must therefore deploy a terrestrial network in the L-Band in order to be able to provide service to their customers.

IV. Conclusion.

Inmarsat agrees with the Applicants that general reallocation of part or all of the L-Band to terrestrial service would not serve the public interest. However, Inmarsat continues to oppose the Applicants' own request to provide in-band terrestrial services on the grounds that it is technically infeasible and unnecessary. The Applicants have provided no evidence to undermine Inmarsat's position. Therefore, for the reasons

²⁸ In fact, it is well known that one of the biggest challenges facing the terrestrial wireless industry is the shortage of suitable antenna locations. The Applicants' proposal would only compound this problem for no good reason.

discussed herein and in Inmarsat's previous filings, Inmarsat urges the Commission to deny the above-captioned application to the extent that it seeks authorization to provide L-Band terrestrial service.

Respectfully submitted,

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ATTACHMENT A

SUPPLEMENTAL ENGINEERING EXHIBIT

1. **Comments Regarding Interference to Co-Channel Satellite Systems and the Reduction of Satellite Reuse Possibilities**

In its Partial Petition To Deny, Inmarsat presented a simplified analysis of the proposed MSV terrestrial operation that demonstrated that even a very limited number of co-channel mobile stations would cause unacceptable interference to MSS. Inmarsat's analysis also demonstrated that use of L-Band spectrum by terrestrial mobile stations would degrade the reuse possibilities of the spectrum, thereby effectively reducing the amount of spectrum available for MSS operations.

In response to Inmarsat, the Applicants present an alternative analysis which they claim demonstrates that no interference will be caused to L-band satellite systems even with the operation of over 5000 co-channel mobile stations. The Applicants state that Inmarsat has overlooked four key factors. However, as discussed below, Inmarsat did consider these factors to the extent they have any bearing on the interference issue. In fact, the Applicants' own analysis makes a number of overly optimistic assumptions, which Inmarsat also discusses below. Further, Inmarsat again emphasises that its own initial analysis did not represent a worst case scenario. Herein, Inmarsat discusses some of the variables employed in its analysis. Finally, regardless of the assumptions made, Inmarsat believes that any allowance made for terrestrial mobile operation in the L-band inevitably will constrain the future development of MSS in the band.

a) The Applicants State that Inmarsat Has Overlooked Four Key Factors

The Applicants claim that Inmarsat overlooked four key factors in its interference analysis. In fact, this is not true. These factors are not relevant to a general analysis, as the amount of interference reduction provided varies depending on the particular scenario considered.

- *Carrier bandwidth difference:* The Applicants' analysis included a 13 dB bandwidth factor. Since Inmarsat's analysis was based on the characteristics of the Applicants' proposed system, Inmarsat accepts that a 6 dB factor could have been used, if a bandwidth factor were to be applied at all. However, the increased number of co-frequency carriers that would have resulted from including this factor is offset by the fact that other assumptions were optimistic, as discussed in the following sections. Carrier bandwidths for MSS carriers vary over a wide range. For example, Inmarsat currently operates carriers with bandwidths ranging from a few kHz up to 100 kHz. On the Inmarsat-4 satellites, due to start service in 2004, carriers with up to at least 200 kHz bandwidth will be used. It can generally be stated that carrier bandwidths of MSS systems tend to increase, due to the increasing demand for higher rate data services, but the characteristics of MSS carriers evolve over time, and the exact link

requirements of future carriers are of course unknown. This leads to the conclusion that an analysis that is independent of specific carrier parameters and instead based on the fundamental characteristics of the satellites, is preferable. Inmarsat provides such an analysis below.

