

BEFORE THE

# Federal Communications Commission

WASHINGTON, D.C. 20554

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JUL - 3 1991

In re Applications of )  
 )  
 MOTOROLA SATELLITE )  
 COMMUNICATIONS, INC. )  
 )  
 ELLIPSAT CORPORATION )  
 )  
 For Authority to Construct, Launch )  
 and Operate a Low Earth Orbit )  
 Satellite System in the )  
 1610-1626.5 MHz and/or )  
 2483.5-2500 MHz Bands )

FEDERAL COMMUNICATIONS COMMISSION  
 OFFICE OF THE SECRETARY  
 File No. 9-DSS-P-91(87)  
 CSS-91-010  
 File No. 11-DSS-P-91(6)

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JUL 8 1991

DOMESTIC FACILITIES DIVISION  
SATELLITE RADIO BRANCH

To: The Commission

REPLY COMMENTS OF TRW INC.

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July 3, 1991

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## SUMMARY

In these Reply Comments, TRW Inc. ("TRW") replies to certain of the comments and petitions to deny that were filed in connection with the applications of Motorola Satellite Communications, Inc. ("Motorola") and Ellipsat Corporation ("Ellipsat") for low Earth orbit satellite systems to operate in the 1610-1626.5 MHz and/or 2483.5-2500 MHz bands.

TRW first urges the Commission to reject the views of the commenters and petitioners who want to have the frequency bands reallocated away from radiodetermination satellite services ("RDSS") to generic mobile satellite services. The fact that several parties have now applied to provide RDSS services using code division multiple access ("CDMA") spread spectrum techniques, in conjunction with spread spectrum mobile voice and data services, means that there still is an economically viable market for RDSS, and that the Commission's original objectives for the service can be achieved. TRW will file, in the very near future, a petition for rule making that will suggest a frequency allocation and regulatory regime for the RDSS service (as enhanced by spread spectrum mobile services).

TRW also replies to certain of the matters addressed in the comments that concern the technical and economic feasibility of Motorola's and Ellipsat's proposed systems. As to Motorola, there are a number of pressing questions as to key aspects of its proposed system that must be resolved before

Motorola may be found technically qualified. Even if those matters are resolved, the fact remains that Motorola is proposing to use the spectrum in a way that will likely hinder the establishment of additional systems in the same bands, while several other applicants -- including TRW -- are proposing to employ spectrum-efficient CDMA transmission techniques that will advance the Commission's policy favoring competitive multiple entry in the RDSS bands.

With regard to Ellipsat's proposal, there are a number of serious allegations raised by Motorola and others as to the threshold acceptability of Ellipsat's application. These questions, and additional questions as to the spectrum efficiency of Ellipsat's system, have yet to be resolved.

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To: The Commission

**REPLY COMMENTS OF TRW INC.**

TRW Inc. ("TRW"), by its attorneys and pursuant to the Commission's April 1, 1991 Public Notice, Report No. DS-1068, 6 FCC Rcd 2083 (1991), hereby replies to the comments and petitions that were filed in connection with the applications of Motorola Satellite Communications, Inc. ("Motorola") for a low Earth orbit system of 77 satellites ("Iridium") and of Ellipsat Corporation ("Ellipsat") for a low Earth orbit system consisting of six satellites ("Ellipso I").

**I. INTRODUCTION**

On June 3, 1991, TRW filed a petition concerning Motorola's Iridium application in order to seek a full airing of issues that have a substantial and material bearing on the grantability of Motorola's application. TRW addressed two

particular aspects of the Iridium proposal: (1) Motorola's failure to demonstrate the technical feasibility of its proposed system; and (2) the fact that the Iridium system does not advance the policies favoring competitive multiple access that the Commission imposed for satellite systems operating in the RDSS bands.

