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

In re Applications of	
AT&T Corporation	File No. 156-162-SAT-P/LA-95
Comm, Inc.	File No. 163-166-SAT-P/LA-95
EchoStar Satellite Corporation	File No. 167/168-SAT-P/LA-95
GE American Communications, Inc.	File No. 169-173-SAT-P/LA-95
Hughes Communications Galaxy, Inc.	File No. 174-181-SAT-P/LA-95
KaStar Satellite Communications Corp.	File No. 203-SAT-P/LA-95
Loral Aerospace Holdings, Inc.	File No. 187-SAT-AMEND-95 188-189-SAT-P/LA-95
Morning Star Satellite Co., L.L.C.	File No. 190-193-SAT-P/LA-95
NetSat 28	File No. 194-SAT-P/LA-95
Orion Asia Pacific Corporation	File No. 206-SAT-AMEND-95
Orion Atlantic, L.P.	File No. 204-SAT-ML-95
Orion Network Systems, Inc.	File No. 195-197-SAT-P/LA-95 205-SAT-AMEND-95
PanAmSat Corporation	File No. 198/199-SAT-P/LA-95 202-SAT-AMEND-95
VisionStar, Inc.	File No. 200-SAT-P/LA-95
For Authority to Construct, Launch and Operate Domestic and/or International Satellite Systems Using Ka-band Frequencies.	

COMMENTS OF LOCKHEED MARTIN CORPORATION

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December 15, 1995

SUMMARY

Lockheed Martin submits these comments to express its views on three aspects of the FCC's licensing of Ka-band applications in the present processing round. First, considering the high level of interest in new Ka-band satellite systems domestically and internationally, Lockheed Martin suggests that certain technical requirements should apply to all Ka-band systems to ensure that Ka-band orbits and spectrum are utilized as efficiently as possible. Specifically, policies adopted for new Ka-band satellite systems should incorporate the following elements:

- While 2° spacing may be assumed in assigning orbital locations for new Ka-band systems, the Commission should strive in practice to implement slightly greater orbital spacing wherever possible, typically up to 3°, in order to permit the full exploitation of small terminal services which Ka-band is so well suited to provide.

- The Commission should require all Ka-band licensees to operate an effective uplink power control system.

- New Ka-band systems should be required to achieve on average 4-fold frequency reuse.

Second, Appendix 3 ("AP3") documents must be filed with the ITU in May 1996 in order to preserve the priority status accorded by Advance Publication of the U.S. Ka-band systems. Since each AP3 should be prepared for the specific system design that will be used at each orbital location, Lockheed Martin urges the

Commission to establish a mechanism as soon as possible for associating specific orbital locations with the particular Ka-band satellite proposals. The preferred procedure would involve direct consultation and negotiation among the applicants, with participation by the FCC's staff and other interested government officials. If such consultations do not lead to a comprehensive resolution of assignment issues, the Commission should resolve any remaining disputes concerning the assignment of orbital locations in accordance with the following principles:

(1) In regions of the geostationary arc where crowding exists, the Commission should ensure that each applicant that originally applied for a location in that region obtains at least one orbital location that meets its requirements before assigning multiple orbital locations in that region to a single applicant.

(2) In finalizing orbital assignments, the Commission should consider the flexibility of each proposed satellite to provide service utilizing alternative orbital locations.

(3) Orbital assignments for applicants proposing global Ka-band systems should be made in a way that does not compromise the ability of the system to provide global coverage.

(4) Applicants proposing Ka-band systems that are more spectrally and orbitally efficient should receive priority in the assignment of orbital locations over applicants proposing less efficient systems.

(5) In cases where no AP4 forwarded to the ITU matches an original orbital location slot requested by an applicant, the Commission should afford that applicant priority in the assignment of other orbital locations in that region for which AP4 documents were forwarded to the ITU and for which no applicant originally applied.

(6) No priority should be afforded to a Ka-band applicant based upon that applicant's use or desire to use non-Ka-band frequencies to provide other communications services.

(7) Orbital locations should be assigned in the U.S. Region on an alternating basis between larger, more established applicants and new, entrepreneurial entrants.

(8) While no applicant should receive more orbital locations than it originally applied for, an applicant should have an opportunity to trade a less desirable orbital location which it has been assigned for another that subsequently becomes available.

(9) Until the May 17, 1996 date by which Appendix 3 materials must be submitted to the ITU, applicants should be permitted to modify an orbital location that has been assigned based on coordination considerations and the applicant's own best judgment as to the feasibility of coordinating its system.

Third, Lockheed Martin sets forth its views concerning the financial qualifications standard that should apply to global Ka-band systems. Specifically, Lockheed Martin urges the Commission to acknowledge that global satellite networks are characterized by unique circumstances, and any financial qualifications standard applicable to global systems should accommodate those unique factors.

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For Authority to Construct, Launch and Operate Domestic and/or International Satellite Systems Using Ka-band Frequencies.	

COMMENTS OF LOCKHEED MARTIN CORPORATION

Lockheed Martin Corporation ("Lockheed Martin"), by its attorneys, hereby submits its comments on the above-captioned applications for authority to construct, launch and operate

various domestic and international fixed-satellite systems using Ka-band frequencies.

Lockheed Martin submits these comments to express its views on three aspects of the FCC's licensing of Ka-band applications in the present processing round. First, considering the high level of interest in new Ka-band satellite systems domestically and internationally, Lockheed Martin suggests that certain technical requirements should apply to all Ka-band systems to ensure that Ka-band orbits and spectrum are utilized as efficiently as possible. Specifically, policies adopted for new Ka-band satellite systems should incorporate the following elements:

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Third, Lockheed Martin sets forth its views concerning the financial qualifications standard that should apply to global Ka-band systems. Specifically, Lockheed Martin urges the Commission to acknowledge that global satellite networks are characterized by unique circumstances, and any financial qualifications standard applicable to global systems should accommodate those unique factors.

I. Commission Rules for Ka-Band Systems Should Ensure Efficient Use of Orbital Locations and Spectrum

Licensing new satellite communications services at Ka-band will require the Commission to establish policies to ensure that orbits and spectrum are utilized efficiently. Among the factors the Commission should consider in evaluating technical portions of the pending Ka-band applications are the following:

A. Orbital Spacing

Recent interest in the use of Ka-band for Fixed Satellite Services ("FSS") has led to congestion in the Ka-band geostationary orbit and it appears that few, if any, "spare" orbital locations remain given the large number of Advance Publication notices filed with the ITU prior to the end of WRC-95. It is incumbent upon all Administrations, therefore, including the United States, to utilize orbital locations and Ka-band spectrum as efficiently as possible.