- *Power control:* Inmarsat agrees that this factor is applicable if the number of mobiles is sufficiently high to enable averaging of mobile terminal EIRP levels. The required number depends on the distribution of MS power levels and a detailed statistical analysis would be required to determine the appropriateness of using a power control factor. More importantly, however, a perfectly realistic scenario exists where only one or a few mobile stations would cause unacceptable interference to a satellite, as shown in Table 1 below. In this case, there will be no power control advantage.
- *Polarisation discrimination:* According to Appendix S8 of the Radio Regulations, the polarisation isolation between an interfering linearly polarised signal and a circularly polarised (LHC or RHC) wanted signal is 1.4 (i.e. 1.46 dB). However, this value would not reliably be available in the present case, due to several factors. The polarisation of the MES antenna may not be perfectly circular, especially for small, low-gain MES. The same is also true of the satellite antenna, which can be expected to be closer to circular, but not perfectly circular. Furthermore, de-polarisation of the transmitted signal occurs, especially in mobile propagation environments as in the case of MSS. Finally, the Applicants make the critical assumption that MSS satellites will be circularly polarised. Although this may be the case with the currently operational satellites, some future MSS satellites may use linear polarisation.
- *Satellite antenna discrimination:* There is very little difference between Inmarsat's and the Applicants' assumed value for this parameter. This value will vary depending on satellite design and the angular separation between the satellite beams and the terrestrial cell. Therefore, 20 dB is just as appropriate as 22 dB, and in some cases lower values will also apply. As an example, the Applicants themselves present an analysis of interference into its own satellites, which uses a 10 dB satellite antenna discrimination.

b) The Applicants Employ Overly Optimistic Assumptions in Their Interference Analysis

Inmarsat believes that the analysis attached to the Applicants' Consolidated Opposition relies on a number of overly-optimistic assumptions. These assumptions are discussed below.

- *Interference margin:* The Applicants adopt the assumption from Inmarsat's initial analysis of a 1 dB interference margin allocated exclusively to interference from terrestrial mobile units. However, Inmarsat itself used this assumption only for the sake of simplicity, and it should be recognised that this is a very optimistic figure. Although 1 dB

corresponds to 20% of the system noise and is a typical interference margin for MSS systems, this margin has to accommodate interference from *several* sources, including co-channel interference from other MSS networks. It is therefore too optimistic to assume that the whole margin will be available for terrestrial mobile interference. In MSS coordination, 6% of the system noise, corresponding to a 0.25 dB margin is normally allocated to interference from a single network.

- *MES EIRP*: As pointed out in Inmarsat's filing, the MES EIRP (5 dBW) used in the calculations is the *maximum* EIRP. This was used since no information was available in the Applicants' filing about the minimum EIRP. However, using the maximum EIRP under-estimates the carrier-to-interference ratio (C/I). The difference between maximum and minimum EIRP for mobile earth stations varies, but a typical value would be 6 dB. This would offset the advantage claimed by the Applicants for power control on the terrestrial mobile signal.
- *Satellite antenna discrimination*: As mentioned above, 22 dB antenna discrimination will not be available in all cases.
- *Shielding*: The Applicants did not question Inmarsat's choice of 15 dB for this parameter, perhaps because it represents a quite optimistic case. 15 dB discrimination would be available only for mobile terminals that are well inside buildings. Mobile terminals which are in urban streets, in buildings close to windows or on the top floor of buildings would normally not achieve this level of isolation. It appears from the Applicants' filing that their intention is to put base stations in outdoor locations. On page 9 of the Appendix, for example, they state that "base station antennas will typically be installed on towers or rooftops". With installations at such sites, it has to be expected that mobile terminals will access the base stations from outdoor locations and the shielding would have to be assumed to be nil.
- *Polarisation discrimination*: This has been discussed above.

c) Inmarsat Initially Did Not Present A Worst-Case Scenario

As stated in Inmarsat's comments, on several counts, Inmarsat's analysis did not represent a worst case scenario, but instead recognised that both better and worse cases exist. However, in order to more critically assess the Applicants' proposal, Inmarsat believes the following additional factors should be taken into consideration:

- As discussed above, a 1 dB interference margin allocated to terrestrial mobile interference is excessive.
- The maximum MES EIRP was used, whereas the minimum would have been more appropriate.
- The satellite antenna discrimination may be less than the 20 dB assumed.