In contrast, TRW asserted that its Odyssey system, by incorporating code division multiple access ("CDMA") spread spectrum modulation, will promote competitive multiple entry to the 1610-1626.5 MHz band (as well as to the 2483.5-2500 MHz band).<sup>1/</sup> TRW concluded that Motorola's application to use the frequencies on a non-spread spectrum (i.e., non-competitive) basis should not be approved in the face of proposals such as TRW's that would advance the Commission's policy favoring competitive multiple access in the RDSS bands.<sup>2/</sup>

Ten parties, in addition to TRW, filed comments or petitions addressing substantive aspects of Motorola's and/or Ellipsat's proposals to operate satellite systems in the 1610-1626.5 MHz and/or 2483.5-2500 MHz bands (the

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<sup>1/</sup> TRW noted that the Commission has repeatedly held that the public interest requires, whenever possible, competitive multiple entry in satellite and most other services. TRW Petition at 4-5 (citing Domestic Communications Satellite Facilities, 22 F.C.C.2d 86 (1970); 35 F.C.C.2d 844, recon. in part, 38 F.C.C.2d 665 (1972); Establishment of Satellite Systems Providing International Communications, 101 F.C.C.2d 1046 (1985) (subsequent history omitted)).

<sup>2/</sup> TRW Petition at 5.

radiodetermination satellite service or "RDSS bands").<sup>3/</sup> Many of these parties raised concerns about the feasibility -- both economic and technical -- of Ellipsat's and Motorola's applications, and a number expressed the view that analysis of the myriad of issues raised by the proposals for use of the RDSS bands should or must be resolved through a formal notice and comment rulemaking proceeding.<sup>4/</sup>

In these Reply Comments, TRW responds first to those parties that urge the Commission, in effect, to regulate the

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<sup>3/</sup> Comments on or petitions to deny Motorola's Iridium application were filed by Hughes Aircraft Company ("Hughes"); Ellipsat; Constellation Communications, Inc. ("Constellation"); and Norris Satellite Communications, Inc. ("Norris"). Comments on or petitions to deny Ellipsat's Ellipso I application were filed by Motorola and Constellation. Comments and petitions addressing both applications were filed by Communications Satellite Corporation ("Comsat"); GTE Spacenet Corporation ("GTE"); RDSS, Inc.; National Academy of Sciences ("NAS"); the Drug Enforcement Administration ("DEA"); and American Mobile Satellite Corporation ("AMSC").

<sup>4/</sup> In addition to parties filing comments or petitions regarding Motorola's and Ellipsat's applications, several new proposals for use of the RDSS bands were received by the Commission before the passage of the cut-off deadline of June 3, 1991 that was established in the Commission's April 1, 1991 public notice. New system applications were filed by TRW (for the "Odyssey" system); Constellation (for the "Aries" system); and Loral Cellular Systems Corporation ("Loral") (for the "Globalstar" system). Ellipsat amended its system proposal by applying for the "Ellipso II" system. AMSC also applied for authority to use the L-Band RDSS frequencies at 1610-1626.5 MHz. The June 3, 1991 "processing group" for the RDSS bands thus includes six applicants, each of whom is proposing a use of the RDSS bands that is unlike (but not necessarily mutually exclusive with) the use proposed by every other applicant.

RDSS service out of existence. There is a way for RDSS to be provided on an economically viable basis in this country. TRW also replies to selected matters that were raised in the various comments and petitions filed in response to Motorola's and Ellipsat's applications.<sup>5/</sup> It concludes that the pleadings filed to date raise serious questions as to the basic qualifications of Ellipsat to construct even its proposed Ellipso I system. A number of serious concerns have also been raised as to the technical and economic practicability of Motorola's proposed Iridium system that were touched upon in TRW's Petition -- concerns that are inherent in Motorola's system design or implicated by its proposal to operate bi-directionally in the 1610-1626.5 MHz band.

## II. DISCUSSION

### A. The Comments And Applications Make It Clear That RDSS Is Not "Dead."

At the outset, TRW disagrees strongly with those commenters (Hughes and AMSC) who assert that RDSS is "dead" or no longer in the public interest. Neither of these parties -- one of which previously held a permit to construct a generic

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<sup>5/</sup> The fact that TRW may not respond to a particular matter in these Reply Comments should not be interpreted either as acquiescence or disagreement with the unaddressed proposition. The instant pleading is intended to provide TRW's responses to certain issues addressed in the comments and petitions that were filed.



