

worldwide operation or access from aeronautical or maritime locations.¹⁰⁶ Specifically, an operator can assign channels in the WRC-92 spectrum first to customers in Regions 1 and 3 and aeronautical and maritime users. This will allow the most efficient use of all available uplink spectrum.

B. Sharing with GE Starsys in the 137 - 138 MHz Band

GE Starsys has indicated on numerous occasions during the last six years that it could share links with another CDMA system.¹⁰⁷ GE Starsys states in its April 25, 1994 amendment that "The sharing agreement allows all three applicants to operate successfully while leaving room for additional applicants at a later date."¹⁰⁸ Since that time, two significant events have occurred: (i) the April 1993 draft revision of ITU-R SA.1027 was further revised in June 1995 and (ii) Orbcomm modified its requested channel assignments on three occasions: August 12, 1994; November 15, 1994; and October 20, 1995.

GE Starsys' April 25, 1994 amendment includes an analysis showing that its proposed power flux density ("PFD") in the 137 - 138 MHz band is in compliance with the April 1993 draft revision

¹⁰⁶ While Orbcomm may argue that it has already begun construction of its satellites and cannot now redesign them to benefit from the incorporation of the WRC-95 spectrum, this does not present an insurmountable issue. It will be several years before new licensees of NVNG MSS systems will be adding even minimal traffic to the 148 - 149.9 MHz band. Orbcomm can incorporate the expanded spectrum plan into its second generation equipment. Furthermore, new entrants will have an incentive to optimize the use of the spectrum pool by first using the WRC-95 spectrum to serve those markets that can be addressed within the regional and service category limitations of this spectrum. It is imperative, though, that competition not be eliminated by precluding any one licensed provider from addressing the full marketplace through an unfair distribution of available spectrum. Therefore, the 148 - 149.9 MHz band must be made available to new FDMA/CDMA systems.

¹⁰⁷ The Report of the Below 1 GHz Negotiated Rulemaking Committee concluded that the 855 kHz for spread spectrum "will be able to accommodate as many as three additional CDMA users." Below 1 GHz Report at 8. See Reply Comments of GE Starsys at 10-11, CC Docket 92-76 (filed May 26, 1993); Supplemental Comments of GE Starsys at 3-2, Docket No. 92-76 (filed June 25, 1993).

¹⁰⁸ Amendment of Application of Starsys Global Positioning, Inc., File No. 33-DSS-P-90 (24), at Att. A, p. A-21 (filed Apr. 25, 1994).

of ITU-R SA.1027. The June 1995 ITU-R revision would require that GE Starsys reduce its PFD by at most 0.9 dB, which is not a significant change.

The interference from Orbcomm's downlinks into GE Starsys is proportional to the GE Starsys CDMA downlink matched filter response integrated over the spectrum used by Orbcomm. Using this measure, the interference decreased by 0.9 dB from Orbcomm's November 21, 1993 amendment, the public record on April 25, 1994 when GE Starsys filed its amendment, and Orbcomm's October 20, 1995 modification. Thus, Orbcomm's change in channel assignments effectively cancels out the effect of the June 1995 SA.1027 PFD reduction.

Consequently, there have been no material changes since GE Starsys filed its April 25, 1994 amendment. Hence, GE Starsys can accommodate an additional second round, narrowband Little LEO system operating in the 137 - 138 MHz band.¹⁰⁹

VI. THE COMMISSION SHOULD DEVELOP A BAND PLAN THAT WILL ALLOW THE INTRODUCTION OF NEW COMPETITIVE NVNG MSS SYSTEMS THAT CAN OFFER A FULL ARRAY OF SERVICES.

A. The FCC's Proposed Band Plan will not Support Near Real-Time Systems

In the Notice, the Commission proposes to award three new NVNG MSS licenses. Leo One USA, FACS and CTA all demonstrated in their comments that these systems will not support near real-time services. CTA notes that Little LEO System 1 could accommodate only one 12 kHz subscriber downlink and one 15 kHz feeder downlink.¹¹⁰ FACS agrees that the limited spectrum

¹⁰⁹ Additional analysis of this issue appears *infra* in Appendix E.

¹¹⁰ Comments of CTA at 21.

associated with this system makes it incapable of supporting near real-time services.¹¹¹ With regard to Little LEO System 2, CTA believes that it could support two small systems or one large system.¹¹² FACS believes that operational constraints associated with sharing with NOAA will result in 35% system outage.¹¹³ All the commenters note that the limited uplink spectrum associated with Little LEO System 3 makes the system unviable.¹¹⁴

Leo One USA's own analysis reached similar conclusions. Specifically, Leo One USA has demonstrated that Little LEO System 1 and Little LEO System 3 are economically and technically unviable. These systems will not be capable of meeting demand requirements for global, near real-time services.

B. Leo One USA's Proposal to License New Little LEO Systems A and B Would Serve the Public Interest.

FACS and E-SAT propose that the Commission grant partial licenses as a means to resolve mutual exclusivity among the pending applicants. These plans seem to be designed to resolve mutual exclusivity rather than provide the public with the opportunity to purchase services from new competitive suppliers. The public does not care about mutual exclusivity, the administrative burdens of the Commission or the parochial interests of an individual applicant. Rather, the public's principal concern is in having a variety of suppliers to purchase wireless status services. In this proceeding, the Commission cannot let the interest of some parties in resolving this proceeding outweigh the

¹¹¹ Comments of FACS at 19. This is because there are not sufficient numbers of channels to allow operation of the multiple overlapping beams necessary to support near real-time services.

¹¹² Comments of CTA at 21-22.

¹¹³ Comments of FACS at 20-21.

¹¹⁴ *See, e.g.*, Comments of Leo One USA at 32.

interest of the public in having a variety of new NVNG MSS services and suppliers. Although Leo One USA believes that the Commission should seek engineering solutions as means to avoid mutual exclusivity, it does not believe it is technically possible to accommodate more than two near real-time systems. In light of this fact, it will not be possible to license near real-time systems if the spectrum is divided among three applicants.

