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

In the Matter of the Application of	)	
	)	
STARSYS, INC.	)	File No.
	)	33-DSS-P-90(24)
For Authority to Construct a Low Earth Orbit Mobile Satellite System	)	

COMMENTS

Geostar Corporation is filing these comments regarding the application of Starsys, Inc. (Starsys) for authority to construct a low-earth orbit mobile satellite system.

Geostar Corporation has two wholly owned subsidiaries. One of these, Geostar Positioning Corporation (GPC) is a Commission licensee in the radiodetermination satellite service (RDSS).[1] The other subsidiary, Geostar Messaging Corporation (GMC), is an applicant for a domestic mobile satellite system.[2]

---

1 *Geostar Corporation*, Mimeo 6144, August 7, 1986. GPC is authorized to construct, launch and operate three dedicated RDSS satellites, and is currently providing an interim RDSS service to over 70 commercial and government customers.

2 On June 18, 1988, GMC filed an application for a digital land mobile satellite system in the 1530-1544 and 1626.5-1645.5 MHz bands, as well as a petition for rulemaking (RM-6459) to allocate these frequencies for domestic mobile satellite service and establish licensing policies and procedures. The Commission has acted on GMC's petition only to the extent of issuing a notice of proposed rulemaking in Gen. Docket 90-56 to allocate these frequencies for domestic mobile satellite use. *Notice of Proposed Rule Making*, FCC 90-63 (March 5, 1990).

Although Starsys will be a competitor, Geostar does not object to Starsys' application to operate a low-earth orbit satellite system in the 137-138 and 148-149.9 MHz bands. However, according to Starsys, "[t]he two-way communications and ultra low-cost positioning capabilities of the STARNET system are unmatched by any technology developed to date."[3] Starsys also claims that "[t]he STARNET system is the most spectrum-efficient mobile satellite system ever proposed to the Federal Communications Commission."[4] Geostar believes that these claims are overstated, and that mobile communication and positioning services can be provided just as efficiently and economically by satellites in the geostationary orbit.

Starsys' claim that it can achieve a retail price of $50 to $150 per terminal[5] should be viewed in the context that these figures appear to be based on a production run in the millions of identical Starsys user terminals. If the prices of terminal equipment in geostationary satellite systems were also based on production runs in the millions, they would drop drastically below the current $4,000 price per terminal figure mentioned by Starsys[6].

---

3 Starsys *Application*, Volume I at 4.

4 *Id.* at 8.

5 *Id.* at VII-52 to 53.

6 *Id.* at III-6.

The claims of Starsys with respect to spectrum efficiency[7] should also be viewed in context. While Starsys claims that it can serve 40 million users with 2 MHz of spectrum, it should be recognized that each user gets very little service compared to the amount of service a user would get from the other systems used in the Starsys comparison.

Moreover, the system capacity figures presented by Starsys warrant close examination since they appear to significantly overstate available capacity. For example, Starsys expects to serve some 25 million automobile commuters.[8] However, taking its own claimed outbound capacity as 350,000 messages per hour, a commuter could expect to receive one message (or acknowledgment of an inbound message) every 71 hours, assuming such messages were evenly spread throughout the 24 hour day and that the system were used only for this type of service.[9]

Moreover, it does not appear that the 0.7 efficiency factor includes other necessary overhead, such as address bits (at least 25 bits, or 4 bytes if rounded up to the next whole byte, are needed to

---

7 *See e.g., id.* at III-11.

8 *Id.* at II-13.

9 Starsys appears to claim only 8 million users per day later in its application, *Id.* at VII-12, but this figure also assumes that each user receives one outbound message a day and that the traffic is spread evenly over the entire 24 hour day. However, commuter traffic is more likely to be spread only the relatively few hours of the day that would be considered "rush" hours, resulting in a further reduction in the number of users that can be served by the system.

address 25 million discrete users), message type/status indicator, and flush bits for the convolutional encoder[10]. The addition of a minimum of 6 additional bytes for this overhead would result in a 19% reduction in outbound capacity.

