

**BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554**

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

COMMENTS OF INMARSAT VENTURES LTD

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February 23, 2004

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14.5 GHz/11.7-12.2 GHz Bands)

COMMENTS OF INMARSAT VENTURES LTD

1. Introduction

Inmarsat Ventures Ltd (“Inmarsat”) has an interest in this proceeding as the parent corporation of Invsat Ltd (“Invsat”), a company specializing in providing integrated communications networks and systems over very small aperture terminals that operate in the portions of the C band and the Ku band that are allocated for the Fixed Satellite Service (“FSS”). In particular, Invsat has partnered with a manufacturer who has developed small, lightweight terminals that are highly transportable and are well-suited for maritime uses, such as serving offshore oil platforms, cruise ships and ferries.

Invsat uses ESVs to provide critical voice and broadband connections to ships and oil platforms and thereby provide passengers and workers on those vessels with connectivity to the rest of the world. ESVs provided by Invsat serve vessels that operate throughout the world, some of which call at ports in the United States. Currently, vessels are required to cease their ESV transmissions when close to United States ports. Inmarsat welcomes the opportunity to improve service to its customers by taking advantage of the Commission’s proposal to facilitate

the authorization of ESV operations close to the United States coast and within its ports. Invsat services currently are provided through hubs located outside the United States, but Inmarsat also is considering providing ESV services through a U.S. hub. Thus, Inmarsat is particularly interested in the proposals for improving the ways that ESVs are licensed.

The maritime services offered through Inmarsat's own network include packet and circuit switched links with data rates up to 64 kbps. Inmarsat is constrained from providing higher data rate services by the limited amount of spectrum available for the Mobile Satellite Service ("MSS"). The L band MSS spectrum that Inmarsat uses totals 41 MHz in each direction (including the additional spectrum allocated by WRC-03), which is less than one-tenth the spectrum available for ESVs in FSS bands – 500 MHz in each direction in the C band and 500 MHz in each direction in the Ku band. Thus, the ability to deploy ESVs in the C band and the Ku band overcomes the bandwidth constraints inherent in the L band. Furthermore, C and Ku band ESV operations can make use of the large number of existing FSS satellite networks that currently provide "conventional" FSS services.

ESVs are used for providing service to vessels that have high bandwidth communications requirements which cannot be met by traditional MSS systems. These include cruise vessels with large numbers of passengers and crew who can use the ESV capabilities for a variety of needs, including making telephone calls, sending e-mails, and accessing the world-wide-web. Among other things, ESVs allow crew members and passengers to use their mobile phones while on board by communicating through low power mobile phone base stations, which are then linked to the PSTN by the ESV. ESVs are also used to provide research vessels, such as those used by petrochemical companies, with the capability to transfer large amounts of data to

and from their corporate headquarters. Companies also use ESVs to extend their corporate LAN facilities to their fleets of ships.

Inmarsat applauds the Commission's proposal to develop appropriate regulatory provisions and a licensing mechanism that respond to the growing role of ESVs, and that recognize the importance of ESVs in meeting the needs of maritime users that cannot be met by systems operating in the MSS frequency bands

Inmarsat actively participated in the ITU studies that took place in ITU-R Working Parties 4-9S and 4A regarding ESVs, and is pleased to see the new provisions for ESVs that were put into place in the Radio Regulations at WRC-03. The new international regulations and the ITU-R Recommendations present a significant step forward in the regulation and facilitation of ESVs. Inmarsat commends the Commission on being one of the first administrations to consider making national rules to reflect the new international provisions.

Inmarsat recognizes that the regulation of ESVs presents some new issues and commends the Commission for thoroughly identifying the relevant issues in the NPRM. Below, Inmarsat provides information and its views relating to the questions raised in the NPRM.

2. Basis For ESV Operations and U.S. Table of Frequency Allocations

In paragraphs 27 and 28, the Commission discusses the regulatory status of ESVs. Throughout the discussions within the ITU regarding ESVs, Inmarsat has strongly supported that ESVs be considered as part of the primary FSS. ESV characteristics must conform with the characteristics of FSS earth stations for which the satellite network supporting the ESV has completed coordination with other satellite networks. One advantage of this approach is that it ensures that ESV characteristics can be fully taken into account in the coordination process between FSS networks, thereby ensuring protection of FSS satellites adjacent to the satellite serving the ESV, and ensuring protection of ESVs from the transmissions of other FSS satellites.

Through footnote 5.457A, WRC-03 clearly authorized ESVs to operate as part of FSS networks which are allocated on a primary basis. WRC-03 also authorized ESVs operating at specified fixed points to be treated in the same way as conventional earth stations of the FSS and to have the right to coordination. With regard to ESVs in motion, although paragraph 3 of Annex 1 of Res 609 states that ESVs in motion shall not claim protection from transmissions of terrestrial services operating in accordance with the Radio Regulations, that provision does not specify whether ESVs are to be considered primary or secondary. Hence, in Inmarsat's view, there is no doubt that ESVs may be treated as a particular type of primary FSS earth station and, when it comes to coordination with other FSS networks, may be treated in the same way as conventional FSS earth stations.