Consequently, Leo One USA, in its comments, proposed that the Commission license two new NVNG MSS systems -- Little LEO Systems A and B.¹¹⁵ System A will operate downlink in the 400.15 - 401 MHz band and System B will operate downlink in the 137 - 138 MHz band. These systems will share the 148 - 149.9, 399.9 - 400.05, 455 - 456, and 459 - 460 MHz band uplinks with Orbcomm. Both of these systems would be capable of offering near real-time services. An analysis of the competitive implications of these two systems reveals that their introduction would significantly reduce market concentration vis-a-vis market structure that exists today or the three systems proposed in the Notice. As Leo One USA demonstrated, the Herfindahl-Hirschman Index ("HHI") for the currently licensed NVNG MSS market is 6800.¹¹⁶ Implementation of the three systems proposed by the Commission would reduce the HHI to 3328, resulting in a highly concentrated market under the Guidelines. If the Commission were to adopt the proposal of Leo One USA to create Little LEO System A and Little LEO System B, the HHI would be reduced to 2885.¹¹⁷

¹¹⁵ In the event the Commission adopts Leo One USA's band sharing proposal, Leo One USA intends to apply for authority to operate Little LEO System A.

¹¹⁶ A more detailed discussion of this analysis can be found in the Comments of Leo One USA at App. A.

¹¹⁷ It should be noted that under the Guidelines, an HHI change of 100 points or more is significant for purposes of a competitive analysis.

There are additional benefits to the Leo One USA proposal when compared to the Commission's proposal or the FACS proposed band plans. First, the total capacity for NVNG MSS systems would rise to 3.13 "Orbcomm equivalent units" under the Leo One USA proposal as compared to 2.36 units under the proposal in the Notice. Certainly, larger total capacity should translate into lower prices and larger gains to consumers. Second, the Leo One USA proposal will more evenly distribute capacity over the four commercial suppliers (Orbcomm, GE Starsys, Little LEO System A and Little LEO System B). Third, if VITA or GE Starsys fail to offer service, the impact of Leo One USA's proposal on capacity and the HHI level becomes more pronounced. As this analysis demonstrates, the consumer would be significantly better off if the Commission were to adopt Leo One USA's proposal rather than the proposal in the Notice or any of the band plans proposed by FACS.¹¹⁸ Finally, licensing under Little LEO Systems 1, 2 or 3, as proposed in the Notice, will not support the introduction of systems capable of offering near real-time services. This will deprive the public of access to new competitive systems capable of offering near real-time service.

C. The Commission Can Eliminate Mutual Exclusivity if it Adopts the Proposals Made by Leo One USA

In order to determine whether mutual exclusivity can be resolved, Leo One USA suggests that the Commission undertake the following actions. First, it should dismiss the applications of the first round licensees and those applicants affiliated with first round licensees. Second, the Commission should adopt the band plan proposed in these comments. Third, the remaining

¹¹⁸ CTA, in its comments, recognizes the problems associated with the Commission's band plan and recommends that Little LEO System 1 and Little LEO System 3 be merged. Comments of CTA at 23.

applicants should be required 30 days after the release of the Report and Order that adopts new rules for the NVNG MSS¹¹⁹ to amend their applications to conform to the new rules including the new financial qualification rules. Fourth, the Commission should review the financial qualifications of each of the applicants and immediately dismiss or defer the applications of unqualified applicants. Fifth, if more than one qualified applicant seeks to operate in the same band, the Commission should auction the band.¹²⁰ This approach can reduce conflicts among the applicants and should resolve mutual exclusivity.

VII. THE COMMISSION SHOULD USE AUCTIONS ONLY AS A LAST RESORT

The comments in this proceeding are replete with public policy reasons why the Commission should not resort to auctions to award new NVNG MSS licenses. These include the likelihood of sequential auctions in countries around the world, the loss of U.S. leadership in satellite policy and the increased possibility of *a priori* planning of the spectrum resource. Leo One USA agrees that the use of auctions would present a number of significant public policy problems. It further agrees that the Commission is obligated to use engineering solutions and strict financial qualifications as a means to resolve mutual exclusivity as long as the public interest in the introduction of new, competitive near real-time systems can be maintained. However, if mutual exclusivity still exists after this process is completed, the Commission would have little choice but to auction new NVNG

¹¹⁹ See Motion for Deferral of Leo One USA and CTA (filed Jan. 6, 1997.)

¹²⁰ The Commission should reject E-SAT's argument that its system can be licensed immediately because it does not affect other users. This is merely a self-serving statement that does not accurately reflect the sharing issues raised by the E-SAT system. In particular, E-SAT will need to develop a mechanism to share with GE Starsys as well as all other first round and second round NVNG MSS licensees using the 137 - 138 MHz band. As the Commission is well aware through the technical disputes between GE Starsys and Orbcomm, CDMA operations in the 137 - 138 MHz band will affect the FDMA/TDMA systems. Given this fact, the Commission cannot authorize E-SAT to proceed unless there is a complete settlement among qualified second round applicants.

MSS licenses. None of the parties has offered any other viable approach to resolve this proceeding. Comparative hearings would be expensive and time consuming. Moreover, it would be difficult for the Commission to make a decision that company A deserves a license over company B. A negotiated rulemaking would seem to have limited prospects for success if the applicants have been unable to resolve the outstanding issues privately.¹²¹ Thus, the only method that could possibly resolve this proceeding would be an auction. Contrary to the view of some commenters, the Commission does have authority to auction NVNG MSS licenses. Section 309(j)(1) of the Communications Act of 1934, as amended,¹²² provides the Commission authority to use competitive bidding to award licenses to qualified applications. Pursuant to Section 309(j)(6)(E) of the Act,¹²³ the Commission is obligated to seek means to avoid mutual exclusivity if at all possible. However, if mutual exclusivity cannot be resolved, the Commission can resort to auctions. None of the commenters has provided any basis for a contrary conclusion.