The Commission has successfully applied its existing 2° spacing policy in the U.S. domestic orbital arc at C- and Ku-band frequencies. Moreover, 2° spacing is now being adopted by Intelsat in the design of its global constellation. In practice, however, international satellite systems operated by different entities experience difficulty in coordinating co-frequency, co-coverage satellites successfully at C- and Ku-bands with orbital spacings of less than roughly 3° due to differences in system characteristics. Typical Ku-band satellite system applications utilize transmitting VSATs as small as 1.2 meters in diameter. By scaling the frequency band from Ku- to Ka-band, a conclusion can be drawn that use of orbital spacings at Ka-band in the range of 2° to 3° will be compatible with the operation of transmitting VSATs of approximately 60 cm.

One significant advantage of exploiting Ka-band spectrum for new satellite services is the ability to use smaller, lower-cost ground terminals. However, the benefits of smaller ground

terminals must be weighed against the need for orbital efficiency. The majority of Ka-band proposals in the current processing round rely on the use of ground terminals with antenna apertures as small as 65 cm in diameter[1/]. The ability to deploy small ground terminals, which differentiates Ka-band systems from VSAT networks currently in use at Ku-band, will permit an expansion of the market base to home consumers and small businesses. Based on the experience in satellite direct-to-home (DTH) TV broadcasting, as used in Europe, Japan and more recently the United States, ground terminal antennas of this size find ready acceptance by consumers because of their low-cost and ease of installation.

An examination of the antenna gain profile of a 65 cm commercially available Ka-band antenna (see Figure 1) shows that the first null occurs at approximately 1.5° from boresight at the transmit frequencies and 2.2° at the receive frequencies. Operation at 2° orbital spacing will give at least 20dB rejection of the adjacent satellite, but at the receive frequencies this is still on the steep side slope of the main lobe, thereby making it very sensitive to antenna pointing errors. An allowance of ±0.2° for antenna pointing error compensates for the topocentric advantage of approximately 0.2° relative to geocentric satellite spacing. Therefore, in order to provide additional margin for manufacturing tolerances of low-cost antennas and additional

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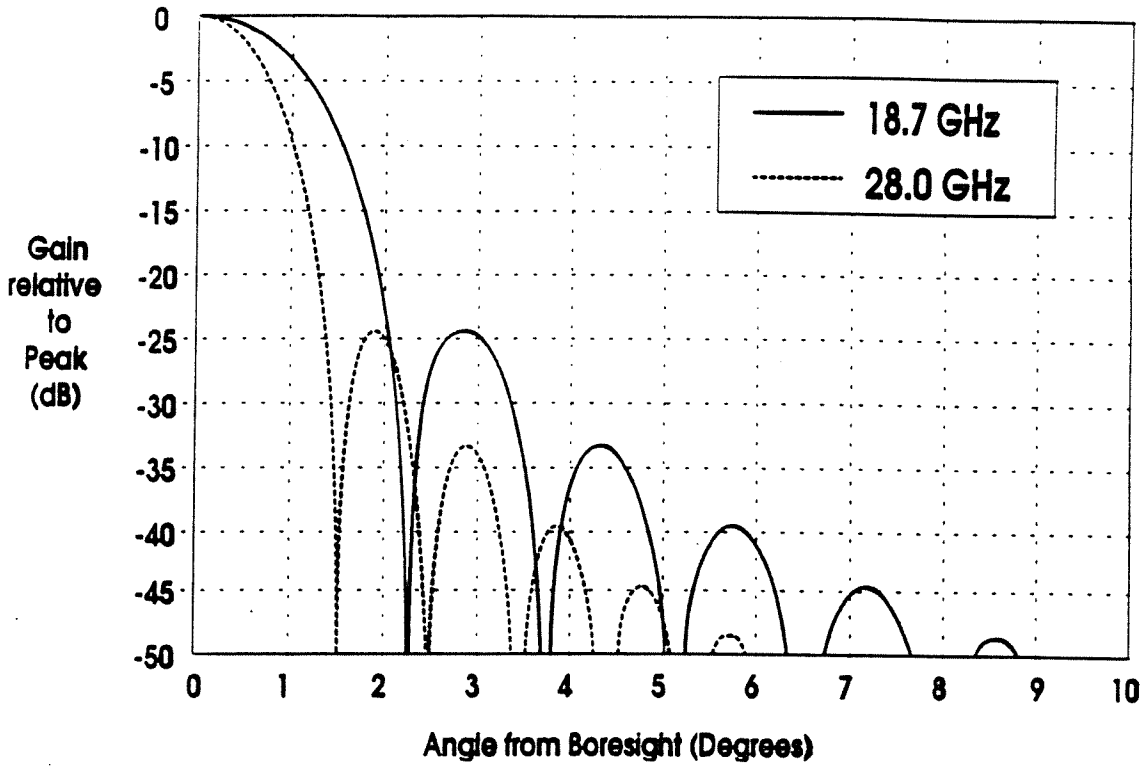
1/ The exception is NETSAT-28 which proposes ground terminals as small as 30 cm in diameter.

pointing error, it may be prudent to consider orbital spacings slightly larger than 2°.[2/]

Figure 1: Gain Profiles of Commercially Available Ka-Band Antenna



Due to the number of internationally filed Ka-band systems, orbital spacings of no greater than between 2° and 3° will be required to meet the currently perceived need for orbital locations. As a result, NETSAT-28's proposal to use 8° orbital spacing is totally incompatible with the current demand for Ka-band orbital locations. Simply stated, 8° spacing is a luxury

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2/ Note that this contradicts the assertion made by Morning Star that the orbital separation from other satellites needs to be "... about 1.5° at Ka-band ..." assuming the use of 60 cm ground terminals.

that cannot be afforded. From the recent experience at WRC-95 where U.S. proposals for Ka-band generally prevailed despite strong resistance from many nations, it would be unrealistic to attempt to coordinate Ka-band geostationary systems with unusually wide orbital spacing requirements such as the 8° spacing advocated by NETSAT-28. Furthermore, any difference in marketability between 30 cm and 65 cm Ka-band terminals does not warrant the huge loss in orbital efficiency that would result from 8° spacing.

In sum, Lockheed Martin proposes the use of 2° spacing in orbital assignments for new Ka-band systems. However, because U.S. Ka-band systems will be coordinating with many foreign "paper satellites" that may never be implemented, Lockheed Martin also believes that the Commission should strive, wherever possible, to attain slightly greater orbital separations, typically up to 3°, in order to ensure satisfactory Ka-band operations with small ground terminal antennas.