MSS system in the 1646.5-1660.5 MHz band (and has now applied to add the 1626.5-1660.5 MHz bands to its proposed generic MSS system) and the other of which is a principal shareholder therein -- has any real concern for the Commission's RDSS service or its potential to serve the public. Their only goal is to convince the Commission to sound the death knell for RDSS in order that the frequencies allotted to the service may be annexed by AMSC for generic MSS without regard to currently-applicable operating limitations inconsistent with AMSC's proposed system. See Hughes Comments at 17-18 (urging reallocation to MSS without Commission mandate of CDMA); AMSC Petition at 18-19.<sup>6/</sup>

The views stated by Hughes and AMSC are premature and plainly inconsistent with the public interest. Although it is now clear that satellite systems devoted exclusively to the provision of RDSS services -- i.e., radiolocation and radionavigation by satellite -- are not economically viable,

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<sup>6/</sup> AMSC, of course, overstates its role as a putative provider of MSS services. Clearly, AMSC is not, as it claims in its petition, "the United States MSS system" (see AMSC Petition at 1). AMSC was, at one time at least, authorized to construct a domestic MSS system to operate, inter alia, in the 1646.5-1660.5 MHz band. It was never granted any rights to operate in L-Band segments below 1646.5 MHz, and any application it may file or has filed for a generic MSS system in frequency bands other than those for which it was initially authorized are not entitled to any preferential treatment. Furthermore, it is not at all clear that AMSC can claim to hold a valid MSS authorization. See Aeronautical Radio, Inc. v. FCC, 928 F.2d 428, 445-53 (D.C. Cir. 1991).

there is still sufficient interest in the provision of RDSS services to ensure that the public benefits the Commission associated with RDSS services in its 1985 and 1986 decisions allocating the RDSS frequency bands and establishing the service will be met.<sup>7/</sup> This interest is represented by the various applications -- including TRW's proposed Odyssey system -- to establish spread spectrum satellite systems in the RDSS bands that would provide both RDSS services and compatible spread spectrum mobile voice and data services.<sup>8/</sup>

Indeed, the Commission's commitment to the RDSS service has not waived or ebbed over the last five years. The continuing strength of this commitment is made clear by the Commission's recent proposal to recommend that the International Telecommunication Union's ("ITU") 1992 World

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<sup>7/</sup> See Amendment of the Commission's Rules to Allocate Spectrum for, and to Establish Other Rules and Policies Pertaining to, a Radiodetermination Satellite Service, Second Report and Order, 58 R.R.2d 1416 (1985) ("RDSS Allocation Order"), recon. in part, 104 F.C.C.2d 637 (1986). See also Amendment of the Commission's Rules to Allocate Spectrum for, and to Establish Other Rules and Policies Pertaining to, a Radiodetermination Satellite Service, Second Report and Order, 104 F.C.C.2d 650 (1986) ("RDSS Licensing Order").

<sup>8/</sup> Of the five applicants other than TRW in the June 3, 1991 "processing group," three -- Ellipsat, Loral, and Constellation -- propose at least nominally to offer CDMA spread spectrum RDSS services in the RDSS bands. The remaining applicants, AMSC and Motorola, propose modulation techniques and spectrum usages that are incompatible with the provision of spread spectrum RDSS services. Only AMSC proposes no RDSS or RDSS-type service.

Administrative Radio Conference elevate the RDSS service to a primary allocation in all three world regions.<sup>9/</sup> The Commission should now act with all due speed and certainty to ensure that those proposals consonant with its objectives for the RDSS service are processed to completion and started on their way in the satellite services marketplace.

To advance these twin goals of preserving and revitalizing the RDSS service, while expediting the establishment of conforming systems, TRW will file, in the very near future, a petition for rule making that would permit the introduction of spread spectrum mobile voice and data services, to the extent compatible with RDSS service, in the 1610-1626.5 MHz and 2483-2500 MHz bands.<sup>10/</sup> TRW's petition will ask the Commission, inter alia, to modify Sections 2.106

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<sup>9/</sup> See An Inquiry Relating to Preparation for the International Telecommunication Union World Administrative Radio Conference for Dealing with Frequency Allocations in Certain Parts of the Spectrum, FCC 91-188, slip op. at ¶ 42 (released June 20, 1991) (Commission proposes that RDSS and MSS be added to the 1610-1626.5 MHz (earth-to-space) and 2483.5-2500 MHz (space-to-earth) bands on a primary basis in all three ITU regions; proposes addition of Footnote 733Z to ensure that any MSS introduced in these bands is compatible with RDSS).