In paragraph 30, the Commission requests comment whether ESV operations in the Ku band warrant the same secondary status as MSS operations in the band or, alternatively, would be better governed through regulation under the secondary MSS allocation. With regard to the U.S. Table of Frequency Allocations and the protection of terrestrial services, it appears to make little difference whether ESVs are classified as primary or secondary since, in either case, the provisions for protecting terrestrial (and space research and radioastronomy) systems would be applied through other regulatory measures, namely footnotes to that table. As the Commission suggests, ESVs should be included in inter-system coordination which can be accomplished in a meaningful manner only if they are treated as part of the primary FSS service. Hence, Inmarsat proposes that to the extent that it is necessary to classify ESVs, they should be classified as "primary." This does not constrain the Commission's ability to impose special conditions with respect to protection from terrestrial services, for example through footnotes or service rules.

2.1 Ku Band ESVs

The Commission indicates, for example in paragraph 60, that it aims to encourage ESV operations in portions of the Ku band where there are no primary FS licensees and where harmful interference to terrestrial systems is less likely to occur. There are no primary FS allocations in any portion of the band 14-14.5 GHz, and Inmarsat supports the Commission's goal of facilitating ESV operations in this band. However, as addressed below, there also is a compelling need for ESV operations at C band. With regard to the proposed status of ESVs with respect to the other services in Ku band, Inmarsat provides comments in the sub-sections below.

2.1.1 11.7-12.2 GHz Band

In paragraph 31, the Commission seeks comment on whether LTTS operations make significant use of the 11.7-12.2 GHz band, and if not, whether it should remove the secondary allocations for fixed and mobile services (other than aeronautical mobile services) and related Part 101 rules for LTTS due to the predominant use of this band for satellite operations. Inmarsat is unable to comment on the extent of use of this band by LTTS operations, but if this band is not heavily used by LTTS, Inmarsat would welcome the proposal to remove the allocations to the terrestrial services, in order to improve the conditions for the operation of earth stations in this band, be they "conventional" earth stations or ESVs.

In paragraph 32, the Commission seeks comment on "whether ESVs receiving in the 11.7-12.2 GHz band should be entitled to claim protection from terrestrial services when the ESV is not in motion." Further, given the unlikelihood of interference to ESVs from terrestrial sources in the United States, "[the Commission] question[s] whether there is sufficient need to delineate between the status of ESVs that are 'in motion' versus stationary." If, as suggested above, the Commission removes the allocation to terrestrial services then such a delineation is unnecessary. If, however, the Commission chooses to retain the terrestrial service allocations,

Inmarsat encourages the Commission to endeavor to protect ESV receivers from interference from terrestrial services, at least in and around major ports where ESVs may operate frequently and possibly may be stationary for lengthy periods. This approach could be implemented, for example, by developing exclusion areas for terrestrial services around the areas of protected ESV operations. This approach would be consistent with the intentions of WRC-03 which, in an international context, provided for ESVs at a fixed stationary position to be treated like a permanently-installed earth station.

Also in paragraph 32, the Commission seeks comment on the proposal “to establish a new non-Federal Government footnote for the 11.7-12.2 GHz band to indicate that ESVs may operate with FSS space stations, so that parties are aware that mobile receivers may be operating in the band.” Inmarsat agrees that this would add clarity for all users of the band and therefore supports this proposal.

2.1.2 14-14.2 GHz Band

In paragraph 34, the Commission discusses the use of the band 14-14.2 GHz by the secondary space research service and proposes “that applications for Ku-band ESVs be required to be coordinated through the National Telecommunications and Information Administration (NTIA) Interdepartment Radio Advisory Committee's (IRAC) before awarding a license for this service.” Due to their importance and despite their secondary status, Inmarsat can appreciate the desire to protect these stations from interference from ESVs. However, due to the small number of space research stations, it would be unnecessarily burdensome to require all ESVs to coordinate through the NTIA irrespective of their operating distance from the space research stations.

Inmarsat therefore proposes that a coordination area be determined for each space research earth station (including those for which current plans exist) with respect to ESVs and

that the coordination areas be published in the Commission's rules. It would then be necessary to coordinate through NTIA only ESVs which require authorization to operate within the coordination areas. Inmarsat does not have the parameters to calculate typical coordination distances, but expects the necessary distance to be less than the 125 km distance determined for the fixed service in Recommendation ITU-R SF.1650, because the horizon antenna gain of the space research earth station is likely to be significantly less than the 43 dBi antenna gain assumed for the fixed service station.

In paragraph 34, the Commission additionally proposes "that a footnote be added to the U.S. Table of Allocations that states, in part, that ESVs operating in this band ensure the protection of the space research operations." The protection of existing and planned space research stations would be accomplished through the coordination provisions proposed by the Commission (possibly modified as proposed above). The proposed footnote would, however, protect future space research stations from interference from ESVs and could therefore require an ESV previously authorized to operate in a particular area to restrict or curtail operations in the vicinity of a subsequent space research earth station. This would place ESVs on a sub-secondary basis with respect to space research and could impose a significant operational burden on ESVs, especially if the loss of service area is not foreseen at the time that an ESV user contracts for the provision of service.