As the Commission noted in the Big LEO proceeding, "[n]othing on the face of Subsection 309(j)(6)(E), or in its legislative history, indicates that [the Commission is] prohibited from granting Big LEO licenses by auction."¹²⁴ Moreover, the auction legislation specifically recognized that there

¹²¹ As FACS and E-SAT have disclosed to the Commission in their comments on the Leo One USA/CTA Motion for Deferral, Leo One USA has participated in good faith in settlement discussions among the new applicants. Contrary to the assertions of FACS and E-SAT, however, these discussions are not on-going. Based on the difficult technical and business issues involved, Leo One USA does not believe that this proceeding can be settled privately.

¹²² 47 U.S.C. § 309(j)(1).

¹²³ 47 U.S.C. § 309(j)(6)(E).

¹²⁴ Big LEO Licensing Order at 5966.

would be situations where mutual exclusivity could not be resolved.¹²⁵ If that situation occurs for the NVNG MSS, Leo One USA believes that the quickest means to ensure the introduction of new competitive NVNG MSS systems capable of providing near real-time service would be auctions.

VIII. MISCELLANEOUS ISSUES

A. The Commission Should Strictly Enforce its Milestone Requirements

The NVNG MSS licensees are required to conform with the milestones specified in their system licenses. Specifically, licensees are required to begin construction of the first two satellites within one year of the date the license was granted and commence construction on all satellites within three years of the date the license was granted. Given the significant shortage of NVNG MSS spectrum, the Commission must closely scrutinize the licensees' actions to ensure that they are complying with the specified milestones. Specifically, the licensees should be required to report to the Commission on or before the date specified in the license that they have met each specific milestone condition. Today, there is nothing in the Commission's record indicating that GE Starsys has commenced construction of its first two satellites. If GE Starsys does not provide this information to the Commission and actually does not begin construction, it will be in a position to warehouse spectrum until at least November 1999, the date by which it is required to have launched its first two satellites. This would not serve the public interest.

Relatedly, each licensee should be required to report any changes to its implementation plans. Evidently, Orbcomm has changed its system design and is currently planning to launch only 28

¹²⁵

See 47 U.S.C. § 309.

satellites as opposed to the 36 satellites specified in the Orbcomm license.¹²⁶ Obviously, this alteration in plans has an impact on the frequency requirements of Orbcomm and implications on the processing of second round applications. It certainly calls into question Orbcomm's stated need to launch twelve additional satellites on the basis of enhancing availability because their plan to launch 28 of the authorized 36 satellites considerably lowers their availability.¹²⁷ In order for the Commission to have an accurate understanding of each licensee's spectrum requirements, Leo One USA urges the Commission to impose strict reporting requirements on licensees to ensure that a licensed system is being constructed in a manner consistent with designated milestones.

B. WRC-95 and WRC-97 Issues

1. Access to Spectrum Allocated At WRC-95 and WRC-97

All the parties agree that the pending applicants and existing licensees should be provided access to use the frequency allocated at WRC-95 and any frequency allocated at WRC-97. In order to ensure that the public obtains the maximum benefits from the introduction of new NVNG MSS systems, Leo One USA believes any spectrum that remains unassigned or becomes available after the second round licenses are issued should first be assigned to second round licensees and then to all existing licensees as appropriate to permit the licensees to implement the full capabilities of their proposed systems.

2. Sharing in the 455 - 456 MHz and 459 - 460 MHz Bands with Terrestrial Services

¹²⁶ See *infra* App. A, Orbcomm Offering Memorandum at 12 (footnote 6 to table).

¹²⁷ See *infra* App. B.

Some of the commenters raised questions regarding the ability of NVNG MSS systems to share uplink spectrum with the Land Mobile Service ("LMS"). Leo One USA believes that this concern is misplaced and unsupported by any technical analysis by these commenters of how these systems will operate. This is because NVNG MSS transceivers will transmit only on channels that are temporarily not being used by the LMS anywhere within the coverage beam of the satellite. The NVNG MSS satellites will use dynamic channel assignment ("DCAAS") receivers to continuously monitor the channel activity on the ground. (DCAAS has been previously successfully demonstrated using an operational NVNG MSS satellite.) Information on available channels will be transmitted to all NVNG MSS transceivers within the satellite beam. Doppler shift of the Land Mobile Service ("LMS") transmitters and the NVNG MSS transceivers is taken into account to insure that NVNG MSS transmissions are not on the same frequencies as those being used locally by the LMS, and also to insure that signals received at the satellite occur only on clear channels. NVNG MSS transmissions are short duration (500 ms or less) and low duty cycle (1% maximum).

There is the small possibility that the DCAAS will fail to detect an active channel (due to blockage, low power, or some other reason). For those small number of cases, Leo One USA used a statistical simulation technique to determine the probability of interference to a LMS receiver and the mean time between interference events. For the cases studied (different channel bandwidths, satellite data rates, and LMS receiver distributions), the potential interference was found to degrade the availability of the channel for LMS use by much less than 0.1%¹²⁸.

¹²⁸ See *infra* App. F: Document 8D/TEMP/133-E, Methods for Modeling Frequency Sharing Between Stations in the Land Mobile Service Below 1 GHz and Non-Geostationary Satellite Orbit (Non-GSO) Mobile Earth Stations was recently approved at the International Working Party 8D meeting held in Geneva, Oct/Nov 1996 as a Working Document Towards Draft New Recommendations. See (continued...)

The analysis that determined these probabilities to be so low, was a multiple worst case analysis. The more general case, without simultaneous worst case conditions, would have even lower probabilities of interference. These analyses were submitted internationally to the meeting of Working Party 8D of the ITU-R in early November. Among the conclusions reached at that meeting was that frequency sharing, as modeled, would produce infrequent interference to the land mobile service.

For the case of LMS base stations, which were not modeled, there are higher antennas and correspondingly larger areas of potential interference. However, the probabilities of interference modeled are so low that even with 30 times the interference area, the criteria of no more than 10% increase in unavailability could be met.

Several land mobile service users associations maintain that no additional interference is acceptable. In the case of the 25 kHz channel noted by the American Petroleum Institute as set aside for the Petroleum Radio Service and specifically dedicated for communications related to oil spill containment and clean up activities it is highly unlikely that any interference would ever be experienced.

