

BEFORE THE

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Federal Communications Commission JUN 11 1990

WASHINGTON, D.C. 20554

Federal Communications Commission
Office of the Secretary

In the Matter of the Application of)
)
ORBITAL COMMUNICATIONS CORPORATION)
)
For Authority to Construct a)
)
Low-Orbit Mobile Satellite System)

File No. 22-DSS-MP-90(20)

To: The Commission

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JUN 13 1990

Domestic Facilities Division
Satellite Radio Branch

RESPONSE OF STARSYS, INC.

STARSYS, Inc. ("STARSYS"), by its attorneys and pursuant to the Commission's April 11, 1990 Public Notice, Report No. DS-953 at 2, hereby submits its response to the reply comments of Orbital Communications Corporation ("Orbital") to STARSYS's Petition to Deny Subject to Amendment to Application ("STARSYS Petition").

In its Petition, STARSYS demonstrated that Orbital's proposed "ORBCOMM" low earth orbit mobile satellite service ("LEO MSS") system was not spectrum efficient, and that approval of the Orbital application would contravene longstanding Commission policies favoring and fostering competitive multiple entry into new satellite technologies. Specifically, STARSYS showed that to the extent that Orbital proposed to use dated technology that would effectively grant Orbital the exclusive right to provide commercial LEO MSS service in the frequency bands now requested by both Orbital

and STARSYS, authorization of the ORBCOMM system was contrary to the public interest. In addition, STARSYS showed that if the Commission were to require Orbital to employ spread spectrum modulation -- a technology with which the Commission has had uniformly positive experiences -- the Commission would be able to establish a new service that was consistent with its policies, and Orbital would still be able to achieve its stated strategic objectives.

Finally, and significantly, STARSYS stated that if Orbital were to amend its ORBCOMM application to incorporate spread spectrum modulation techniques, STARSYS would no longer object to the ORBCOMM system application. Indeed, STARSYS echoed Orbital's assessment that LEO MSS services are poised to provide tremendous benefits to large segments of the population and industry.

In its reply comments, Orbital denied STARSYS's assertion that Orbital was seeking exclusive authority for its proposed ORBCOMM system to provide service in the subject frequency bands. Orbital also purported to refute STARSYS's showing that the incorporation of spread spectrum technology is preferable to the dated technology embraced by Orbital.

It is unfortunate that Orbital has taken such a narrow view of the competitive challenge provided by STARSYS. Orbital response to STARSYS's showing that ORBCOMM would be the exclusive commercial LEO MSS system (absent a requirement that

Orbital employ spread spectrum technology) by stating that "ORBCOMM's services will be subject to competition from a range of terrestrial and geostationary satellite providers." Orbital Reply Comments at 9-10. As Orbital is well aware, the competition to which STARSYS referred in its Petition, and which the Commission has encouraged in its satellite decisions, is intramodal competition, not intermodal competition. Moreover, both Orbital's ORBCOMM and STARSYS's Starnet systems are premised on the fact that they are able to make satellite services available on a universal basis via ultra low-cost terminal equipment -- services and equipment that are not available on comparable scales today.

Orbital also stated that it does not object to the authorization of additional LEO MSS systems, provided that "those applications will not interfere with ORBCOMM's system, or if the applications seek alternative frequencies." Orbital Reply Comments at 10. This "competition is acceptable so long as the competitors play somewhere else" attitude is hardly the type of reaction one expects from an entity that is really interested in the establishment of healthy competition. Orbital's rhetoric cannot mask the fact that grant of its ORBCOMM application as presently configured would severely inhibit the establishment of LEO MSS competition.