Inmarsat therefore recommends that the Commission adopt rules that would be less-constraining on ESVs, and that would reasonably accommodate the needs of the space research service. There is a large geographic area available for new space research earth stations for which the distance from the sea or large inland waterways is sufficient such that the risk of interference from ESVs is negligible. Hence, there appears to be little hardship for new space

research earth stations to be carefully sited with respect to ESVs. Inmarsat therefore recommends that the Commission not adopt the proposed footnote regarding space research, and at the very least, that the Commission place space research and ESVs on an equal status.

In the Commission's discussion, it is apparent that the space research allocation is used for space-to-earth applications. However, the allocation is generic and may therefore be used for space-to-space, earth-to-space, and passive applications, as well. If ESVs or FSS networks which support ESVs are required to protect space research, it is important, for planning purposes, to limit the particular applications or stations that are to be protected. It does not appear practical to protect all receivers on space research space stations, be they passive receivers or communication receivers.

In paragraph 35, the Commission seeks comment on issues relating to the secondary MSS allocation in the band 14-14.2 GHz. Since the MSS allocation is limited to the earth-to-space direction, and ESVs transmit in the same direction, Inmarsat does not believe that there are any special issues for consideration. There are issues surrounding possible interference from MSS earth stations to FSS space stations which support ESVs. However, in this regard the protection requirements for those FSS networks which include ESVs are no different to those for FSS networks which do not support ESVs. Inmarsat therefore supports the Commission's proposals for ESVs to communicate with FSS space stations in the 14.0-14.2 GHz band on a primary basis.

2.1.3 14.2-14.4 GHz Band

Regarding LTTS operations, Inmarsat has no information regarding the extent of use by, and therefore can offer little comment regarding the consequences of removing, the secondary mobile allocation in the 14.2-14.4 GHz band, or the grandfathering of any existing

operations. Inmarsat would, however, welcome provisions which improve the general conditions for all satellite operations in this band.

If LTTS operations continue to be permitted in this band, the Commission asks about the appropriate regulatory status of LTTS operations. If LTTS operations are retained, it should first be determined whether they require protection from ESV operations. If, for example, they typically are deployed away from coastal areas or are transient, they may not require any special protection. Furthermore, since LTTS operations already must accept interference from FSS and MSS applications, the additional interference from ESVs may be negligible. If, on the other hand, they do require continuing protection, requiring ESVs to protect future LTTS operations could result in ESVs unexpectedly being required to cease providing service in areas in which they previously were authorized. As with the case for space research discussed above, such a requirement would place a significant operational burden on ESVs and those users who rely on ESVs for broadband connectivity. The Commission appropriately notes that other bands are available for LTTS operations. Thus, Inmarsat recommends that future LTTS operations in the 14.2-14.4 GHz band not be protected from interference from ESV operations.

In sum, Inmarsat supports the Commission's proposals for ESVs to communicate with FSS space stations in the 14.2-14.4 GHz band on a primary basis.

2.1.4 14.4-14.5 GHz Band

Inmarsat has no information regarding systems in the secondary FS and MS allocations in the 14.4-14.5 GHz band. However, it is significant that such stations are currently required to accept interference from primary FSS earth station operations. It may be feasible for ESVs not cause interference to existing secondary FS and MS operations in this band for some period of time. However requiring ESVs to protect new FS and MS operations has the potential

to remove areas where previously authorized ESVs can operate, which could greatly constrain the provision of ESV service. Aside from the practical difficulties of how this would be applied, it could mean that ESV service providers unexpectedly would be unable to meet the service expectations and needs of their customers. Inmarsat therefore suggests that ESVs not be required to protect future fixed and mobile stations operating under this secondary allocation.

Regarding the radio astronomy service, as discussed by the Commission in paragraph 39, Inmarsat takes a similar view to that expressed regarding the space research service above. Coordination areas should be determined for the thirteen radio astronomy stations, and ESV operations at 14.47-14.5 GHz that need to operate within those areas should coordinate with IRAC. While Inmarsat appreciates the need to protect existing radio astronomy stations, Inmarsat believes that the deployment of ESVs would be unnecessarily constrained, and the sharing situation would be unbalanced, if ESVs also had to protect future radio astronomy stations. As for space research earth stations, there are substantial geographic areas for which a new radio astronomy station can be installed which are a sufficient distance from the coast and large inland waterways. This introduces a small constraint for the radio astronomy service and avoids a potentially large and significant constraint for ESVs. Inmarsat therefore recommends that the Commission not adopt the proposed footnote “USxxx” as proposed in paragraph 42 of the NPRM.

2.1.5 Proposed Footnotes

In paragraph 41, the Commission proposes a footnote NGyyy. Inmarsat supports this footnote as a mechanism to permit the operation of ESVs in Ku band.