- The shielding factor of 15 dB, as discussed above, assumes that the Applicants' mobile terminals will all be within buildings.

d) Additional Interference Calculations

To illustrate the above points, an additional interference link budget is given in Table 1 below. To simplify the analysis, the calculations shown below derive the increase in satellite noise due to terrestrial mobile interference. This analysis gives a more basic measure of the effect of introducing terrestrial stations in the band, which is independent of particular carrier parameters.

		W. PC	W/O PC	Comments
Motient satellite G/T (at beam peak)	dB/K	18.3	18.3	From Motient's filing
Satellite antenna gain	dBi	42	42	From Motient's filing
Satellite T	dBK	23.7	23.7	Calculated
Satellite No	dBW/Hz	-204.9	-204.9	Calculated
6% interference allowance	dBW/Hz	-217.1	-217.1	Assumed
Mobile station EIRP	dBW	0	0	From Motient's filing
Bandwidth	kHz	200	200	From Motient's filing
MS EIRP SD	dBW/Hz	-53.01	-53.01	Calculated
FSL	dB	188.8	188.8	Calculated
Shielding	dB	0	0	Assumed
Satellite antenna discrimination	dB	20	20	Assumed
Power control	dB	6	0	From Motient's reply comments
Io per carrier	dBW/Hz	-225.81	-219.81	Calculated
Number of carriers possible		7.4	1.9	Calculated

Table 1: Interference link budget based on Applicants' proposed terrestrial and satellite parameters

The assumptions used in the interference link budget shown in Table 1 are consistent with the comments made in the previous section. The second column (labelled W. PC), which includes a power control advantage of 6 dB, derives the number of possible co-frequency mobile carriers as 7 (if 8 carriers are present, the aggregate interference will exceed the assumed allowance). However, since this number is quite small, the power control factor of 6 dB is highly questionable. This is confirmed by the calculation in the third column (labelled W/O PC), which shows that only two carriers operated at maximum EIRP would cause the interference limit to be exceeded.

Thus, above calculations confirm what Inmarsat stated in its previous comments: that to protect satellite operations, the number of co-frequency carriers that could be allowed on the Applicants' terrestrial system would be extremely limited.

e) **The Number of Possible Terrestrial Subscribers Is Highly Relevant to an Assessment of the Effect of the Applicants' Proposed System On MSS Operations**

In its previous comments, Inmarsat used the result of its interference link budget to estimate the number of subscribers that could be supported in the Applicants' terrestrial network. In reply, the Applicants state that the traffic model

used by Inmarsat was flawed. However, they offer no explanation in support of this statement. Rather, the Applicants further claim that the number of subscribers is irrelevant to an analysis of the potential for harmful interference.

Inmarsat strongly disagrees with the Applicants' dismissal of this figure. In fact, the number of co-frequency carriers is meaningless unless it is translated into a number of subscribers, since the latter number gives an indication of whether it is possible to introduce a financially viable terrestrial service while still protecting satellite operations. The Applicants have identified a mass market of up to several million users that they seek to serve. However, they have failed to demonstrate how such a large number of subscribers *could* be served, given that the number of carriers would be so limited by interference concerns. In fact, Inmarsat continues to believe that the number of possible subscribers is simply too small to be compatible with the service that the Applicants propose to provide. The only way that the Applicants could serve the identified market using the L-band would be to deprive MSS operators of access to part of the L-Band. Inmarsat strongly reiterates that this is unacceptable given the already congested state of MSS operations at L-band, a state that the Applicants do not dispute.

f) The Commission Must Examine the Impact of Terrestrial Mobile Operation on All L-Band Systems

A very important point should not be lost sight of while considering the details of the interference calculation discussed above. If any allowance at all is made in L-band MSS link budgets for terrestrial mobile interference, this allowance would not be available for interference from other satellite networks. As an example, if a total of 20% of the satellite system noise is available for interference, this allows interference entries from approximately 4 satellite systems. If one of these entries is made available for interference from a terrestrial mobile system, only 3 satellite systems can be accommodated. Thus, the addition of terrestrial mobile systems in the band will reduce the possibility of frequency reuse in the band, both within the Applicants' own system and among other MSS systems, thereby reducing the spectrum efficiency of the MSS use of the band.