In response to Orbital's claim that incorporation of spread spectrum technology into its ORBCOMM system would be

"economically impractical and technically unworkable[,]" see Orbital Reply Comments at 11, STARSYS renews its observation that the Commission has emphatically disagreed with Orbital's assessment. See STARSYS Petition at 4. See also Amendment to the Commission's Rules to Allocate Spectrum For, and to Establish Other Rules and Policies Pertaining to, a Radiodetermination Satellite Service, 104 F.C.C.2d 650 (1986), where the Commission not only required applicants for authorizations to construct satellite systems to operate in the new radiodetermination satellite service to incorporate spread spectrum technology into their systems, it required applicants proposing uses of technology that were less efficient than spread spectrum uses an opportunity to amend their system proposals to specify spread spectrum technology or face rejection of their applications. Id. at 662. Neither Orbital's unsupported statements that incorporation of spread spectrum modulation would drive the cost of terminals out of the mass market range and would be inconsistent with the equipment (and uses thereof) employed by current government users in the band, nor its dismissal of STARSYS's claims as "mere puffery," hold much weight in light of the Commission's prior findings.*/

*/ A brief technical overview of the mechanics of STARSYS's spread-spectrum modulation proposal is supplied in the Technical Statement of Marvin Senter (STARSYS's technical consultant) that is attached hereto.

Next, while STARSYS has a few thoughts of its own about the technical, legal, and financial qualifications it stated in its Starnet system application, it agrees with Orbital that the instant proceeding is not the proper forum within which to address the bow shot fired against its Starnet application by Orbital. See Orbital Reply Comments at 10 n.17. It urges the Commission expeditiously to place the Starnet application on public notice, and invites Orbital's comments in response thereto.

Finally, STARSYS takes this opportunity to observe that it is Orbital, and not STARSYS, that has filed a "copycat" application. STARSYS's affiliates have been providing LEO MSS services in the requested bands to government and scientific users for more than a decade; indeed, it is the users of these systems that Orbital pledges to protect. Orbital is not entitled to undercut STARSYS's affiliates' exemplary and longstanding record of LEO MSS service provision, with claims that it (and not STARSYS) is the true innovator, merely by virtue of the fact that it filed its application two months before STARSYS.

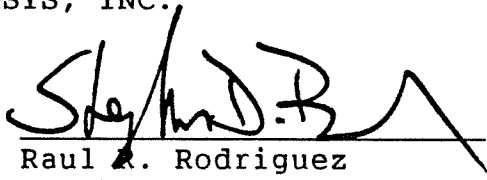
In sum, STARSYS has no desire to derail or to delay the prosecution and grant of Orbital's application. It merely urges the Commission to determine that only those LEO MSS applicants that propose to incorporate spread spectrum modulation techniques into their systems can be authorized

consistent with the public interest, and to impose such a requirement on Orbital's ORBCOMM application.

Respectfully submitted,

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June 11, 1990

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ATTACHMENT

TECHNICAL STATEMENT

It is imperative that the system technology selected for satellites operating in the proposed LEO MSS bands enable all services using those bands to function. Spread-spectrum type systems can facilitate sharing by occupying more bandwidth, reducing the spectral power density and using processing gain to reduce the signal margin required.

STARSYS's proposed use of a Code Diversity Multiple Access ("CDMA") pseudonoise modulated technique provides for lower radio frequency power, thereby improving overall system performance while facilitating LEO MSS services sharing. This enhanced ability to frequency share is due to the non-destructive nature of a relatively low bit rate CDMA modulation and its resulting flat spectrum shape. The absence of large noise peaks provides for a friendly RF environment.

This STARSYS modulation approach will facilitate sharing within the LEO MSS services, and between the LEO MSS and other services operating in the frequency bands. The STARSYS solution establishes the basis for compatibility between systems and thereby facilitates sharing. The STARSYS CDMA technique, a technically sophisticated and robust modulation approach, is more tolerant of the natural RF interference present in a multi-service environment. This multi-service synergistic approach is much preferred to the previously employed techniques that use higher power.

The CDMA spread-spectrum technique improves the efficiency of communications by spreading the signal out over the bandwidth available. This spreading provides for dilution of the signal energy for the given bandwidth resulting in a small power density at any point. In addition, the signal spreading process enables the receiver to reject strong undesired signals (interference). This rejection is accomplished through the correction of the spreading sequence between the transmitter and the receiver. The signal despreading process enhances the demodulated signal since the nonspread signals (noise/interference) are suppressed -- a very effective antijamming technology dominantly used in the worldwide military environment.