In paragraph 42, the Commission proposes to add footnote USxxx. For reasons stated above, Inmarsat does not believe that such a footnote results in a reasonable balance between the needs of various users. With regard to both the space research service and the radio

astronomy service, Inmarsat proposes that ESV operations be considered as if they were a co-equal service. Furthermore, in accordance with the discussion above regarding the generic allocation to the space research service, Inmarsat recommends that only existing space research *earth* stations be protected. A footnote which puts these conditions into effect could be:

USxxx Earth stations on vessels shall operate on a co-equal basis with respect to Federal Government earth stations of the space research service in the band 14-14.2 GHz and to stations of the radio astronomy service in the band 14.47-14.5 GHz.

2.2 C Band ESVs

2.2.1 3700-4200 MHz Band

In paragraph 44, the Commission proposes that ESV receivers not be entitled to protection from the FS in the band 3700-4200 MHz. The Commission also invites comments on whether ESVs not “in-motion” merit some level of protected status. An ESV obviously may become unable to function if it receives excessive interference from FS sources.

Crew and passengers on board vessels that enjoy broadband communication through ESVs while at sea certainly would like to enjoy the same capabilities while operating close to shore and while berthed at port. While the vessel is in motion, any interference from a fixed link is likely to be transient and therefore is unlikely to be a significant constraint. However, when the vessel is berthed at port, interference from a fixed link could render the ESV unusable for the duration of its berth. Because many of the communication needs for vessels at sea also exist when docked in port, the limitations imposed by terrestrial interference while the ESV is stationary in port are far more significant constraints.

For these reasons, Inmarsat recommends that the Commission provide ESVs with interference protection from fixed links at specific locations that are commonly used by ESVs. These areas might include the major ports at which C band ESV-equipped ships are commonly docked for long periods. Such locations could be coordinated as if a permanent earth station

existed at a single location. This would be consistent with the intent of noting b) of Resolution 902 which, in the international context, explained that Article 9 applies for ESVs operating at specified fixed points. This protection could be limited to particular tranches of spectrum (for example 72 MHz of bandwidth). Thus, by limiting the number of locations where such protection is provided, and constraining the range of frequencies protected, the constraints on new fixed links could be minimized, while also meeting the needs of ESV users.

2.2.2 5925-6425 MHz Band

In paragraph 45, the Commission proposes that ESV operations in the 5925-6425 MHz band not cause harmful interference to, claim protection from, or otherwise impose constraints on the operation or development of, other radio services operating in the same band. This would require ESVs to cease transmissions where there is a risk of interference to terrestrial services. For some users, it may be quite acceptable to cease emission close to shore and while docked at port. On the other hand, the availability of the ESV while in port may be critical to the communication requirements of some users. Inmarsat therefore recommends that the Commission adopt provisions which would allow for the coordination of ESVs with respect to terrestrial services, at least while the ESV is stationary in port, and that this means of obtaining interference protection should be optionally available to ESV operators.

2.2.3 Proposed Footnotes

In paragraph 46, the Commission proposes footnote NGxxx. As indicated above, Inmarsat believes that the proposed requirement for not claiming protection from and not causing harmful interference to the FS is generally satisfactory, but that ESVs in particular ports should be entitled to be coordinated and treated like permanent earth stations. Implementing this proposal would necessitate the modification of proposed footnote NGxxx.

3. Operational Considerations for ESV Networks in the Ku Band

In paragraph 47, the Commission seeks comment on whether to limit the elevation angle of the ESV antenna. With regard to the protection of terrestrial services, WRC-03 provided a limit on the horizontal e.i.r.p. of the ESV in Annex 2 of Resolution 902. This limit allows ESVs with relatively low e.i.r.p. to operate at lower elevation angles, while maintaining the same interference potential as ESVs with a relatively high e.i.r.p. which operate at higher elevation angles. A horizontal e.i.r.p. limit therefore allows some flexibility between the two parameters of e.i.r.p. and elevation angle and gives a clear value to the maximum level of interference that should be anticipated from an ESV. The Commission has proposed to apply the Resolution 902 provisions, including the horizontal e.i.r.p. limit nationally. Inmarsat therefore does not believe there is any reason to also adopt an elevation angle limit.

The Commission also proposes, in paragraph 47, that Ku band ESV operators provide vessel tracking information. The equipment provided by Invsat is capable of providing vessel location information, utilizing GPS receivers and transmitting the vessel location to the hub station. Inmarsat does not object to making the data available, provided it is available only to the Commission and to authorized representatives of the terrestrial services, who become obligated to keep the information confidential before being permitted access.

In paragraph 48, the Commission discusses the authorization of Ku band ESVs under a blanket license. Inmarsat generally supports these proposals as the most appropriate method for licensing Ku band ESVs. In paragraph 52, the Commission seeks comment on whether it should provide for licensing of individual earth stations. Invsat currently does not have a hub station in the United States but offers ESV service to vessels which could include United States registered vessels. For example, an ESV may operate in the territorial waters of the United States but through a hub station in the United Kingdom. Inmarsat therefore believes

that it is critical to provide an opportunity to license ESVs on such vessels for operation in US territorial waters. This could be achieved by licensing the ESV service provider (*e.g.*, Invsat) with its hub outside the U.S. or by licensing the vessel operator. In either case, it would provide the opportunity for such a vessel to operate in United States waters under the control of a Commission licensee, and therefore would facilitate the provision of service to end users. If the licensee is the vessel operator, the requirements for the provision of tracking data and similar information could be made the responsibility of the vessel operator rather than the service provider.