Finally, in the hypothetical case that the Applicants are able to restrict their terrestrial service to the extent that frequency reuse of *current* MSS systems is not degraded, the flexibility of MSS operators to develop *future* MSS systems would be constrained due to the need to take into account the particular characteristics of the additional interference source, and presumably the need to provide protection to the Applicants' terrestrial service. The restrictions such services would place on the evolution of future MSS services represent yet another reason why the public interest would not be served through grant of the application.

2. Comments On Interference Into Adjacent Band MES and GPS

The Applicants state that they have performed measurements on MES and GPS equipment which establish that such equipment will not suffer interference from operation of the Applicants' terrestrial base stations. Inmarsat is unable to offer meaningful comments regarding these conclusions without knowing more about the

equipment tested and the manner in which the measurements were derived. Suffice it to say that Inmarsat is not convinced by the Applicants' results and remains concerned about this issue. The main reason for Inmarsat's concern is the fact that, as reported in its initial comments, Inmarsat users have experienced such blockage from terrestrial mobile transmissions in an adjacent band.

The Applicants further claim improved protection for adjacent band MES based on several factors, including power control and voice activation to a total of 10 dB. However, these factors are questionable since a transmission at peak power could cause blocking of an MES regardless of the duration of the transmission. A further 8 dB advantage is claimed due to the use of LHC polarisation for the proposed terrestrial base stations, whereas MSS terminals use RHC polarisation. As discussed above, future MSS systems may well use different polarisations, in which case this advantage will not be available. Furthermore, the Applicants claim this polarization advantage in conjunction with base station antenna discrimination, ignoring the fact that the polarization performance of antennas is not reliable off antenna boresight. The Applicants also rely on protection provided by their proprietary radio resource management algorithms. However, since no details of these algorithms are made available it is not possible to assess if any improved protection would be available.

The Applicants also state that a guard band of [at least] 400 kHz will be used to ensure that no interference is caused to adjacent band terminals. Inmarsat notes that this guard band will of course limit further the amount of spectrum the Applicants could use for their terrestrial service and thereby further restrict the number of terrestrial subscribers that could be served.

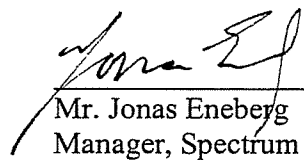
3. Comments on spectrum efficiency and dual band operation

In several places in their original filing and in the reply comments, the Applicants refer to the improved spectrum efficiency they claim is offered by their new system. They claim that spectrum efficiency would be improved in two ways: "(i) by using advanced, spot-beam technology to provide greater frequency reuse by the satellite, and (ii) by assigning to the fill-in base stations the frequencies that, in that local area at that time, the satellites cannot use." Inmarsat has no quarrel with the first of these claims, and indeed has supported the Applicants' spot beam proposal. However, as discussed in detail in Section 1 above, the Applicants' claim regarding the spectrum efficiency of its terrestrial proposal does not take account of the fact that a terrestrial service cannot operate without introducing additional interference into the band. As Inmarsat has noted several times, this will reduce the effective spectrum availability for MSS by reducing the satellite reuse possibilities.

CERTIFICATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this pleading and its attachment, that I am familiar with Part 25 of the Commission's Rules, that I have reviewed the engineering information submitted in this pleading, and that it is complete and accurate to the best of my knowledge and belief.

18-05-2001
Date


Mr. Jonas Eneberg
Manager, Spectrum

CERTIFICATE OF SERVICE

I, Maria Cabico, a secretary to the law firm of Powell, Goldstein, Frazer and Murphy LLP, certify that copies of the attached Response of Inmarsat Ventures, plc, were delivered May 21, 2001, via 1st class mail, postage prepaid, to the following parties:

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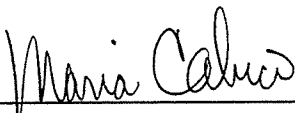
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