B. Uplink Power Control

The use of uplink power control to reduce ground terminal EIRP during clear sky conditions is an essential technique to minimize uplink interference in Ka-band systems. Not only does this technique reduce interference within a system, thereby increasing the ability to re-use spectrum and hence achieve high system capacity, but it also significantly minimizes interference into adjacent satellites.

Uplink rain fade allowances in the 28-30 GHz frequency band may be as high as 10 to 15dB, depending on system design and ground terminal locations. The dynamic range of the uplink power control, which must operate over this fade range, adds dB-for-dB to the interference isolation that is achievable. The use of uplink power control in this context would be equivalent to additional orbital spacing of several degrees, or as much as a two-to-one increase in spatial frequency re-use within a system. These advantages in orbital and spectrum efficiency clearly outweigh any disadvantage in extra system complexity.

Lockheed Martin therefore urges the Commission to require all potential Ka-band licensees to operate an effective uplink power control system. Such a requirement will be defined in terms of the maximum increase in received signal power at the satellite during clear sky conditions when compared to that received during the deepest rain fades in which the system is designed to operate. Recent experimental results[3/] suggest that, if a Ka-band downlink beacon is used as a measure of the uplink rain fade, a maximum satellite received power increase of 3dB for 95% of the time, or 4.5dB for 99% of the time might be appropriate. However, these parameters may require further study.

3/ ACTS Uplink Power Control Experiments Final Report, Comsat Laboratories, SSTD/95-217, March 1995.

C. Frequency Re-Use

A wide range of frequency re-use factors are employed in the various Ka-band systems proposed by the applicants, ranging from as little as 2 times to as large as 32 times. All of the proposed systems employ 2-fold polarization re-use, but the applications vary greatly in the amount of spatial frequency re-use proposed. However, in all cases the individual coverage beams are sufficiently small compared to the overall service areas such that spatial re-use should be easily achievable.

The Commission's existing rules require international separate satellite systems to achieve at least 4-fold frequency re-use, based on the ability of separate systems to achieve spatial re-use across relatively large geographic regions.[4/] This rule should be applied to require new Ka-band systems to achieve an average of at least 4-fold frequency re-use.

II. The Commission Must Take Immediate Steps to Facilitate the Assignment of Orbital Locations to Specific Ka-Band Applicants in View of Appendix 3 Filing Requirements

Lockheed Martin respectfully requests the Commission to take steps to protect the international coordination rights of U.S. Ka-band systems. Specific orbital locations should be designated as soon as possible for each of the Ka-band applicants in order to accomplish the timely forwarding of Appendix 3 data to the ITU. The Commission should convene an informal meeting of Ka-band applicants and interested government officials to attempt to

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4/ 47 C.F.R. §25.210(e)(1994).

achieve mutually-acceptable agreements regarding the assignment of orbital locations. If the applicants are unable to reach a comprehensive resolution of orbital assignment issues, the Commission should resolve any remaining disputes concerning orbital assignments in accordance with guidelines discussed herein.

A. The Priority Status of U.S. Ka-Band Proposals Must be Protected by the Timely Filing of Appendix 3 Materials for Each Requested Orbital Location

Although each applicant applied to the FCC for specific orbital locations, it became apparent during the joint preparation of ITU Advance Publication materials that these exact orbital locations should not be forwarded to the ITU for the purpose of frequency coordination. The FCC determined that all Advance Publications must be spaced at least 2° from any other proposed U.S. Ka-band satellite, including co-frequency U.S. government satellites that have already been Advance Published. It also became apparent that the recent flurry of Advance Publications by other Administrations made certain orbital locations requested by U.S. applicants unlikely to be useful from a coordination perspective. Therefore, the FCC, in consultation with the applicants, selected for Advance Publication 72 orbital locations that did not exactly match those originally requested by the applicants. The FCC must now determine the specific orbital locations to assign or associate with each of the

respective Ka-band applications.[5/] Any such assignment of orbital locations would, of course, be subject to the outcome of the Commission's Ka-band licensing decision.

At the Advance Publication stage, generic Appendix 4 ("AP4") documents were submitted to the ITU encompassing all the various applicants' system designs at every orbital location. The same approach cannot be followed during the next stage in the ITU process when the Appendix 3 ("AP3") documents must be submitted. Instead, each AP3 should be prepared for the specific system design that will be used at each orbital location. For this reason, the Commission must determine which orbital slots to assign or associate with which applicants prior to the submission of the AP3 documents to the ITU.

Pursuant to procedures described in the ITU Radio Regulations, satellite systems that have been Advance Published will be accorded date priority upon the receipt by the ITU of AP3 documents. However, AP3 documents are considered as having been received by the ITU no earlier than six months after the date of receipt of the AP4 documents. Consequently, to avoid losing "date priority" to foreign Ka-band systems for which AP4 documents were submitted simultaneously or later than for U.S. systems, AP3 documents for the U.S. systems must be received by

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5/ In addition, there are other U.S. Ka-band ITU filings made previously that are not assigned to licensees and which should be made available to the current round of Ka-band applicants, such as the USASAT-27 and USASAT-29 series.

the ITU no later than May 17, 1996.[6/] Since the U.S. government's AP3 approval process can be time-consuming, especially given the number of AP3 documents that will need to be reviewed, the Commission should set a target date of no later than March 15, 1996, for submission of final AP3 documents by applicants to the FCC. Sufficient time will be required for preparation of the AP3 documents by the Ka-band applicants, and it will therefore be necessary for the Commission to notify each applicant of its orbital locations by mid- to-late February 1996.

Lockheed Martin firmly believes that U.S. interests will be seriously harmed if the U.S. does not submit the AP3 documents for the U.S. Ka-band systems by the May 17, 1996, deadline discussed above. Other nations capitalized on the FCC's public procedures to gain priority status over U.S. interests by expediting ITU filings for their own Ka-band systems. Indeed, during the period from July 28, 1995, when the FCC issued its initial Ka-band public notice, to November 17, 1995, when the U.S. submitted its AP4 documents to the ITU, there were a total of 97 Ka-band orbital locations filed by 13 foreign Administrations, all of which have priority over any of the U.S. Ka-band systems. Consequently, the number of orbital locations available for U.S. Ka-band systems has been significantly reduced.

