Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands	))))	IB Docket No. 02-10

PARTIAL OPPOSITION AND COMMENTS OF PANAMSAT CORPORATION

Introduction and Summary

The Boeing Company ("Boeing") and ARINC Incorporated ("ARINC") have filed petitions seeking reconsideration of the Report and Order ("R&O") in the above-captioned proceeding regarding Earth Stations on Board Vessels ("ESVs") operating in the 5925 – 6425 MHz, 14000 – 14500 MHz, 3700 – 4200 MHz, 10950 – 11200 MHz, 11450 – 11700 MHz and 11700 – 12200 MHz bands.[1] PanAmSat Corporation ("PanAmSat"), by its attorneys and pursuant to Section 1.429(f) of the Commission's rules, hereby opposes in part the Boeing and ARINC petitions. PanAmSat also comments in this filing on certain elements of the Boeing and ARINC petitions that PanAmSat supports.[2] As discussed below:

- PanAmSat agrees with the Commission that each ESV in a system employing simultaneous co-channel transmissions should be subject to an individual EIRP density limit based on the aggregate limit minus 10log(N).
- If the Commission reverses itself and adopts Boeing's proposal to permit such systems to operate without being subject to limits for individual ESVs, then applicants should be required to make a detailed showing as to the measures they propose to employ in an effort to comply with the aggregate off-axis EIRP masks.

[1] FCC Doc No. 04-286 (Jan. 6, 2005).
[2] PanAmSat also has filed a petition for reconsideration in this proceeding.

- The Commission should reject ARINC's proposal to eliminate the pointing accuracy requirement for ESVs. It is unnecessary, however, to specify a maximum mispointing error in the rules, so long as pointing error is factored into the off-axis EIRP limit.
- The Commission should reject Boeing's proposal to permit a gap of as much as three seconds between the time that the maximum pointing error for an ESV system has been exceeded and the time that the mispointing is corrected.
- Subject to refinements suggested by PanAmSat, the Commission should accept Boeing's proposal that ESVs be permitted to operate with power levels that exceed the Commission's off-axis EIRP density limit if the power levels have been coordinated with adjacent satellite operators.

Discussion

I. OFF-AXIS EIRP DENSITY LIMITS FOR INDIVIDUAL ESVs

In its Petition for Partial Clarification or Reconsideration (the "Boeing Petition"), Boeing requests clarification with respect to the off-axis EIRP limits that are applicable to individual earth stations when access techniques (*e.g.*, CDMA) that allow simultaneous transmissions in the same frequency band are used[3]. Boeing states that the R&O could be read as limiting the off-axis EIRP *per earth station* to a value equal to the aggregate off-axis EIRP limit minus 10log(N), where N is the maximum number of simultaneous co-frequency transmissions at a given instant. Boeing objects that "[s]uch an approach would preclude a bandwidth-on-demand ESV system … because it does not account for the varying capacity needs of individual ESV terminals."[4]

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[3] *Petition for Partial Clarification or Reconsideration of the Boeing Company,* IB Docket No. 02-10, Mar. 2, 2005, see Section II.
[4] Boeing Petition at 17.

The Commission recently addressed this issue in another proceeding. In an order released last month, it amended Sections 25.221(a) and 25.222(a) of its rules in order to clarify that the 10log(N) adjustment applies to ESVs.[5] PanAmSat supports this approach, because it provides a stable, predictable environment for taking into account the maximum off-axis EIRP that can be generated by any particular ESV. The approach also makes it possible to determine with ease whether an ESV system is capable of satisfying the aggregate mask.

If the Commission, notwithstanding its recent action and the benefits associated with it, nevertheless were to permit simultaneous co-frequency transmissions from ESVs that are not subject to a uniform EIRP density limit, as Boeing has proposed, then special care would be warranted. ESV systems are comprised of large numbers of earth stations that are in motion. If EIRP density can vary without limit from ESV to ESV, and if EIRP density for any given ESV can vary without limit from one moment to the next, then maintaining compliance with the aggregate off-axis EIRP limit in systems with simultaneous co-frequency transmissions becomes a complex task of power management requiring sophisticated techniques. In these circumstances, ESV system applicants should be required to make a detailed showing as to the measures they propose to employ in an effort to comply with the aggregate off-axis EIRP masks.[6]

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[5] *See 2000 Biennial Regulatory Review – Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations*, Sixth Report and Order and Third Further Notice of proposed Rulemaking ("6th R&O and 3rd NPRM") , IB Docket No. 00-248, Appendix B (Mar. 15, 2005)

[6] Sections 25.221(a) and 25.222(a) of the rules already require generally that "applications for licenses for ESVs … provide sufficient data to demonstrate that ESV operations meet the [required] criteria." Given the complexities discussed above, however, the Commission should add language making clear the need for a detailed showing in the case of ESV systems that use simultaneous transmissions on the same frequency and that have no EIRP density limit for individual ESVs.