C. Status of Not-For-Profit Entities

Leo One USA opposes any requirement that forces NVNG MSS licensees to reserve system capacity for use by particular groups or entities.¹²⁹ Although Leo One USA supports the humanitarian services SatelLife, Inc. ("SatelLife") provides and which VITA proposes to offer, Leo

¹²⁸ (...continued)
Appendix F.

¹²⁹ See Comments of SatelLife, Inc. at 2.

One USA believes there is an insufficient basis for the Commission to conclude the public interest would be served by taking the drastic step of setting aside system capacity for use by these entities. Leo One USA agrees that SatelLife's humanitarian efforts are significant. Leo One USA applauds SatelLife for its efforts which have allowed for the use of innovative communications systems for health and other public services. The NVNG MSS should be used to bring these services to the public, and Leo One USA looks forward to working with entities such as SatelLife to ensure the public benefits from these communications systems.

As an initial matter, Leo One USA urges the Commission to consider the precedent-setting nature of the SatelLife request. SatelLife claims that its proposed "humanitarian capacity requirement" to be imposed on NVNG MSS providers would promote SatelLife's humanitarian mission around the world.¹³⁰ Leo One USA believes that all of SatelLife's arguments could be applied to virtually every communications service. Certainly, rural medical facilities in the United States would benefit from access to Big LEO and Fixed Satellite Service facilities at reduced or no cost. Imposition of this requirement on the NVNG MSS inevitably would lead to similar claims on other existing and future communications technologies.

Leo One USA notes that SatelLife relies primarily on the Direct Broadcast Satellite ("DBS") service to support its claim that the Commission has the authority and precedent to apply a capacity set aside for the NVNG MSS.¹³¹ In the case of DBS, however, Congress explicitly directed the

¹³⁰ *Id.* at 5 *et seq.*

¹³¹ *See Id.* at 9.

Commission to set aside system capacity for educational or informational programming.¹³² No such statutory mandate exists for the NVNG MSS. In fact, in the Telecommunications Act of 1996,¹³³ Congress rejected proposals to set aside for public use a percentage of all facilities using public rights of way. To enact such a set aside in this case would be antithetical to Congress' most recent decision in this area.

Leo One USA also is concerned that SatelLife's proposal is flawed from an implementation prospective. It would be extremely difficult to define what entities would be given access to the set aside. The capacity reserve might subject NVNG MSS service providers to unnecessary litigation from groups claiming rights to the capacity reserve or from groups claiming they were unfairly excluded.

As a final matter, Leo One USA notes SatelLife's claims are simply premature. SatelLife has in orbit a satellite fulfilling much of the mission it claims cannot be satisfied without a capacity reserve. Moreover, SatelLife could explore with service providers the possibility of obtaining non-peak capacity at reduced cost. Leo One USA would welcome such discussions from a purely humanitarian entity such as SatelLife. At a minimum, the Commission should wait until there is evidence that system capacity is not available for humanitarian groups before considering any set aside.

IX. CONCLUSION

Leo One USA applauds the Commission initiatives in this proceeding. The prompt adoption of the policies proposed by the Commission, as modified by changes suggested by Leo One USA,

¹³² *Id.*

¹³³ Pub. L. No. 104-104, 110 Stat. 56.

will ensure that the public is provided with opportunities to purchase NVNG MSS services from a variety of competitive suppliers.

Respectfully submitted,



Frederick R. Warren-Boulton
MiCRA
1155 Connecticut Avenue, N.W.
Suite 900
Washington, D.C. 20036
(202) 467-2500

Robert A. Mazer
Albert Shuldiner
Vinson & Elkins
1455 Pennsylvania Avenue, N.W.
Washington, DC 20004
(202) 639-6500

Economist

Counsel for Leo One USA
Corporation

Dated: January 13, 1997

APPENDIX A

ORBCOMM OFFERING MEMORANDUM (excerpts)

OFFERING MEMORANDUM SUMMARY

The following summary is qualified in its entirety by, and should be read in conjunction with, the more detailed information and financial statements, including the Notes thereto, appearing elsewhere in this Offering Memorandum. Unless the context otherwise requires, the terms "Company" or "ORBCOMM" refer to ORBCOMM Global, L.P., ORBCOMM USA, L.P. ("ORBCOMM USA") and ORBCOMM International Partners, L.P. ("ORBCOMM International"). Certain capitalized terms used in this Offering Memorandum are defined in the Glossary. All references in this Offering Memorandum to "\$" or "dollars" are to U.S. dollars. Prospective purchasers of the Notes should carefully consider the specific matters set forth under "Risk Factors" beginning on page 13 as well as the other information and data included in this Offering Memorandum prior to making an investment in the Notes.

The Company

The Company is establishing the first commercial low-Earth orbit ("LEO") satellite-based mobile data and messaging communications system that will be available on a global basis (the "ORBCOMM System"). The ORBCOMM System, planned to be fully deployed in late 1997, is designed to provide reliable, low-cost, two-way global data and messaging communications through a constellation of 28 LEO satellites and a complement of associated ground infrastructure situated around the world. The Company believes that there is significant global demand for its low-cost data and messaging communications services. Major target markets include worldwide mobile asset tracking; remote industrial monitoring and control applications; environmental data collection; and real time person-to-person and machine-to-machine communications, including two-way Internet electronic mail ("email") communications and recreational and business messaging. The Company anticipates that the ORBCOMM System will be used: (i) as a complement to existing or proposed tower-based services such as paging and other narrowband personal communications services ("PCS"), providing geographic coverage in areas these systems are unable to reach; and (ii) to enhance data applications currently being provided through the public switched telephone network ("PSTN") and the public switched data network ("PSDN"). In addition, the Company expects that the introduction of its low-cost, reliable data and messaging communications will lead to the development of new applications and services.