6/ The Advance Publications for the U.S. Ka-band systems were filed with the ITU on November 17, 1995. The Commission should be aware that the ten Ka-band Advance Publications submitted to the ITU by Mexico have a "date of receipt" that is identical to the U.S. Ka-band Advance Publication documents.

The U.S. cannot afford to lose date priority for the Ka-band orbital locations for which it submitted AP4 documents. The priority accorded U.S. Ka-band systems by virtue of the Advance Publication materials submitted on November 17, 1995, will only have value if perfected by the timely filing of AP3 documents.

Therefore, Lockheed Martin urges the Commission to establish procedures, with appropriate deadlines, by which the assignment of specific orbital locations to Ka-band applicants can be accomplished within the timeframes described above. The deadline for filing AP3 documents with the ITU must not be allowed to slip, regardless of whether the FCC's ultimate licensing decision on these Ka-band applications has been made.

B. The Commission Should Initiate an Informal Process Which Allows Ka-Band Applicants to Reach Agreement, to the Extent Possible, on Orbital Assignments

The preferred and most practical approach for selecting orbital locations would involve direct consultation and agreement among the Ka-band applicants. Good working relationships among the parties were established during preparation of the generic AP4 materials, and hopefully this cooperation will continue during the process of finalizing orbital assignments. There are advantages to permitting the applicants themselves to reach agreement on orbital locations that best meet the needs of their respective systems. Most importantly, this approach would allow applicants to make their own judgments where trade-offs and compromises are necessary, instead of relying on Commission

judgments made with insufficient knowledge regarding requirements of the respective systems.

Time constraints do not permit the use of formal FCC processes, such as a negotiated rulemaking, in the present context. Instead, a working group comprised of the current Ka-band applicants, with additional participation from U.S. government representatives, including the FCC and NTIA, should attempt informally to finalize and propose a list of orbital assignments for the Commission's consideration.

This working group's objective would be to reach agreement on the orbital slot or slots that would be assigned from the list of orbital locations submitted for Advance Publication on November 17, 1995. Since it is unlikely that agreement will be reached for each applicant's complete orbital needs, the contentions of the affected applicants regarding unresolved orbital assignments will need to be summarized by the group in a single report to the Commission. To meet the schedule outlined above, the working group should conclude deliberations by the end of January, 1996, in order to afford sufficient time for the Commission to resolve outstanding issues and finalize a list of orbital assignments by the end of February, 1996.

C. The Commission Should Resolve Contentions Regarding the Assignment of Orbital Slots Using Certain Principles to Establish Assignment Priorities

While Lockheed Martin believes that consultation and negotiation among Ka-band applicants can resolve many, if not most, orbital assignment issues, the Commission must assign

orbital locations in those circumstances where the applicants cannot reach agreement among themselves. To help assure that the FCC's orbital assignments are made in a logical and thoughtful manner, Lockheed Martin submits that the Commission should establish at the outset the following principles for assigning orbital locations. These principles incorporate factors the Commission should consider to ensure that the final assignment of orbital locations is equitable, takes account of the different needs of various applicants, and optimizes use of U.S. orbital and spectrum resources.

Principle 1

In regions of the geostationary arc where crowding exists, the Commission should ensure that each applicant that originally applied for a location in that region obtains at least one orbital location that meets its requirements. Any extra orbital locations remaining within a region after each applicant's first orbital location is selected may be assigned to an applicant that originally requested more than one slot in that region. No orbital locations within a region should be assigned to applicants that did not originally request an orbital location in that region.

For purposes of applying this principle, and taking into account the 72 orbital locations recently Advance Published by the United States, the various regions of the orbital arc may be defined as follows:

U.S. Region:	147°W to 67°W
Atlantic Ocean Region:	58°W to 15°W
European Region:	7.5°W to 56°E
Asia Pacific Region:	68.5°E to 130°E
Pacific Ocean Region:	139°E to 173°E

The reasons for defining regions of the orbital arc in this manner are set forth below. In each case, a diagram is provided of the 10° elevation contour plotted from the orbital location at the extreme edge of each defined range. A 10° elevation is considered to be the lowest elevation angle that could be used in most situations at Ka-band.

U.S. Region. Figure 2(a) shows the 10° elevation contours from the 147°W and 67°W orbital locations. Although 147°W does not achieve full CONUS coverage above 10° elevation, it is the most westerly orbital location requested by any applicant which still has significant coverage of CONUS. The next orbital location to the west is 38 degrees further to the west, 173°E, and has almost negligible coverage of CONUS. At the other extreme, 67°W provides coverage of CONUS but does not reach major cities in Europe, such as London and Paris, and others further to the east.

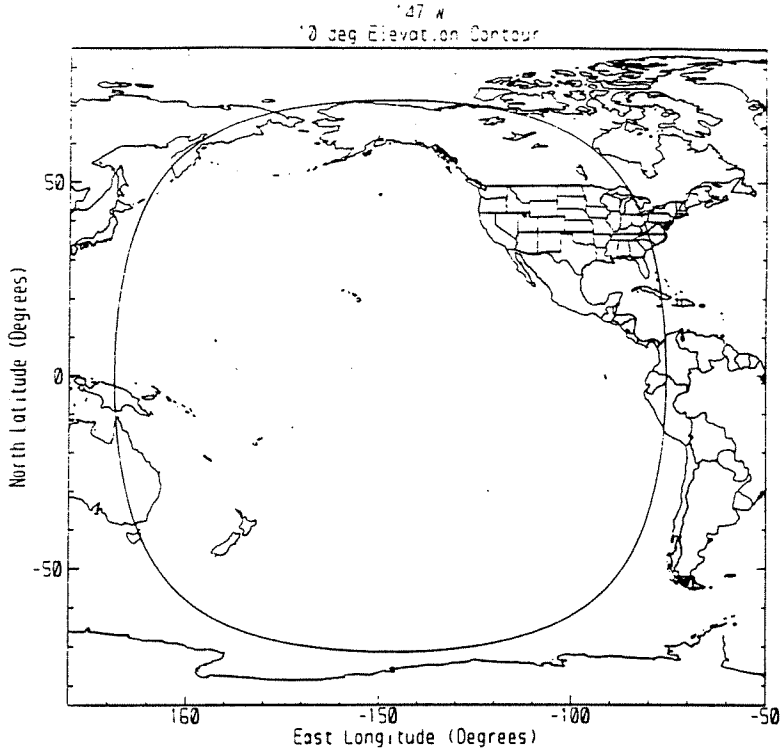
Atlantic Ocean Region. Figure 2(b) depicts the 10° elevation contours from the 58°W and 15°W orbital locations. At the western extreme of this range, trans-Atlantic links are possible from the majority, but not all, of CONUS to some of the major areas of western Europe. At the eastern extreme of the range, trans-Atlantic links are possible from the east coast of the United States to all of Europe and Africa.