II. POINTING ACCURACY

In its Petition for Reconsideration (the "ARINC Petition") ARINC asks that the Commission eliminate the pointing accuracy requirement for ESVs[7]. PanAmSat strongly opposes this proposal. For reasons that are discussed below, it is impossible, absent information concerning pointing accuracy, to evaluate whether the aggregate off-axis EIRP mask will be satisfied.

ARINC maintains that "even when the antenna is mispointed by a full 4 degrees … it does not encroach on the off-axis EIRP limit"[8]. The facts presented by ARINC, however, do not support this proposition. In Figure 1 of its Petition, ARINC compares the off-axis EIRP of a *single* Ku-band earth station "similar to those SKYLink℠ has operated" with the *aggregate* off-axis EIRP mask. This comparison is meaningless, because the SKYLink℠ system developed by ARINC allows simultaneous transmissions on the same frequency. The pertinent question, which ARINC does not address, is whether the combined effect of all of the simultaneously transmitting co-channel ESVs in the system, if mispointed by four degrees, would exceed the aggregate limit. It is likely that, in many cases, substantial mispointing will cause the aggregate off-axis EIRP mask to be exceeded.

Boeing requests that the Commission take pointing accuracy into account in its off-axis EIRP limit.[9] PanAmSat has no objection to this approach. In fact, PanAmSat made a proposal along these lines in its Petition For Reconsideration Or Clarification.[10]

Boeing suggests implementing its proposal by substituting $(\theta+\delta\theta)$ for θ in the off-axis EIRP masks in § 25.221(a) and §25.222(a), where $\delta\theta$ is the maximum

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[7] Arinc Incorporated *Petition Reconsideration,* IB Docket No. 02-10, Mar. 2, 2005.
[8] *Id.*, see page 5 and Figure 1 (page 2 of the Technical Appendix).
[9] *Petition for Partial Clarification or Reconsideration of the Boeing Company,* IB Docket No. 02-10, Mar. 2, 2005, see page 21 in Section III.
[10] *Petition of PanAmSat Corporation for Reconsideration or Clarification,* IB Docket No. 02-10, Mar. 2, 2005, see Section 2b, in particular the example therein.

pointing error. The same result could be achieved more simply, however, if the Commission were to shift by $\delta\theta$ the off-axis EIRP density charts referred to in Sections 25.221(b)(1) and 25.222(b)(1) or the gain charts referred to in Sections 25.221(b)(2) and 25.222(b)(2).[11] PanAmSat recommends using the simpler approach.

Boeing claims that so long as pointing error is factored into the off-axis EIRP limit, then there is no need for the Commission to establish a mispointing limit in its rules.[12] PanAmSat agrees. But even if there is no legal limit on pointing error, each applicant should be required to specify the maximum mispointing ($\delta\theta$) that could occur in its system, without which it is not possible to determine the amount by which the off-axis EIRP density charts or gain charts would have to shifted when checking compliance with the aggregate mask for the system.[13] In addition, the applicant should be required to make a technical showing (*e.g.*, a showing as to tracking capabilities) addressing how this pointing accuracy can be achieved.

The principles expressed in the preceding paragraph reflect an evolution in PanAmSat's thinking. Accordingly, PanAmSat is modifying the proposal it made in its Petition for Reconsideration or Clarification for revising Sections 25.221(a)(6) and 25.222(a)(6) of the rules.[14] PanAmSat's new proposal for how those rules should read is as follows:

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[11] Since it is not known towards which adjacent satellite the mispoint will occur, the off-axis EIRP density charts referred to in § 25.221(b)(1) and §25.222(b)(1) or the gain charts referred to in § 25.221(b)(2) and §25.222(b)(2) would have to be shifted by $+\delta\theta$ and by $-\delta\theta$ in order to account for situations in which antenna patterns are not symmetric around $\theta=0$.

[12] Actually, the fact that different applicants may specify different values of $\delta\theta$ is one more reason why, as discussed in the previous paragraph, rather than shifting the EIRP masks it is better to shift the individual off-axis EIRP density charts or gain charts.

[13] If dynamic control ESV systems were permitted along the lines proposed in the Boeing Petition, mispointing for such systems would be taken into account not by shifting the charts but rather by being incorporated in the power control strategy.

[14] Id., Section 1a.

> "A maximum pointing error ($\delta\theta$) between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna has to be specified by the applicant. ESV antenna systems must utilize an automatic antenna pointing mechanism and present a technical showing in support of the fact that such mechanism is capable of achieving and maintaining the specified minimum antenna pointing accuracy."