The Company currently offers commercial intermittent data communications services in the United States through its existing network, which consists of two LEO satellites launched in April 1995 and related U.S. ground infrastructure. When fully deployed, the ORBCOMM System is designed to provide data and short, alphanumeric paging-like messaging communications coverage virtually anywhere on the Earth's surface in a reliable and cost-effective manner. In contrast to "Big LEO" systems, which are designed primarily for voice applications and require satellite communications systems that are estimated to cost in excess of \$2 billion to construct and deploy, the ORBCOMM System, which is a "Little LEO" system, is focused on data communications and messaging applications and will be constructed and deployed for approximately \$258 million (with additional amounts needed to fund initial operation of the ORBCOMM System and certain debt service obligations). The ORBCOMM System is designed to address the substantial existing and growing demand for communications services worldwide, without the high cost and geographic and technical limitations imposed by other communications systems. The Company believes the diversity and depth of the ORBCOMM System's potential applications result in a significant addressable end-user market. Based on industry data and the Company's marketing analyses regarding the tracking and monitoring markets, the Company believes that the size of the 1996 potential addressable market exceeds 78 million users worldwide, including 32 million users in North America. In addition, the Company believes there is a significantly larger addressable market that includes potential users of other messaging services such as paging and PCS.

In October 1994, a subsidiary of Orbital Sciences Corporation ("Orbital") became the first company to be awarded Federal Communications Commission ("FCC") authority to construct, launch and operate a LEO satellite-based data and messaging communications system in the United States. Today, the ORBCOMM System is the only commercial Little LEO system that is fully licensed for all segments of its

system in the United States. Certain portions of the radio spectrum were allocated by the International Telecommunications Union ("ITU") for use by Little LEO systems, such as the ORBCOMM System, on an international basis in 1992. The Company intends to enter into agreements with International Licensees, who will pursue the requisite local regulatory approvals for each foreign country in which the ORBCOMM System will operate and who will pay fees for access to the ORBCOMM System in their territory.

In 1995, in addition to the successful launch of the first two ORBCOMM System satellites, the Company: (i) completed initial development and construction of the ground infrastructure located in the United States and associated network control systems; and (ii) tested prototype Subscriber Communicators. The two ORBCOMM System satellites and four U.S. Earth stations currently are providing data communications services, focused on monitoring applications, to the U.S. environmental and oil and gas industries, with tracking and positioning applications targeted for the near future. As of May 31, 1996, the ORBCOMM System had transmitted in excess of one million messages and successfully completed extensive internal and third-party testing, including a rigorous demonstration program conducted by the U.S. Department of Defense ("DoD") as part of its Joint Warrior Interoperability Demonstration '95.

To use the ORBCOMM System, a user creates a text message utilizing a computer or Subscriber Communicator device, which message is sent to the nearest ORBCOMM System satellite and delivered to an ORBCOMM Earth station, which supports communication with the satellites, and then to the Gateway Switching System, which processes the messages. Within the Gateway, the message is processed using a combination of ORBCOMM-developed and commercial email software, and sent on to its ultimate destination. If desired, an acknowledgement message is returned to the sender. The final delivery may be to another Subscriber Communicator or may make use of public/private X.25 data networks, the Internet, or text-to-fax conversion.

The Company intends to distribute its services globally in a cost-effective manner through the use of Resellers in the United States and International Licensees around the world. The Company is in the process of negotiating and signing agreements with Resellers, each of whom will be responsible for marketing to end customers in a specific industry and/or market and generally is expected to develop software applications to facilitate use of ORBCOMM System services by such industry or market segment. To date, 21 reseller agreements have been signed with companies including Arinc, Inc., Boatrac, Inc., Corexco Consulting Services, Inc., Globitrac, Inc., IWL Communications, Inc., QUALCOMM, Incorporated and the Stevens Water Monitoring Division of Leupold & Stevens, Inc. The Company has signed 17 Memoranda of Understanding with potential International Licensees and is in active negotiations with six other potential International Licensees; taken together, these 23 potential International Licensees represent approximately 75 countries around the world. The Company intends to convert its existing Memoranda of Understanding into Service License Agreements during the next three to 18 months. In addition, the Company has signed a Service License Agreement with one International Licensee, ORBCOMM Canada Inc., which is controlled by Teleglobe Inc. ("Teleglobe"), and which has been given the exclusive right to market services in Canada using the ORBCOMM System.

ORBCOMM is a limited partnership formed in 1993 to develop, construct, operate and market the ORBCOMM System. The general and limited partnership interests in ORBCOMM are held by each of Orbital Communications Corporation ("OCC"), a subsidiary of Orbital, and Teleglobe Mobile Partners ("Teleglobe Mobile"), a Delaware general partnership whose interests are held by Teleglobe and Technology Resources Industries Bhd. ("TRI"), a Malaysian holding company that controls the largest cellular operator in Malaysia. OCC and Teleglobe Mobile have invested or committed to invest approximately \$160 million in the ORBCOMM project. As of June 30, 1996, approximately \$130 million of the total equity commitment had been contributed to the Company, with the balance to be contributed prior to the consummation of the Offering. The Company believes that such equity investment, together with the proceeds of the Offering and cash expected to be generated from operations, will be sufficient to fund the ORBCOMM System, including: (i) all capital expenditures necessary to deploy the ORBCOMM System; and (ii) all required working capital until at least December 31, 1997, when full deployment of the ORBCOMM System is planned to have occurred. There can be no assurance, however, that additional capital will not be necessary.

Business Strategy

The principal elements of the Company's business strategy include:

Real Time, Reliable Worldwide Coverage. The fully deployed ORBCOMM System has been designed to provide for the delivery and receipt of data communications and short, alphanumeric paging-like messages anywhere in the world on a highly efficient and cost-effective basis. The ORBCOMM System's worldwide coverage will enable it to provide tracking, monitoring and messaging services, including Internet email capability, to customers that are currently beyond the geographic reach of existing terrestrial wireline or wireless systems. The ORBCOMM System is designed to deliver reliable communications services through the use of acknowledgment and store-and-forward capabilities. ORBCOMM expects that, with a planned constellation of 28 satellites, the ORBCOMM System will provide communications availability generally exceeding 95% of each 24-hour period in the United States and other temperate zones in the Northern and Southern Hemispheres and exceeding 75% of each 24-hour period in the equatorial region.