European Region. Figure 2(c) shows the 10° elevation contours from the 7.5°W and 56°E orbital locations. At the western extreme of this range, trans-Atlantic links to CONUS are no longer possible, but Europe, the Middle East and Africa are well served. At the eastern extreme of the range, all of western Europe, with the exception of the northern parts of the British Isles and Ireland, are still served.

Asia Pacific Region. Figure 2(d) shows the 10° elevation contours from the 68.5°E and 130°E orbital locations. At the western extreme of this range, all of Asia is served including the former Soviet Union, China, India, and all of Southeast Asia. The only parts of the western Pacific rim that are not served are portions of Japan and the eastern half of Australia and New Zealand. At the eastern extreme, the western Pacific rim is well served, but Hawaii is not visible, so these locations are not useful for providing direct links to the United States.

Pacific Ocean Region. Figure 2(e) shows the 10° elevation contours from the 139°E and 173°E orbital locations. This entire range provides the capability to link directly between the western Pacific rim and the United States, using Hawaii as a U.S. gateway. 173°E is the most easterly orbital location Advance Published by the United States.

Figure 2(a) - Limits of US Orbit Region



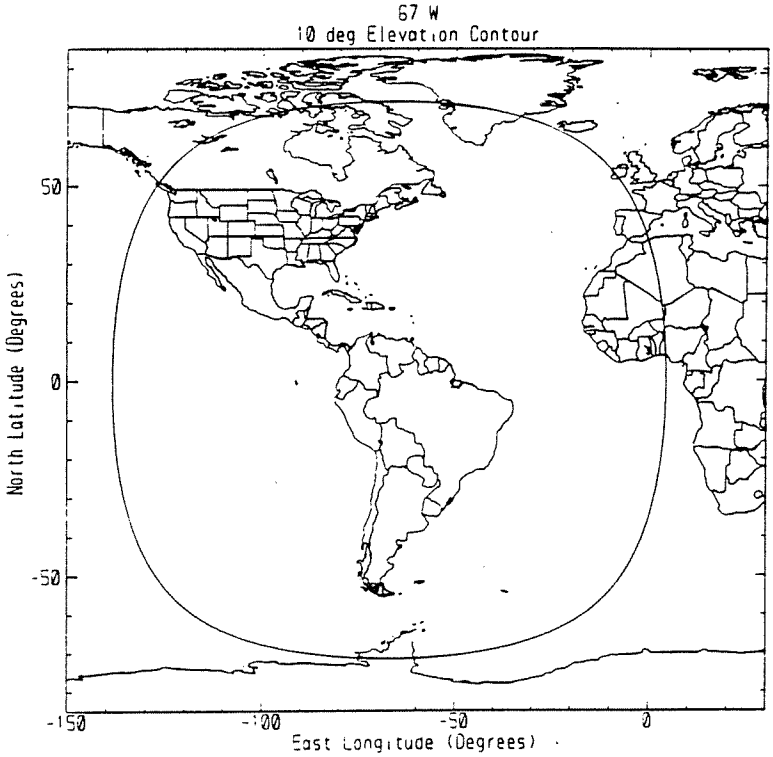
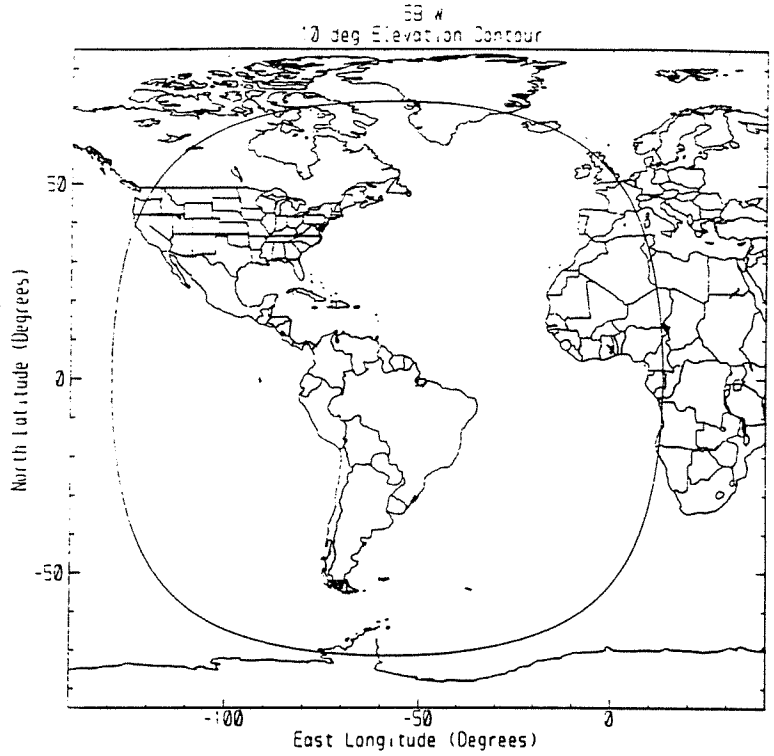