<sup>10/</sup> TRW notes that several of the parties commenting on Motorola's and Ellipsat's applications called for the initiation of a rulemaking proceeding to address the policy issues engendered by the applications, and to avoid the need for the Commission to regulate in ad hoc fashion through the grant of waivers of existing regulations. See, e.g., Comsat Comments at 6-8; RDSS, Inc. Comments at 8-11. TRW's forthcoming petition for rule making will answer that call.

and 25.141 (formerly Section 25.392) of its rules to accommodate this enhanced use of the RDSS bands, and to ease modestly the power flux density limitations on RDSS downlink transmissions in the 2483.5-2500 MHz band. Because of the proposed requirement that any spread spectrum mobile services introduced into the bands must be compatible with the current RDSS service requirements, TRW will suggest that the RDSS service rules and policies unaffected by TRW's proposal could be applied to the present applicants, thereby obviating the need for a protracted proceeding to develop sui generis rules and policies and, at the same time, enabling the Commission to expedite both the consideration of TRW's petition and the subsequent authorization of applicants in the RDSS bands.<sup>11/</sup>

TRW urges the Commission to take a hard look at its petition for rule making, and the suggestions that will be presented therein. It is clear that RDSS services, if not dedicated RDSS satellite systems, have a future. It is up to the Commission to act swiftly to enable the establishment of

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<sup>11/</sup> By expediting consideration of TRW's forthcoming petition, the Commission will be able to avoid the need to act on the requests for waiver of the construction permit requirement of Section 319(d) of the Communications Act that have been filed by several of the applicants in the June 3, 1991 "processing group." This will lead to an additional savings of Commission resources, without compromising the ability of qualified applicants to enter the marketplace at the earliest possible time.

satellite systems providing the public benefits the Commission has long envisioned for RDSS services.

**B. The Comments And Petitions Raise Several Issues Concerning The Feasibility Of Motorola's Proposed Iridium System.**

Several parties discussed aspects of Motorola's proposal that require resolution, if resolution is possible, before Motorola can be found basically qualified to establish the Iridium system. Particularly relevant comments in this vein were filed by Hughes, Comsat, and Ellipsat.

According to Hughes, the Iridium system would provide uniform coverage of populated and unpopulated areas of the world, leading to the waste of capacity whenever Iridium beams are over unpopulated areas. Hughes Comments at 6. Hughes asserts that this inefficiency is compounded by the fact that the service areas of the Iridium satellites converge with multiple overlapping beams above the North and South Poles as a result of Motorola's polar orbit plan. Id. at 7. In addition, Hughes alleges that nearly half the beam cells Iridium satellites place on the surface of the earth must be turned off at any one time (because Motorola's system prohibits two satellites from operating in the same coverage area), and proceeds to argue that no more than "one eighth of the electronics flown on the Iridium system . . . is actually useful for carrying communications traffic." Id. (footnote

omitted).<sup>12/</sup> Hughes also points out that virtually all 77 Iridium satellites must be installed on station before Motorola's Iridium service can commence -- a characteristic of the Iridium system that is functionally disadvantageous.<sup>13/</sup> Hughes also assails Motorola for limiting potential capacity of the spectrum "by a factor of twenty of more" by relying on time division multiple access techniques rather than "advanced, proven CDMA transmission techniques." Id. at 8.

Hughes also raises concerns about the economic efficiency of the Iridium system. Like TRW, Hughes feels that Motorola's dependence on unproven and even undeveloped technology for Iridium may have led it to understate its already significant system costs, and could require Motorola to increase its already high price-per-minute projections for Iridium usage. Hughes Comments at 10-12. Hughes also notes

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<sup>12/</sup> This number may well have to be reduced further. As AMSC notes in its Petition, Motorola's Iridium system design does not "provide enough battery power to permit operation at night when the solar arrays are not illuminated." AMSC Petition at 23. This represents a serious operational drawback to the Iridium system.

<sup>13/</sup> According to one published article, the requirement for all 77 Iridium satellites to be on station in order for the Iridium system to work at all will require Motorola to maintain an ambitious, technically and financially burdensome schedule of launching one Iridium satellite every several weeks, for as long as Iridium is in operation, to replace Iridium satellites as they reach the end of their 5 or 6 year design lifetimes. Klass, Motorola's Iridium Satellite System Could Serve Aviation Market, Aviation Week & Space Technology, June 3, 1991, at 81.

that because Iridium is essentially a "bypass" system, Motorola may have difficulty in securing landing rights in countries whose ministries of posts, telegraphs and telecommunications "feel threatened" by the Iridium system. Id. at 12-13.