Additional difficulties are presented by the inbound capacity analysis presented by Starsys. For example, in the non-spread spectrum case, it is not clear why the capacity is increased by the ratio of the assigned channel bandwidth to the occupied channel bandwidth (i.e. a factor of 1.74).[11] Also, the 60 millisecond burst duration at 4800 bps for a 32 character message provides only 32 bits for user identification, type of message/service, time reference identification, and acquisition preamble[12]. This seems insufficient.

Nor does Starsys explain the basis for its computation of the inbound capacity for the spread spectrum case. For example, if Starsys' analysis is based on theoretical spread spectrum transponder capacity calculated on the basis of only code division noise[13], the capacity value would have to be significantly reduced to

---

10 The 4.5 dB E_b/N_0 value used in the link budgets for a 10^{-5} bit error rate corresponds to the processing gain of rate-1/2 forward error correction. Such error correction is not likely to be applied to the framing bits used to recover synchronization during temporary blockages between the satellite and mobile terminal.

11 *Id.* at VII-13.

12 Starsys does not address how the effects of doppler frequency shifts will be handled by the demodulators, or the correlators in the case of a spread spectrum system, in terms of the length of the acquisition sequence needed at the receiving earth station.

13 *See e.g.* CCIR Report 1050.

take into account other sources of degradation, such as interference from other satellites in the same system or interference from external sources. Thus, the inbound capacity is likely to be significantly less that the 530,000 (non-spread spectrum) or 1,590,000 (spread spectrum) messages/hour claimed by Starsys.

Starsys expects to provide a significant amount of safety and health (e.g. telemedicine and handicap support) services. However, Starsys does not analyze the blocking probability or average length of time to access its system for such critical services. With millions of users contending for only 10 channels, this is a significant issue if reliance is to be placed on the Starsys system for such services.

Moreover, the accuracy of position determination in the Starsys system will be much lower than that obtained from a geostationary RDSS satellite system unless the user is willing to wait for significant periods of time at a fixed location. For example, position fixes are determined to an accuracy of 50 meters in an RDSS system at the central earth station within seconds of receipt of a single transmission burst. In its low-earth orbit system, however, Starsys claims the accuracy of a single fix as only a kilometer.[14] Greater accuracy requires multiple position fixes over a period of minutes to hours, and even then the position accuracy is no better than a single fix obtained over a geostationary RDSS system.[15] Moreover, such an

---

14 Starsys *Application*, Volume I at VII-22

15 To get accuracies of 20 meters (relative positioning), Starsys requires several hours for a fixed terminal and a accurately located benchmark. *Id.* at VII-23.

improvement in positioning accuracy, by requiring multiple transmissions, will only further decrease the throughput of the Starsys system below the capacity claimed in its application.

In summary, while Geostar does not object to a grant of the Starsys application, the Commission should carefully scrutinize the claims made in the application before relying on them. Moreover, the Commission should not apply disparate treatment to other pending applications for new mobile satellite systems. In light of the prompt adoption of parallel rulemaking and application procedures for low earth orbit proposals, the Commission should expedite its handling of the long-standing applications for other new mobile satellite systems using the geostationary satellite orbit.[16]

Respectfully submitted,

T. Stephen Cheston
Executive Vice President
Governmental Affairs

Geostar Corporation
1001 22nd Street, N.W. - Suite 500
Washington, D.C. 20037
(202)-887-0870

August 17, 1990.

---

16 It took the Commission only five months from the filing of the first low earth orbit mobile satellite system application and associated petition for rulemaking to the issuance of a cut-off notice for additional applications for similar systems to be processed in parallel with the rulemaking. In contrast, it has been over 2 years since the filing of GMC's mobile satellite application and petition for rulemaking, and the Commission has yet to accept GMC's application. See note 2, *supra*.

CERTIFICATE OF SERVICE

I, Christine A. Brazeau, certify that on this 17th day of August, 1990 a copy of the foregoing "Comments" of the Geostar Corporation concerning the Application filed by Starsys, Inc. was mailed first-class to:

Raul R. Rodriguez, Esq.
Leventhal, Senter & Lerman
2000 K Street, N.W.
Suite 600
Washington, D.C. 20006-1809

Stephen D. Baruch, Esq.
Leventhal, Senter & Lerman
2000 K Street, N.W.
Suite 600
Washington, D.C. 20006-1809

Christine A. Brazeau

Christine A. Brazeau