Figure 2(b) - Limits of Atlantic Ocean Orbit Region



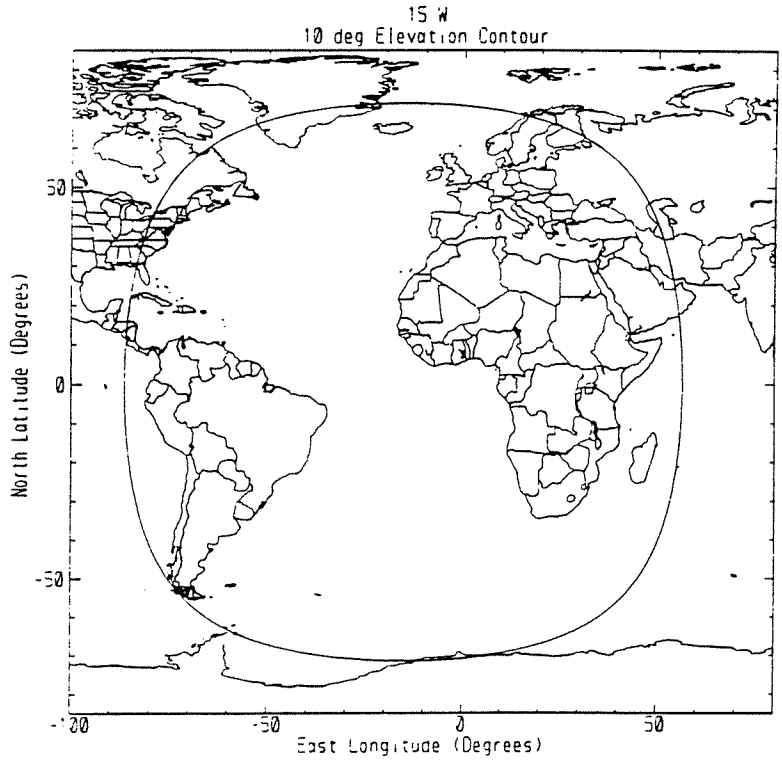
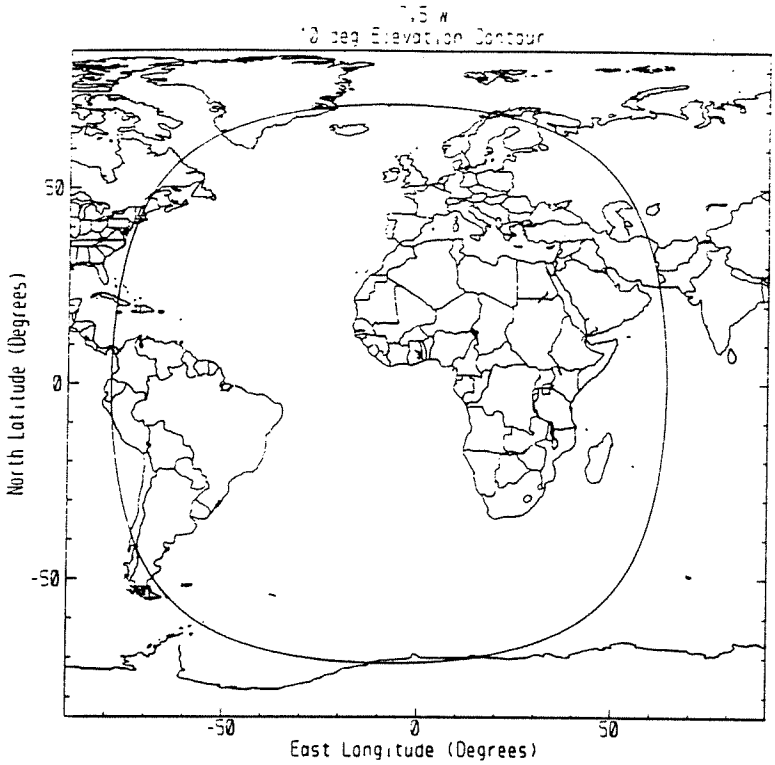


Figure 2(c) - Limits of European Orbit Region



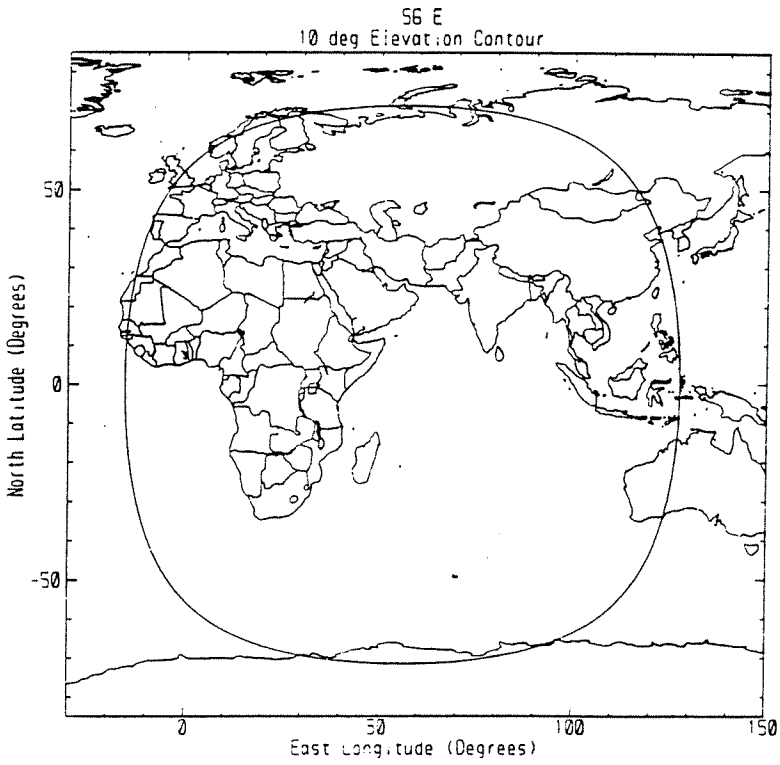
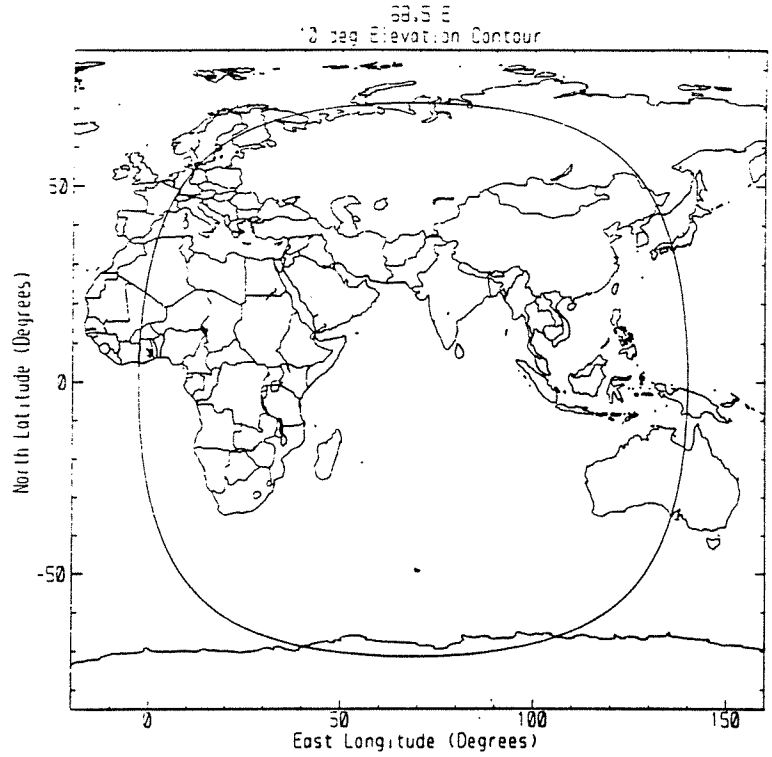