In paragraph 53, the Commission discusses the need to prevent adjacent satellite interference caused by ESVs. Regulatory provisions are often imposed on earth stations to prevent harmful interference to neighboring satellites and the Commission already has adopted suitable provisions with regard to VSATs in §25.134 of its rules. Through the proposed revisions to §25.134, the Commission has proposed that ESVs operate under the same provisions as VSATs, but with the addition of a criterion on antenna pointing accuracy. Since the existing VSAT criteria for routine processing place no limit on pointing accuracy, the Commission's proposed provisions are more constraining for ESVs than for earth-bound VSATs which could operate with the same satellite. Inmarsat does not object to the inclusion of the antenna pointing accuracy in the criteria for routing processing of Ku band ESVs, but believes that no additional provisions, beyond those contained in current §25.134, are necessary with regard to adjacent satellite interference. The Commission further mentions the use of power control with respect to Ku band ESVs (paragraph 53). There are no special provisions mandating power control for Ku band VSATs,¹ and Inmarsat therefore sees no justification for including provisions for power

¹ Compare § 25.204(g) (*mandating power control for Ka band earth stations*) with

control relating to Ku band ESVs, particularly given that Ku band ESVs use the same types of earth station equipment used for “conventional” VSATs.

Similarly with regard to satellites with which ESVs may operate (also paragraph 53), Inmarsat can see no reason for providing special restrictions for ESVs where none exist for VSATs. Hence ESVs should be entitled to operate with any U.S.-licensed satellite and any non-U.S.-licensed spacecraft on the Permitted List, to the same extent as VSATs.

In paragraph 54, the Commission seeks comment on whether it should limit ESV operations to vessels that are 300 gross tons or larger. With regard to the space research and radio astronomy services, the Commission has proposed coordination provisions to ensure that ESVs do not cause interference to those services. The Commission has indicated its preference for ESV operations in Ku band due to the limited extent of terrestrial operations in the band and has even entertained the possibility of removing some of the existing allocations to the terrestrial services to facilitate the deployment of Ku band ESVs. Even if there are existing terrestrial services, geographical restrictions could be placed on ESVs through the licensing process. It therefore seems unnecessary to impose any limit based on the size of the vessel on which an ESV is mounted, in order to restrict the area of possible ESV operation.

In paragraph 54, the Commission also proposes that ESV systems be equipped with automatic mechanisms to terminate transmissions whenever the station operates outside its authorized geographic area or operational limits. Paragraph 6 of Annex 1 of Res 609 requires that “the ESV system shall include [...] mechanisms to immediately cease emissions, whenever the station does not operate in compliance with the provisions of items 2 [technical limits] and 4 [off-shore distances] above.” The mechanisms by which this can be accomplished does not

§ 25.204(e) (allowing power control for earth stations operating above 10 GHz, at the *option* of the operator).

necessarily require a complex automatic system. The ESV service provider has the capability of terminating the ESV transmission from the hub station. Inmarsat proposes that in the event that interference is shown to be caused by a rogue ESV, the ESV service provider should be contacted and requested to terminate (or suitably modify) the ESV emissions, much in the same way that the operator of a VSAT network is obligated to control the operation of its network. For example, Sections 25.271 and 25.274 of the Commission's rules already prescribe certain procedures to be followed in cases of suspected harmful interference. The ESV service provider can provide the role of the earth station licensee in those provisions, and should provide a permanent point of contact for this purpose.

In paragraph 55, the Commission discusses the need for a minimum antenna diameter of 1.2m for ESVs to qualify for routine processing. Although the majority of current Ku band ESVs are 1.2 m, Inmarsat would welcome the opportunity to use smaller antennas to the same extent and under the same conditions as current VSAT operations. ESV terminal manufacturers are beginning to introduce smaller diameter terminals. Resolution 609 provides for a minimum antenna diameter of 1.2m but permits the authorization of smaller antennas: "provided that the interference to the terrestrial services is no greater than that which would be caused with an antenna size of 1.2 m, taking into account Recommendation ITU-R SF.1650". The adoption of the horizontal e.i.r.p. limit in Resolution 609, as proposed by the Commission, will ensure that the horizontal e.i.r.p. from an ESV with a small antenna will not exceed the value taken into account in Recommendation ITU-R SF.1650.

Inmarsat therefore believes that the Commission can authorize the use of antennas smaller than 1.2 meters in diameter, while remaining fully in compliance with the WRC-03 provisions.