In a system that proposes sharing within the LEO MSS, and between the LEO MSS and other services, CDMA spread-spectrum technology provides considerable enhancement and improved reliable communications. Conventional MSS signals, such as Narrow Band FM ("NBFM"), are rejected as are other spread-spectrum signals not bearing the desired pseudonoise (PN) coding sequence. The result is a private channel in which only the spread-spectrum signals using the same pseudonoise sequence will be accepted by the spread-spectrum receiver. The use of different binary sequences allows several spread-spectrum systems to operate independently of each other within the same band. Once system

parameters are formalized, LEO MSS users in the same band space will experience minimum interference from other spread-spectrum users. Accordingly, more signals can be packed into the band, thereby facilitating sharing within the LEO MSS and between the LEO MSS and other services.

Effective spectrum utilization implies maximizing use of the band while minimizing interference. Additional spread-spectrum signals only raise the background noise level in a soft limiting effect, and are not as severe as the rapid degradation caused by over-allocation by other than spread-spectrum modulation techniques.

This overlay approach utilizes the spreading spectrum signal rarification and interference-rejection effects to share a band with conventional MSS or other modulation users. The STARSYS solution is a form of frequency diversity that utilizes unused spectrum space within the allocated band. This pseudonoise-modulated spread carrier, enables the receiver to measure precisely the initiation time of the signal. Thus, ranging for distance measurements to the transmitter is enhanced, complementing the position location capability of the system.

The STARSYS CDMA process is accomplished by modulating the RF carrier with a spreading code, thereby spreading it out over the entire bandwidth. This technique is direct sequence spreading whereby the phase of carrier frequency is shifted by

a random binary bit stream. This binary sequence is called pseudo-noise. Direct sequence spread-spectrum is the typical method used for transmitting digital information. In a direct sequence system, a correlator identifies and detects the signals in accordance with the applicable spreading code. The undesired signal will differ statistically from the desired signal, thus the correlator will discriminate the matched stronger signal. Upon removal of the spreading sequence, this demodulation process results in the digital information stream.

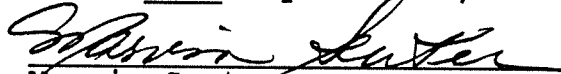
The STARSYS CDMA spread-spectrum modulation technique allows several spread-spectrum systems to operate independently of each other within the same band. Therefore, the objective of sharing within the LEO MSS, and between the LEO MSS and other services, is achieved.

ENGINEERING CERTIFICATE

My name is Marvin Senter. I am Engineering Manager of STARSYS, Inc. I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in the foregoing Technical Statement in support of the Response of STARSYS, Inc. to Orbital Communications Corporation's Reply Comments, and that I have prepared the foregoing Technical Statement. Under penalty of perjury, the Technical Statement is complete and accurate to the best of my knowledge.

Dated this 11 day of June, 1990

By:



Marvin Senter
Engineering Manager

CERTIFICATE OF SERVICE

I, Katharine K. Bryant, do hereby certify that a copy of the foregoing "Response of Starsys, Inc." was mailed, first-class postage prepaid, this 11th day of June 1990, to the following:

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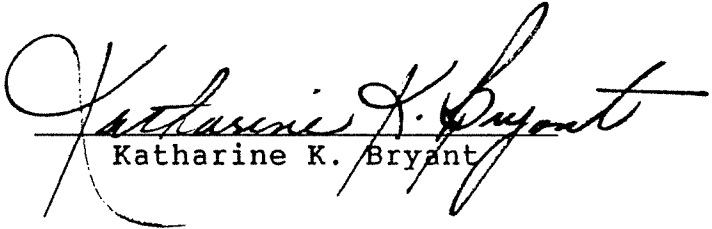
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