Figure 2(d) - Limits of Asia Pacific Orbit Region



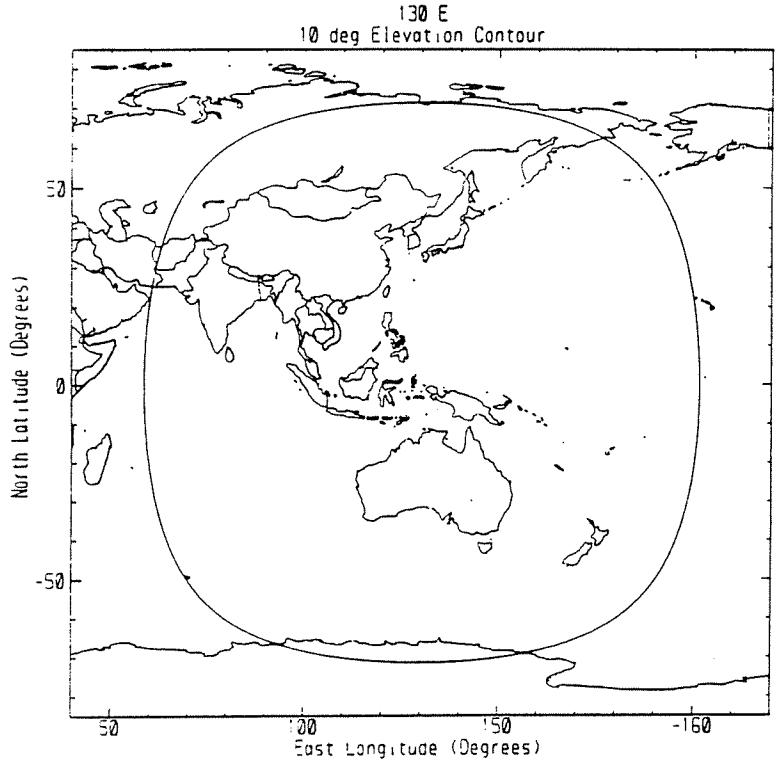
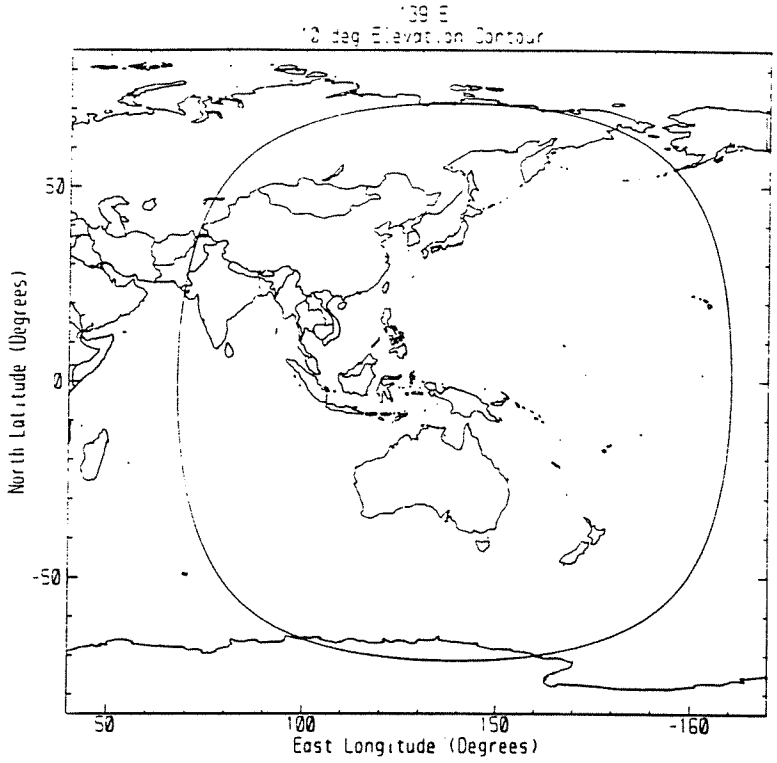
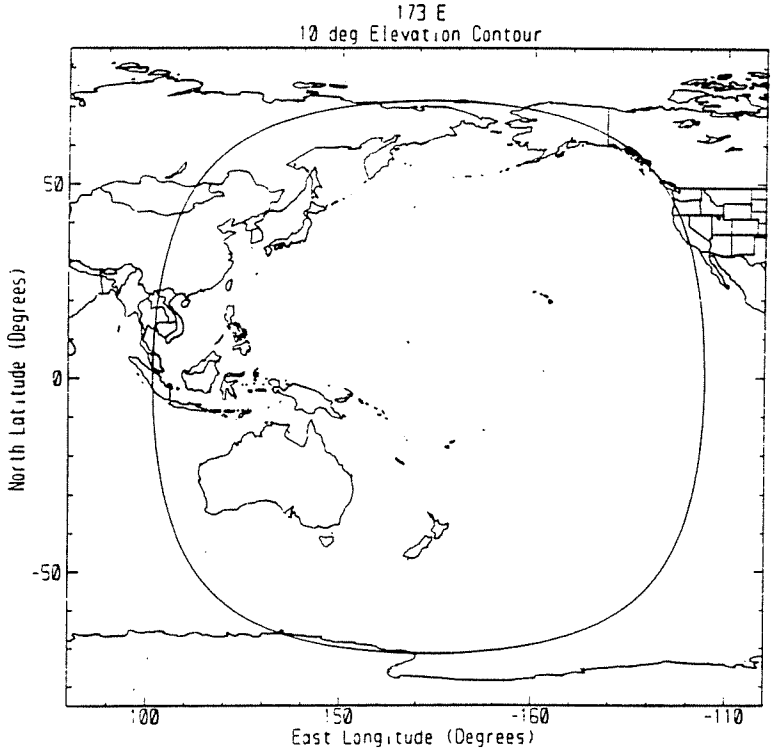


Figure 2(e) - Limits of Pacific Ocean Orbit Region





Principle 2

In finalizing orbital assignments, the Commission should consider the flexibility of each proposed satellite to provide service utilizing alternative orbital locations. Some applicants have greater flexibility than others in the selection of orbital locations by virtue of their planned coverage areas. An applicant's flexibility to use alternative orbital locations can be determined by reference to its "service arc," as defined in Appendix 3 and Appendix 4 of the ITU Radio Regulations. The service arc is the range of orbital longitude for a particular satellite over which the satellite can provide the required coverage of its service area. In general, the service arc is greater when the east-to-west span of the coverage area is less. Satellites that have wider coverage areas in the east-to-west direction will have a smaller service arc, and therefore will have less flexibility in the selection of orbital longitude.