With respect to Commission service rules, Inmarsat observes that hundreds of thousands, if not millions, of VSATs with antennas smaller than 1.2m have been licensed and successfully are operating under blanket authorizations, even though they do not meet the antenna performance requirements of §25.209 for angles between one and two degrees. For this reason, the Commission currently has under consideration a proposal for allowing such sub-1.2 meter antennas to be processed on as streamlined basis as well.² As for other technical provisions discussed above, Inmarsat proposes that ESVs should be treated in the same way as VSATs. Thus, Inmarsat proposes that the Commission consider a similar streamlined licensing for sub-1.2m-ESVs as well.

4. Operational Considerations for ESV Networks in the C Band

In paragraph 62, the Commission seeks comment on the need for ESV operators to use the C band. Inmarsat concurs with the Commission's suggestion that, where both options exist, Ku band is preferable for ESV operations due to the more limited use by terrestrial services. It is also generally the case that provision of ESV services at Ku band is less costly than at C band. For example Ku band ESV systems are available from \$37,000, whereas C band ESV systems start \$60k – over 50% more. Moreover, transponder capacity on a hemispheric C band beam is approximately twice the cost of capacity on a Ku band beam. Hence, there is already a significant economic incentive for ESV operators to use the Ku band. However, as the Commission suggests in its discussion, the C band is also needed for ESV operations, in particular for trans-oceanic vessels. Most Ku band satellite antenna patterns are designed to cover land areas and thus leave the oceans with minimal coverage, except for where the beam

² See Comments of the Satellite Industry Association, IB Docket No. 00-248 (filed March 10, 2003), at 23-24.

spills over to the sea areas. Hence, for these ocean-going applications, there is no realistic possibility of using the Ku band.

C band ESVs have antennas with a minimum diameter 2.4m. This means they can be installed only on large vessels, typically 300 gross tons or larger. This also means that they tend to operate from relatively large ports and do not typically operate close to the United States coast, except when entering and leaving port. These two factors impose very practical limitations on the use of C band ESVs, and therefore help mitigate concerns about the broad deployment of ESVs in the C-band.

The Commission discusses two approaches for licensing ESVs in the C band: the “non-coordination approach” and the “coordination approach.” Inmarsat endorses use of both alternatives. For regular operations where the same port is frequently used by the same ESV on a regular basis, the coordination approach would likely be the most feasible and attractive. For vessels which only occasionally call at United States ports, the time, effort and expense required for coordination is likely to outweigh the benefits. In this situation, the non-coordination approach appears to offer the most feasible and attractive solution.

More detailed comments on these two proposed methods of licensing are given below.

4.1 Non-Coordination Approach

The Commission proposes, in paragraphs 64 and 65, certain conditions applicable to ESVs under the non-coordination approach. Inmarsat does not object to the proposal to make available real-time tracking data on a secure basis. However, Inmarsat is concerned that the proposed two-year license term is too short. Because contracts for ESV services typically have a three to four year term, Inmarsat recommends that the license terms for the non-coordination approach be four years instead. Because the ESV licensee is required to operate on a non-

interference basis, this license term should not have a detrimental effect on terrestrial users. Moreover, considering the comparative advantages of Ku band operations which already exist, C band operation likely will only be chosen where there is an overriding requirement for such use.

Inmarsat does not object to the proposed requirement to provide a permanent point of contact and a list of vessels, their frequency, bandwidth and satellites. However, Inmarsat questions the need to provide an itinerary for each vessel. The ESV operator will normally have no control or visibility of the vessel's itinerary which would, in any case, be subject to change at short notice. Since real-time tracking data will be made available, the need for this additional information is not apparent. Inmarsat therefore requests that the Commission not adopt this requirement.

As noted above, Inmarsat believes that access to the data should be limited to the Commission and the FS point of contact person and that the data should be treated as confidential. An ESV operator should not have access to the data provided by other ESV operators.

4.2 Coordination Approach

In paragraphs 69, 79 and 81, the Commission discusses its proposal to limit the ESV operator to 36 megahertz of uplink and 36 megahertz of downlink spectrum per satellite, per operator, per location (*e.g.* port and waterway) over a maximum of two FSS satellites in order to facilitate the coordination of ESVs with FS systems. Based on its current expectations for C band operation of ESVs in the United States, Inmarsat believes that this would be adequate for most circumstances. With respect to the Commission's question whether it should also identify a specific limited portion of the C band in which all ESVs must operate, the answer depends on the size of the "limited portion." ESV operators are currently able to obtain transponder capacity from a number of FSS operators on a competitive basis and to utilize

spectrum anywhere within the band 5925-6425 MHz, a range of 500 MHz. Limiting the spectrum available to ESVs to a small portion of this range could limit the number of FSS operators able to provide capacity and therefore could increase costs for ESV operators. The smaller the portion of spectrum available to ESVs, the greater the difficulty in obtaining satellite capacity. The situation would be exacerbated if other countries took a similar approach, but identified different portions of spectrum. An ESV operator would then be required to lease capacity in two or more bands with a corresponding increase in operational costs. For these reasons, Inmarsat proposes that the Commission allow ESV operators flexibility in choosing which band to coordinate.