Like Hughes, Comsat levels a number of serious charges at the technical efficiency of Motorola's proposed Iridium system. In addition to addressing some of the matters raised in Hughes's comments (e.g., the requirement for all 77 satellites to be in place prior to commencement of service), Comsat notes that Motorola has claimed that it will need additional L-Band spectrum by the end of the decade. Comsat urges the Commission to "consider whether the viability of the Iridium system is dependent on [Motorola's] obtaining additional frequencies beyond those asked for in the current application." Comsat Comments at 22.

In its Petition to Deny or Dismiss Motorola's application, Ellipsat asserts that Motorola's requests for bi-directional operation in the 1610-1626.5 MHz band and its specification of TDMA access methods "would potentially cause interference to . . . future users of the RDSS bands whose systems conform to the existing regulatory scheme. Moreover, . . . the Iridium system would be incompatible with competitive, multiple entry, and instead would likely restrict the number of systems that could ultimately be accommodated in the RDSS bands." Ellipsat Petition at 3-4. Ellipsat's

concerns regarding the impact of Motorola's application on the Commission's longstanding policy favoring competitive multiple entry in new technologies were echoed as well in Constellation's comments.

On the basis of the comments and petitions filed by TRW and others, there are a number of pressing questions that Motorola has yet to answer concerning fundamental attributes of its Iridium proposal. It may be the case, however, that whether Motorola is able to provide completely satisfactory answers to these questions is a moot issue -- at least so long as Motorola proposes to operate in the 1610-1626.5 MHz band. As long as there are qualified applicants who propose to employ spectrum efficient CDMA transmission techniques that will advance the Commission's policy favoring competitive multiple entry in the RDSS bands, the Commission must not give comparative consideration to Motorola's proposal to use the frequencies on a non-competitive basis.

**C. There Are A Number Of Inconsistencies In Ellipsat's Proposal That May Preclude A Finding That It Is Basically Qualified To Construct Its Proposed Ellipso I System.**

Most of the challenges that are leveled against Ellipsat's Ellipso I application appear to be targeted at Ellipsat's basic qualifications to be a licensee. Motorola, in particular, asserts that Ellipsat's application must be dismissed as patently defective, as it "fails to provide basic



information about its proposed system, contains numerous errors and internal inconsistencies, and fails to comply with applicable international Radio Regulations which, taken as a whole, require its immediate dismissal." Motorola Petition to Dismiss and/or Deny Ellipsat's Application at 4 (footnote omitted).

According to Motorola, as much as 40% of the information required by the Commission in In re Filing of Applications for New Space Stations in the Domestic Fixed-Satellite Service, 93 F.C.C.2d 1260, 1265 (Appendix B) (1983), and Section 25.392(a) (now Section 25.141(a)) of the Commission's rules, is missing from the Ellipso I filing. Motorola Petition at 9.<sup>14/</sup> While Motorola's assertions regarding the technical attributes of Ellipsat's application appear pertinent, TRW has no comment on Motorola's efforts to analyze the sufficiency of the financial information that Ellipsat did submit with its Ellipso I application, other than to observe that it may be premature for Motorola to apply the

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<sup>14/</sup> Specifically, Motorola notes the absence of Appendix B-requested information concerning, inter alia, mass and power budgets; service link budgets for 5° elevation angles; earth station parameters; system reliability; capabilities for service to Hawaii, Puerto Rico, and the U.S. Virgin Islands; construction milestones; detailed financial statements; space station antenna beam coverage contours; communications subsystem block diagrams; electrical energy system description; and information concerning Ellipsat's proposed telemetry, tracking, and control functions. Motorola Petition at 9-10.

"second stage" financial showing of the RDSS financial qualifications test at this time.<sup>15/</sup>

In its petition, the NAS asserts that Ellipsat has not demonstrated that the Ellipso I system can protect Radio Astronomy Observation ("RAO") operations in the 1610-1613.8 MHz band from harmful interference, and urges the Commission to withhold action on Ellipsat's application until such a showing is made. NAS Petition at 2-4. While TRW does not necessarily agree with NAS's statements as to the degree of protection that is required for RAO operations,<sup>16/</sup> it does concur that Ellipsat must show how it will protect a service that the Commission has proposed for co-primary status with RDSS in the 1610-1613.8 MHz band. See WARC-92 Report, FCC 91-188, slip op. at A-25 and proposed Footnote 734 (Mod).