First-to-Market. The ORBCOMM System began providing commercial intermittent service in February 1996. Prior to commencing commercial operations, the space segment, network and management control systems, U.S. Gateway and prototype Subscriber Communicators were tested extensively to ensure technical viability. The Company believes that the existence of an in-service, commercially operational system provides substantial "first-to-market" benefits, including: (i) reducing technical risk; (ii) increasing the attractiveness of the ORBCOMM System to potential Resellers, International Licensees and Subscriber Communicator manufacturers; (iii) facilitating and encouraging the development of software by Resellers and other application developers for a variety of market applications because of the ability to test the hardware and software in an actual operating environment; and (iv) developing a customer base before other competing Little LEO systems are fully deployed, which the Company believes will not occur before 2000. There can be no assurance, however, that there will be no delays in the existing schedule associated with the construction or deployment of the ORBCOMM System.

Global Distribution of Services. The Company believes the ORBCOMM System can rapidly achieve a global presence in a cost-effective manner by capitalizing on the significant resources of Resellers and International Licensees worldwide. The Company plans to provide services in the United States through Resellers, many of whom have an existing, well-established market presence through their existing customer bases, market-specific brand name recognition and distribution networks. Outside the United States, the Company will enter into Service License Agreements with International Licensees who will be responsible in their territory for, among other things, procuring and installing the necessary Gateways, obtaining all regulatory approvals to provide services using the ORBCOMM System and operating and marketing services using the ORBCOMM System. The Company intends to select its International Licensees primarily by evaluating the ability of the International Licensee to distribute and market successfully the Company's services. Key components of such an evaluation include the prospective International Licensee's: (i) reputation in the marketplace; (ii) existing distribution capabilities and infrastructure; (iii) financial condition and other resources; and (iv) ability to obtain the requisite local regulatory approvals.

Low-Cost Subscriber Communicators. The Company is committed to promoting the production of lightweight Subscriber Communicators that have a long battery life and are widely available at prices attractive to a broad customer base. The Company has provided extensive design specifications and technical and engineering support to its various Subscriber Communicator manufacturers. The Company currently has a development agreement with Kyushu Matsushita Electric Company, Ltd. (also known as "Panasonic"), which has received authorization from the Company to manufacture a basic Subscriber Communicator and has units that are now commercially available. The Company is in the process of finalizing manufacturing and sales support agreements with Panasonic and has executed Subscriber Communicator Manufacturing Agreements, which include terms regarding the development, manufacture and sales support for Subscriber Communicators, with Scientific-Atlanta, Inc ("Scientific Atlanta"), Magellan Corporation ("Magellan"), Torrey Science Corporation ("Torrey Science") and Stellar Electronics Ltd. ("Stellar"), an Israeli company that is a subsidiary of Tadiran Ltd., a leading Israeli electronics company. The Company believes that once its other Subscriber Communicator manufacturers have units that are commercially available and once the

overall production volume for Subscriber Communicators increases, the price for Subscriber Communicators will decline substantially. Panasonic and Stellar have informed the Company that, in lots of at least several thousand, the price for their respective Subscriber Communicators will be approximately \$550 per unit.

Expertise of Strategic Partners. Orbital and Teleglobe, the Company's partners, have invested or committed to invest approximately \$160 million in the ORBCOMM project. The Company has used and will continue to use its partners' expertise and capabilities to enhance the ORBCOMM System, including expertise in the design, construction and deployment of satellites and the operation of international wireline and wireless telecommunication services.

Orbital, a Delaware corporation headquartered in Dulles, Virginia and with offices in five countries, is the founder of the ORBCOMM project, and through its subsidiary, OCC, has a 50% Participation Percentage interest in ORBCOMM. Orbital is a space technology and satellite services company, with annual revenues in 1995 of approximately \$364 million, that designs, manufactures, operates and markets a broad range of space products and services, including launch systems, satellites, space sensors and electronics, ground systems and software products, satellite access products and communications and information services. Under the terms of the Procurement Agreement between Orbital and ORBCOMM, Orbital will, among other things, construct 34 satellites (including eight ground spares), launch 26 satellites and, on an optional basis, launch the eight ground spares. The satellites and launch services are provided on a fixed-priced basis, although the Procurement Agreement contains certain performance incentives with respect to the satellites.

Teleglobe, a Canadian corporation with 1995 revenues of approximately C\$1.6 billion, provides international telecommunications services to over 240 countries worldwide through a network of submarine cables and satellite Earth stations. Teleglobe currently has offices in ten countries. Teleglobe is owned approximately 22% by BCE Inc., which is the largest public corporate entity in Canada, and indirectly approximately 20% by Telesystem Ltd., which has an interest in Telesystem International Wireless Corporation N.V. ("TIW"). TIW has paging and cellular interests in several countries around the world, including China, Mexico and India. Teleglobe has substantial experience as an intercontinental provider of telecommunication services and has played and continues to play an important advisory role in the ORBCOMM project generally and in the Company's marketing and distribution strategy in particular.

Teleglobe has formed a partnership, Teleglobe Mobile, with TRI to hold its interest in the ORBCOMM project. TRI operates the largest and one of the fastest-growing cellular networks in Malaysia, with over 800,000 subscribers. TRI also has cellular and paging joint ventures in five countries.

The Company's principal executive offices are located at 21700 Atlantic Boulevard, Dulles, Virginia 20166, and the Company's telephone number is (703) 406-6000. The Company's Web site is located at <http://www.orbcomm.net>.

Significant Milestones

Milestones Achieved to Date

Through June 30, 1996, the Company has achieved the following milestones:

- *FCC Authorization.* In October 1994, OCC was granted authority by the FCC to construct, launch and operate 36 LEO satellites in the United States (the "FCC License"). In May and June 1995, OCC received FCC authority to operate its four U.S. Earth stations and to provide services in the United States to Subscriber Communicators.
- *Deployment of First Two Satellites.* In April 1995, the first two of the 28 satellites expected to comprise the ORBCOMM System were deployed. These two satellites are operational.
- *Equity Commitments.* In September 1995, the partners increased their committed equity in the ORBCOMM project to a total of approximately \$160 million.