If, however, the Commission does constrain ESVs operators in the C band to a portion of the available spectrum, it should also provide ESV operators with some partially offsetting benefits. Specifically, Inmarsat proposes that a new terrestrial fixed link should not be permitted in this limited portion of the C band if it would constrain ESV operations in the identified band and that ESV operation should remain possible outside the identified range on a non-interference basis. If this proposal were accepted, proposed footnote NGxxx would need to be modified to reflect that, in these particular circumstances, ESV operations could impose constraints on the development of the fixed service.

Due to the size of vessel on which a 2.4 meter C band ESV antenna typically is mounted, Inmarsat does not object to the proposal to limit C band ESVs to vessels of 300 gross tons. Nor does Inmarsat object to the proposal for historical tracking data to be made available on request, as proposed in paragraph 70, subject to that information being kept confidential and being provided under appropriate constraints only to those terrestrial operators with a “need to know.”

In paragraph 74, the Commission asks for comments on the minimum distance of 300 km. The agreed distance of 300 km, as given in Recommendation ITU-R SF.1650, is intended to sufficiently protect all fixed links, irrespective of their geography and technical characteristics. Inevitably, this will over-protect the majority of fixed links which operate in areas of more benign propagation characteristics and with less sensitive technical characteristics. Inmarsat notes that in the development of the Recommendation in WP4-9S, the United States supported a smaller distance,³ and would welcome the introduction of a smaller minimum distance in the new provisions. Although Inmarsat suspects the 300 km distance is overly restrictive for fixed links in the United States, it is difficult to determine an alternative without knowledge of the relevant FS characteristics and without experience of coordination. A smaller distance would be particularly relevant for vessels which pass within a distance closer than 300 km from the United States coastline, but do not intend to dock at a United States port and remain a large distance (e.g., 200 km) from the coast. In any case, it would be advisable to review the appropriate distance when more experience of coordination and ESV operations has been obtained.

4.3 Non-Coordination and Coordination Approaches at C Band

In paragraph 88, the Commission suggests that ESVs should have automatic mechanisms to terminate transmissions whenever the station operates outside its authorized geographic area or operational limits. As for the similar requirement in the Ku band, Inmarsat proposes that the ESV be required to shut-off transmissions in the event that harmful interference is caused or if the ESV operates outside its technical and geographical limitations. This can be accomplished from the network hub, or from the ESV itself, as necessary. This would require no

³ For example, in ITU document 4-9S/175 (10 October 2001), the United States proposed a distance of 250 km for C-band.

hardware modifications to current ESV equipment, and would place the responsibility of compliance with the ESV operator. Although more complex technical solutions can be envisaged, they are not currently available and would clearly increase the cost and complexity of ESV terminals. Inmarsat believes that this solution, together with the requirements for provision of real-time tracking data, would be sufficient to ensure that any “rogue” ESV will quickly be brought into compliance.

In paragraph 89, the Commission questions the need for pointing limitations on ESV antennas. Inmarsat concurs with the implication that the pointing of the ESV antenna has a significant effect on the interference potential. The minimum distances were based on, among other things, an assumption on the horizontal e.i.r.p. of the ESV. Provided this value is not exceeded, one can be confident that the 300 km distance protects FS receivers. Hence there is a need to ensure that this horizontal e.i.r.p. is not exceeded by ESVs just beyond the 300 km distance and this is done through the provisions of Resolution 902. Irrespective of the horizontal e.i.r.p., ESVs inside the distance must not cause harmful interference to terrestrial services. The ESV operator has an obvious incentive to minimize the horizontal e.i.r.p. of the ESV, to limit the interference potential to terrestrial services. This applies whether the non-coordination or the coordination approach is followed. Hence no benefit would be obtained by terrestrial services from such a satellite pointing limitation. However, placing a limit on the pointing of the ESV antenna, would limit the choice of satellites available to the ESV operator which could, in turn, lead to increased costs of satellite capacity. For these reasons, Inmarsat recommends against limitations on ESV antenna pointing and suggests that a limit on the horizontal e.i.r.p. is sufficient.

In paragraph 92, the Commission seeks comment on whether applicants for C band ESV licenses should have the option of choosing whether their ESVs would be authorized under either, or both, of the described approaches. As already stated above, Inmarsat suggests that both licensing approaches should be available. For operations where the same port is frequency used by the same ESV, on a regular, planned basis, the coordination approach would likely offer the most attractive solution. For vessels which only occasionally call at United States ports, the time, cost and effort required for coordination is likely to outweigh the benefits. In this situation, the non-coordination approach appears to offer the most appropriate solution.

In paragraph 52 of the NPRM, the Commission seeks comment on the need for licensing of individual earth stations in Ku band. Inmarsat has identified the need for such a proposal in section 3 above where for particular situations, licensing of an individual ESV could be the only possibility of obtaining authorization. For similar reasons as apply in the Ku band case, Inmarsat recommends the same approach be available for C band ESVs.

In paragraph 93, the Commission seeks comment regarding the duration of licenses. As already indicated above, Inmarsat recommends a four year license for ESVs licensed under the non-interference approach. A fifteen year license under the coordination approach is appropriate.