Finally, TRW agrees with Constellation's assertion that Ellipsat must not be allowed to use L-Band capacity for the feeder links for its Ellipso I system. Constellation

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<sup>15/</sup> See RDSS Licensing Order, 104 F.C.C.2d at 663-65.

<sup>16/</sup> It appears that NAS would extend the coordination distances that are listed in Appendix D to the Commission's RDSS Allocation Order, 58 R.R.2d 1416, Appendix D. See NAS Petition at 3. NAS's request for inclusion of S-Band filtering to protect operations in the 4990-5000 MHz band (the first harmonic) is out of line with the protection required under the ITU Radio Regulations, which specify that RAO should be protected to the level of any other radiocommunication service. Radio Regulation 344. NAS's request that RAO be protected to -241 dBW/m<sup>2</sup>/Hz, at frequencies twice removed from the S-Band operating frequencies specified by Ellipsat, goes beyond the international requirements.

Comments re Ellipso I Application at 7-8. Although the Commission's rules do not prohibit the use of the 1610-1626.5 MHz band for feeder links,<sup>17/</sup> the high level of demand for L-Band frequencies and the relative abundance of higher spectrum segments, preclude a finding that Ellipsat's proposal to use L-Band spectrum for feeder links is spectrum efficient or otherwise in the public interest.

In sum, the comments and petitions filed in response to Ellipsat's Ellipso I application reveal a number of defects and inconsistencies.<sup>18/</sup> It is not clear at this time whether Ellipsat's June 3, 1991 "Ellipso II" application contained information sufficient to cure the defects identified to date. TRW will address this issue, to the extent necessary, in its filing in response to that application once the Commission issues a public call for comments and petitions.

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<sup>17/</sup> Section 2.106, Footnote 726A does specify that the L-Band frequencies immediately above 1626.5 MHz (i.e., the 1626.5 -1645.5 MHz and the 1646.5-1660.5 MHz bands) are not to be used for feeder links of any service. 47 C.F.R. § 2.106, Footnote 726A.

<sup>18/</sup> As it did with respect to Motorola's system design, AMSC asserted that Ellipsat's system design for Ellipso I lacks sufficient battery power to permit operation at night or when the solar arrays are not illuminated. AMSC Petition at 23.

### III. CONCLUSION

On the basis of the foregoing discussion, TRW urges the Commission to reject the comments of those parties who assert that RDSS is no longer a viable service. The viability of the RDSS service is demonstrated by the applications filed by TRW and others for spread spectrum systems to operate in the RDSS bands. The Commission should proceed to revitalize the RDSS service in the manner proposed in TRW's forthcoming petition for rule making.

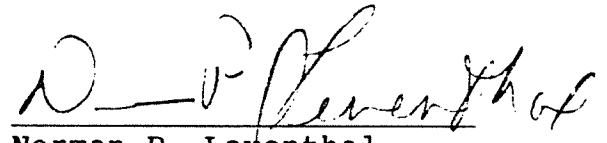
As to the Motorola and Ellipsat applications, TRW agrees with many of the comments submitted to the extent that they raise substantial and material questions as to the technical and economic feasibility (and therefore grantability) of either application. However, the fact that Motorola's system precludes competitive multiple entry in the 1610-1626.5 MHz band, while the spread spectrum systems proposed by TRW and others would advance the Commission's policy favoring

competitive multiple entry in both the 1610-1626.5 MHz and 2483.5-2500 MHz bands, should lead to the denial of the Iridium application whether Motorola resolves the feasibility questions or not.

Respectfully submitted,

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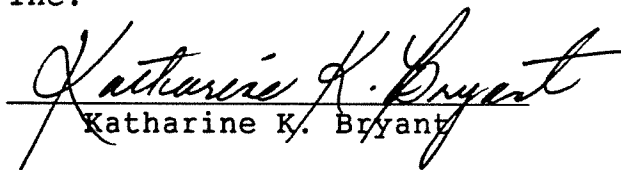
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