- *Gateways.* As of December 1995, the U.S. Gateway, including three of the four Earth stations and key portions of the ORBCOMM System's control segments, was operational. In May 1996, the fourth Earth station became operational.
- *Commercial Service.* In February 1996, after extensive testing, the ORBCOMM System commenced commercial service.
- *Subscriber Communicators.* The Company has reached agreements with several manufacturers for the development and manufacture of various types of Subscriber Communicators. Panasonic's Subscriber Communicator became commercially available in March 1996.
- *Resellers.* The Company has signed agreements with 21 Resellers in the United States who will provide services for, among others, the trucking, marine, oil and gas and environmental industries.
- *International Licensees.* The Company has signed Memoranda of Understanding with 17 potential International Licensees and is in active discussions with six additional potential International Licensees; taken together, these 23 potential International Licensees represent approximately 75 countries around the world. On December 19, 1995, the Company signed a Service License Agreement with ORBCOMM Canada Inc.

Future Milestones

The Company expects to achieve the following future milestones:

- *Deployment of Additional Satellites.* By the end of 1997, the Company plans to have launched an additional 26 satellites, for a total constellation of 28 satellites. The Company has an option to launch an additional eight ground spare satellites that, if launched as a fourth plane, would complete deployment of the 36 LEO satellites authorized by the FCC License.
- *Subscriber Communicators.* By the first quarter of 1997, the Company expects that Subscriber Communicators will be commercially available from Torrey Science and Stellar.
- *Resellers.* The Company is currently in negotiations with 13 additional potential Resellers who will provide services for, among others, the utility, rail carrier and law enforcement industries.
- *International Licensees.* By December 1997, the Company plans to have converted its 17 existing Memoranda of Understanding into definitive Service License Agreements with International Licensees.
- *Commencement of Global, Real Time Service.* In 1998, following the launch and deployment of an additional 26 satellites and extensive review of the fully deployed ORBCOMM System, the Company plans to be able to offer real time communications services.

Constellation Design and Implementation Strategies

The ORBCOMM System has been designed to provide for the delivery and receipt of short messages anywhere in the world on a highly efficient and cost-effective basis. The Company believes that multiple aspects of the ORBCOMM System design will result in a low-cost product offering worldwide and that the implementation plan for the ORBCOMM System should reduce the risk of cost overruns, system performance shortfalls and system deployment delays. Important components of the ORBCOMM System design and implementation strategies include: (i) the design, development and deployment of a low-cost satellite system; (ii) the development of a communications protocol specifically designed for data and messaging communications; (iii) the use of contractual and other means to mitigate the risk of delays and system failures; and (iv) the use of advantageous radio frequencies. See "Business — Constellation Design and Implementation Strategies."

Sources and Uses of Funding for the ORBCOMM System

The net proceeds from the sale of the Notes offered hereby are estimated to be approximately \$164 million (after deducting discounts and commissions to the Initial Purchasers and estimated Offering expenses). All the net proceeds of the Offering will be applied to: (i) the design, construction, launch, operation and marketing of the ORBCOMM System through the date of full deployment of the ORBCOMM System, including the procurement of satellites, launch services, launch insurance and U.S. ground segment components; (ii) related development, operating and marketing expenses; (iii) the purchase of the Pledged Securities; and (iv) the deposit into a segregated account an amount sufficient to pay when due all remaining interest and principal payments on the Company's Loan and Security Agreement with MetLife Capital Corporation ("MetLife") (the "MetLife Note"). Pending such uses, the net proceeds will be invested in short-term, investment-grade securities.

The table on the following page summarizes the estimated sources and uses of capital by ORBCOMM for the period from June 30, 1993 (date of inception) through December 31, 1997, when full deployment of the ORBCOMM System is planned to have occurred.

Sources and Uses of Funding for the ORBCOMM System

(In millions)

Uses:

ORBCOMM System:

Satellite constellation, ground spares and launch services	\$202
U.S. ground segment(1)	30
Insurance	8
Other system costs(2)	<u>18</u>
Total system costs	258
Operating expenses and working capital(3)	26
Excess proceeds of the Offering(4)	13
Debt repayment and interest expense(5)	29
Pledged Securities(6)	<u>24</u>
Total uses	<u>\$350</u>

Sources:

Partners' capital:

Contributed as of March 31, 1996	\$111
Additional commitments(7)	<u>49</u>
Total partners' capital	160
Other indebtedness	5
Net proceeds of the Offering(8)	164
Necessary cash from operations(9)	<u>21</u>
Total sources	<u>\$350</u>

- (1) Construction of a substantial number of Gateways located outside of the United States will be necessary to provide real time services on a global basis. Procurement of such Gateways will be the responsibility of the International Licensees and is not reflected in the above table. There can be no assurance that such International Licensees will be able to fund the purchase and deployment of such Gateways. See "Risk Factors — Reliance on Resellers and International Licensees."
- (2) Represents certain project management costs.
- (3) Consists of estimated project development and operating and other related expenses through December 31, 1997.
- (4) Represents cash proceeds of the Offering in excess of amounts the Company anticipates will be required through at least December 31, 1997. This cash will be available to deploy the ORBCOMM System.
- (5) Represents required fixed interest payments on the Notes and scheduled payments of principal and interest (at an interest rate of 9.20% per annum) on the Company's other indebtedness, in each case through December 31, 1997. For purposes of this table, the Pledged Securities will be used to make two semi-annual interest payments on the Notes required to be made prior to December 31, 1997.
- (6) Represents the estimated remaining principal amount of Pledged Securities as of December 31, 1997 pledged as security for repayment of principal on the Notes.
- (7) Represents the balance of the equity commitment of OCC and Teleglobe Mobile, all of which has been or will be contributed prior to the consummation of the Offering.
- (8) Represents \$170 million of gross proceeds of the Offering (including funds to be used to purchase the Pledged Securities), less discounts and commissions and other expenses of the Offering estimated at \$6 million.
- (9) Represents the additional cash needed through the date of full deployment of the ORBCOMM System, which is expected to be funded by cash from operations. It is expected that a significant portion of such cash from operations through December 31, 1997 will come from licensee fees payable by International Licensees.