Boeing also addresses in its petition issues relating to the time it takes for an ESV to cease transmitting if it is mispointed beyond the maximum level for its system as specified in the FCC license application. Because ESVs generally maintain their pointing accuracy using tracking technology, Boeing refers to such mispointing as a "tracking exceedance." There are two components to this period of time: (1) the time it takes to detect that the maximum pointing error ($\delta\theta$) has been exceeded (T_d); and (2) the time it takes to cease transmitting once an exceedence has been detected (T_c).

What matters in terms of the potential for interference to an adjacent satellite is the sum of these intervals (*i.e.*, $T = T_d + T_c$). Accordingly, the time limit specified in the rules should apply to the total time it takes to detect an exceedance and correct it, and the clock should start running as soon as an exccedance occurs.

It T is set at too high a level, the EIRP density mask loses force, because ESVs can cause unacceptable interference to adjacent satellites before corrective measures are taken. The time that it takes for a mispointed ESV to cause unacceptable interference is exceedingly small. Accordingly, PanAmSat opposes as insufficient Boeing's proposal that T be set at three seconds and also opposes the ETSI approach, which Boeing refers to, under which an ESV applicant can select any value of T, up to five seconds, for its system.[15].

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[15] *Petition for Partial Clarification or Reconsideration of the Boeing Company,* IB Docket No. 02-10, Mar. 2, 2005, see footnote 39. As explained in Boeing's footnote, the ETSI approach includes an incentive that is intended to encourage applicants to select values of T that are below the maximum.

III. COORDINATING POWER LEVELS IN EXCESS OF THE OFF-AXIS EIRP DENSITY LIMIT

Boeing proposes that Ku-band ESVs be permitted to operate with power levels that exceed the Commission's off-axis EIRP density limit if the power levels have been coordinated with adjacent satellite operators.[16] PanAmSat agrees with Boeing in principle. PanAmSat disagrees, however, with some elements of the manner in which Boeing proposes to implement this approach.

Boeing makes a separate proposal for "regions where two-degree spacing is not the norm," and in that context makes reference to Europe and Asia where, according to Boeing, "three degree spacing is the norm." There is no basis for this characterization. Throughout the geostationary arc (including portions of the arc that are over Europe and Asia) there is a wide range of orbital spacing, including values that are smaller (as well as larger) than two degrees. Accordingly, relaxing the off-axis EIRP limits for ESVs that transmit to satellites over Europe or Asia, based on an assumption that the closest satellite will be at least three degrees away, would be inappropriate and would expose adjacent satellites to unacceptable interference.

PanAmSat proposes instead that a uniform set of principles apply to U.S. licensing of ESVs that transmit at off-axis EIRP levels exceeding the limits specified in Section 25.222(a) of the rules. PanAmSat suggests the following approach:

[16] Id., Section I.

Licensing of these earth stations should be satellite specific. Granting blanket authority would be inconsistent with the fact that higher power levels must be coordinated with the operators of satellite networks that are located within six degrees of the target satellite.

If the target satellite is not U.S.-licensed, then (as Boeing has proposed) the applicant should be required to provide a certification from the operator of the target satellite to the effect that the required coordination agreements are in place.

If the target satellite is U.S.-licensed, then each satellite network that must be coordinated with could be either U.S.-licensed or foreign-licensed. If it is foreign-licensed, then a coordination agreement permitting the higher EIRP density levels may already be in place. The certification procedure proposed by Boeing may expedite matters in these circumstances, because it eliminates the need for a new contact between the two operators. Accordingly, PanAmSat supports Boeing's proposal for a certification procedure in cases in which the target satellite is U.S.-licensed and the satellite network that has been coordinated with is foreign-licensed.

PanAmSat disagrees with Boeing's approach, however, for cases in which the target satellite and the other satellite both are U.S.-licensed. U.S. operators generally address services that are not two-degree compliant on a case-by-case basis. Consequently, it is unlikely if two U.S.-licensed operators are involved that there will be an existing coordination agreement addressing excess EIRP density levels. If there is no existing coordination agreement, then the certification procedure proposed by Boeing will be of no benefit. Accordingly, whenever the required coordination involves two U.S.-licensed satellites, affidavits from the adjacent satellite operators confirming their agreement to the non-compliant ESV operations should be required. Requiring affidavits in such cases also has the added benefit of ensuring that U.S.-licensed operators have

up-to-date information concerning the interference environment in which they are operating.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing PARTIAL OPPOSITION AND COMMENTS OF PANAMSAT CORPORATION was sent by first-class mail, postage prepaid, this 21st day of April, 2005, to the each of the following:

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