5. ESV Operations at C Band and Ku Band

In paragraph 98, the Commission asks if ESV operators should be required to place identification tags in their ESV transmissions to identify the ESV operator and the vessel. Identification tags are not currently implemented in Inmarsat's ESV transmissions. It is unlikely that a land based receiver would be able to successfully demodulate and decode an ESV transmission, especially bearing in mind the different modulation and coding schemes used by ESVs and the need to protect the customer's data from unauthorized receivers. Inmarsat agrees

that tracking and frequency data associated with each licensed vessel could be made available (as discussed elsewhere). This will give sufficient information to be able to determine the source of any harmful interference, and the licensee. Inmarsat therefore believes that identification tags would not provide any significant benefits and should not be required.

6. Vessels of Foreign Registry Near U.S. Coasts and Vessels of U.S. Registry Near Foreign Coasts

In section E, the Commission discusses the issues of foreign registered vessels and the operation of vessels of United States registry near foreign coasts. In general, licensing of ESV hubs gives the Commission control over the ESVs with which the hub communicates and thereby provides control over the potential for interference into other services. It also provides the potential for ESV operators to extend their service close the United States coastline and within ports. Everyone benefits by having ESVs licensed and operating in a controlled environment.

Inmarsat recommends that the Commission not limit an ESV hub operator's license to communication with U.S.-registered vessels, or to vessels of foreign nations with which a bilateral agreement exists. An ESV blanket license should permit the operator to communicate with any ESV, regardless of the country of registration of the vessel on which the ESV is located. This is similar to the way in which the Commission allows a U.S.-licensed earth station to communicate with any earth station within the coverage area of the satellite with which the licensed earth station is authorized to communicate. In the case of communications with a foreign registered vessel, there do not appear to be any significant benefits in requiring a prior bilateral agreement with the country of the vessel's registration that could not also be obtained by holding the licensee of the U.S. hub responsible for the operations of the ESV on the foreign registered vessel. In paragraph 102, the Commission asks whether, under this approach, ESV

operations should be restricted to operating on a non-harmful interference basis. Provided the ESV licensee has control over the operation of the terminal on board the vessel, there does not appear to be any justification in treating ESVs on foreign-registered ships differently than those on U.S.-registered ships. In such a case, Inmarsat would agree with the Commission's suggestion that the hub earth station licensee that controls the ESV network should be held responsible for resolving any harmful interference that may be caused by serving non-U.S.-flagged vessels.

In paragraph 102, the Commission seeks comment on whether, as proposed by FWCC, it should prohibit the U.S. licensee of an ESV network from communicating with any ESV station within the identified minimum distances if the ESV is not part of the ESV network licensed by the Commission or, in the case of a vessel of foreign registry, is not the subject of a bilateral agreement between the United States and the country of registry. As explained above, Inmarsat endorses a licensing approach that would allow a U.S.-based ESV hub to communicate with any ESV anywhere within the service area of the satellite the hub uses, regardless whether the ESV is a minimum distance from the U.S. coastline, and regardless whether the ESV is communicating with a foreign vessel.

In this regard, it should be recognized that there are many vessels of foreign registry which service U.S. ports and carry U.S. crew and passengers. The benefits of ESV services should be available to them, as they would be to crew and passengers on U.S. registered vessels. Although Inmarsat encourages the development of bilateral agreements, it is not realistic to expect an agreement to be available from every national administration which registers ships. Under Inmarsat's proposal where an ESV hub licensee has control over the

operation of an ESV on board a vessel of foreign registry, the proposal by the FWCC is unnecessary and unduly constraining.

7. Foreign Licensed ESV Operators

In section F, the Commission discusses treatment of foreign-licensed ESV operators. As with the case described above, it is in everyone's interest that foreign-licensed ESVs comply with the requirements for protecting U.S. terrestrial services in the same way as U.S.-licensed ESVs. The Commission proposes that ESVs generally be authorized on a blanket-licensed basis, and controlled through a hub station. Other countries are also developing their ESV licensing procedures and are considering a similar licensing basis as the Commission.

Within the CEPT, work is underway to develop a common approach to licensing of ESVs and conditions for the mutual recognition of licenses between CEPT administrations. This work is underway in CEPT Project Team RA6 and is at an early stage in the process. While administrations are in the process of developing their ESV license conditions, this is an ideal time to develop bilateral or multi-lateral agreements. The agreements should allow for U.S. licensed ESVs to operate within the off-shore distance⁴ of other administrations and, in return, for foreign licensed ESVs to operate within the off-shore distances of the U.S. coast line. Inmarsat fully supports the development of such agreements, which would enable the Commission to impose similar conditions on foreign-licensed ESVs as are applied to U.S.-licensed ESVs. We propose that where the appropriate operational and technical conditions can be assured, that foreign licensed ESVs be permitted to operate close the U.S. coastline under the same conditions as U.S. licensed ESVs, regardless of whether the hub is located in the United States.

⁴ 300 km in C band and 125 km in Ku band.