ORBCOMM believes that the net proceeds of the Offering and the remaining capital commitments of the ORBCOMM partners, together with expected cash from operations, will be sufficient to fund the Company's operations through at least December 31, 1997, when full deployment of the ORBCOMM System is planned to have occurred. Additional funds may be necessary in the event of delay, cost overruns or any shortfall in estimated levels of operating cash flow, or to meet unanticipated expenses. There can be no assurance that ORBCOMM will be able to obtain any such additional financing on favorable terms or on a timely basis. See "Risk Factors — Potential Additional Capital Requirements."

The Offering

Securities Offered	\$170 million aggregate principal amount of 14% Senior Notes (the "Notes").
Issuers	The Notes will be the joint and several obligations of ORBCOMM Global, L.P. ("ORBCOMM" or the "Company") and ORBCOMM Global Capital Corp. ("Capital" and, together with the Company, the "Issuers").
Maturity	August 15, 2004.
Fixed Interest	Interest on the Notes will accrue at the rate of 14% per annum, payable semi-annually in arrears on February 15 and August 15 of each year, commencing on February 15, 1997.
Revenue Participation Interest	Revenue Participation Interest (as defined herein) is payable on the Notes, on each interest payment date, in an aggregate amount equal to 5.0% of System Revenue (as defined herein) for the six-month period ending on December 31 and June 30 (each, a "Semi-annual Period") most recently completed prior to such interest payment date. Payment of all or a portion of any installment of Revenue Participation Interest may be deferred if, and only to the extent that, (a) the payment of such portion of Revenue Participation Interest will cause the Credit Parties' Fixed Charge Coverage Ratio for the four consecutive fiscal quarters last completed prior to such interest payment date to be less than 2.0:1 on a pro forma basis after giving effect to the assumed payment of such Revenue Participation Interest and (b) the principal of the Notes corresponding to such Revenue Participation Interest has not then matured and become due and payable (at stated maturity, upon acceleration, upon maturity of repurchase obligation or otherwise). The aggregate amount of Revenue Participation Interest payable in any Semi-annual Period will be reduced pro rata for reduction in the outstanding principal amount of Notes prior to the close of business on the record date immediately preceding such payment of Revenue Participation Interest. The payment of Revenue Participation Interest is subject to certain restrictions set forth herein. See "Description of Notes — Principal, Maturity and Interest."
Ranking	The Notes will be senior obligations of the Issuers, will rank <i>pari passu</i> in right of payment with all existing and future senior indebtedness of the Issuers and will rank senior in right of payment to any future subordinated indebtedness of the Issuers. As of March 31, 1996, after giving pro forma effect to the Offering and the application of the net proceeds therefrom, the total amount of outstanding liabilities (including trade payables) of the Issuers, on a consolidated basis, would have been \$189.1 million.
Security	At the closing of the Offering, the Company will use a portion of the net proceeds thereof to purchase the Pledged Securities, representing funds sufficient to provide for payment in full of interest on the Notes through August 15, 1998 (estimated at approximately \$44.3 million) and as security for repayment of

the principal of and interest on the Notes. See "Description of Notes — Security." The actual amount of the net proceeds used to purchase Pledged Securities may vary depending on the interest rates on U.S. government securities prevailing at the time of the closing of the Offering. The Pledged Securities will be held by the Collateral Agent under the Pledge Agreement pending disbursement.

- Guarantees** The obligations of the Issuers under the Notes will be jointly and severally guaranteed by OCC, Teleglobe Mobile, ORBCOMM USA and ORBCOMM International (collectively, the "Guarantors"). The guarantee of each of the Guarantors will rank *pari passu* in right of payment with all senior indebtedness of such Guarantor and senior in right of payment to all indebtedness expressly subordinated to the guarantee of such Guarantor. The guarantees are non-recourse to the shareholders and/or partners of such Guarantors (including Orbital, Teleglobe and TRI) and no shareholder or partner of such Guarantors will have any liability for any claim under the Notes. See "Description of Notes — Guarantees."
- Optional Redemption** The Notes are not redeemable prior to August 15, 2001. Thereafter, the Notes will be redeemable at the option of the Issuers, at the redemption prices set forth herein plus accrued and unpaid interest and Liquidated Damages (as defined), if any, thereon to the applicable redemption date. See "Description of Notes — Optional Redemption."
- Notwithstanding the foregoing, prior to August 15, 1999, the Issuers may redeem outstanding Notes with the net proceeds of a sale of Capital Stock (as defined) (other than Disqualified Stock) at a redemption price equal to 115% of the principal amount thereof, plus accrued and unpaid interest and Liquidated Damages, if any, thereon to the redemption date; provided, however, that (i) not less than \$127.5 million aggregate principal amount of Notes remain outstanding immediately after any such redemption; and (ii) such redemption shall occur within 30 days of the date on which any such sale of Capital Stock is consummated.
- Mandatory Redemption** The Issuers will not be required to make mandatory redemption or sinking fund payments with respect to the Notes.
- Change of Control** Upon the occurrence of a Change of Control (as defined), each Holder of Notes will have the right to require the Issuers to purchase all or any part of such Holder's Notes at an offer price in cash equal to 101% of the aggregate principal amount thereof, plus accrued and unpaid interest and Liquidated Damages (if any) thereon to the date of purchase. See "Description of Notes — Repurchase at the Option of Holders."
- Covenants** The Indenture governing the Notes (the "Indenture") will contain certain covenants that limit the ability of the Issuers, the Guarantors and their Restricted Subsidiaries (as defined) to incur additional Indebtedness (as defined), pay dividends or make other distributions, repurchase Equity Interests (as de-