Therefore, applicants who are unable to resolve orbital conflicts during the consultation and negotiation process should be required to define the exact service arc for each satellite for which an orbital location has yet to be determined, based upon the beam coverages submitted in the applicant's original applications. This information should be provided to the Commission in the report of the working group after the conclusion of its deliberations.

Principle 3

The orbital location requirements of applicants that have proposed global Ka-band systems, with coverage of all land areas of the world, should be given appropriate consideration in the event that one or more of their orbital locations must be determined by the Commission. In the design and optimization of global systems, the selection of each orbital location is dependent upon the other orbital locations chosen for the system. Global systems may not have the same flexibility in selecting orbital locations as other systems may have because the choice of an orbital location in one part of the world may impact other orbital locations chosen to provide global coverage. Such interrelated orbital requirements, which can be complex, are a function of the significance of the given geographic areas, elevation angle requirements, and overlapping coverage between adjacent satellites. Therefore, if the Commission must select orbital locations for any global system, the proponent of such system should define for the Commission any orbital constraints that may apply. This should be done in the report of the working group following the completion of informal discussions.

Principle 4

The implementation of greater spectral efficiency involves more complexity and cost in the satellite, achieves more communications capacity from a single orbital location, and hence results in greater efficiency in the use of the geostationary

orbit. In the event of a conflict over a particular orbital location, applicants that have proposed systems which are more spectrally and orbitally efficient, and are prepared to make the commensurate financial investment, should receive priority over applicants proposing less efficient systems.

Therefore, in making orbital assignment decisions, the Commission should consider the relative spectral efficiencies of systems that are contending for the same orbital location. Most applicants have specified in their applications the frequency re-use schemes they intend to employ, which provides the appropriate measure of efficiency. For those applicants that have not stated their frequency re-use schemes, it is a straightforward matter to determine the re-use scheme from the frequency plan and beam coverage information.[7/]

Principle 5

In the majority of situations, the U.S. Administration has submitted AP4 documents for each orbital location requested by an applicant. In some cases, however, this was not possible due to conflicts between U.S. applicants, or with a U.S. government satellite, or because another country pre-empted an originally planned orbital location. In these cases, where no Advance Publication matches the original orbital location requested by an

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7/ Information required to be submitted in a space station application under Part 25 of the Commission's Rules is sufficient to deduce the spectral efficiency of a planned satellite system design.

applicant, that applicant should be given priority in the assignment of other orbital locations in that region for which AP4 documents were forwarded to the ITU and for which no applicant originally applied.

Principle 6

Certain applicants in the present Ka-band processing round have requested particular Ka-band orbital locations for reasons totally unrelated to providing satellite services using Ka-band frequencies. In some cases, this is based upon the use of a hybrid communications payload, involving Ku-band on one part of the link and Ka-band on another. In other cases, an applicant happens to have other spacecraft operating in different frequency bands, either existing or planned, at a particular orbital location and wishes to preserve the option of combining the various missions on a single spacecraft platform at a future date. Lockheed Martin believes that these applicants should be afforded no higher priority for any particular Ka-band orbital location than any other Ka-band applicant in the current processing round.

Applicants participating in the present Ka-band processing round are entitled to expect that their applications will be evaluated fairly and objectively via-a-vis other Ka-band system proposals, and that the Commission will not compromise even-handed decision-making by relying upon factors which are extraneous to the Ka-band proceeding. In other words, the

Commission should maintain a level playing field and afford no priority in assigning Ka-band orbital locations because of an applicant's use or desire to use non-Ka-band frequencies to provide other services. Indeed, to afford an applicant a priority on this basis could help it gain an unfair competitive advantage in the marketplace for reasons unrelated to the present Ka-band proceeding.

Moreover, in most cases there is no evidence to suggest that the Ku-band portion of these proposed hybrid missions can be coordinated. In fact, the prospects for successful coordination in many cases appears highly unlikely. One of many examples of this situation involves the Broadcasting-Satellite Service ("BSS") frequency band at 36°E. While a U.S. Ka-band applicant has proposed to provide Ku-band services from this orbital location, there are at least four other Administrations with priority over the United States (Luxembourg, Eutelsat, Sweden, and Croatia). These other proposed systems are within 2° of 36°E, with several at less than 1° spacing, and have overlapping coverage areas and frequency bands. The coordination rules applicable in this frequency band (Appendix 30, Article 4 of the ITU Radio Regulations) will prevent the proposed U.S. system from achieving successful coordination. Therefore, it would be inappropriate to compromise the Ka-band orbital assignment process by giving priority to a Ku-band proposal that is so uncertain and precarious.

Principle 7

The apparent overcrowding of the geostationary arc at Ka-band is a potential problem which may not become real for many decades. Nevertheless, it presents a regulatory obstacle which must be overcome if any of the proposed U.S. Ka-band systems are to be implemented. The only way to proceed with the frequency coordination of these systems is to assume the use of 2° spacing. However, it is unlikely that Ka-band systems will ultimately operate, in every case, with satellites spaced at 2° intervals. This reality is likely to be true both for foreign- and U.S.-licensed systems.

Where possible, the Commission's orbital assignment decisions should envision a framework where U.S. Ka-band systems could be spaced greater than 2° apart in order to provide a greater interference protection margin vis-a-vis adjacent systems.[8/] While it is impossible to predict with any certainty which U.S. Ka-band proposals will actually be implemented, it would not be unreasonable to assume, given the financial risks and market uncertainties surrounding ventures of this magnitude, that the larger, more established satellite companies afford greater potential for actually building and launching their satellite networks than smaller, new entrants to the industry. Lockheed Martin respectfully suggests in the U.S. orbital region,

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8/ As noted above, supra pages 4-5, while the FCC has historically applied 2° spacing in the U.S. domestic arc, international satellite systems operated by different entities have found it difficult to coordinate co-frequency, co-coverage satellites with less than roughly 3° spacing.

and where flexibility otherwise exists, that the Commission consider assigning orbital locations on an alternating basis between the larger, more established parties and the new entrepreneurial entrants. No priority should be afforded to any applicant on this basis, for it would be unfair to disadvantage any party based on speculation as to which systems will be implemented and which ones will not. However, where there are no other significant differentiating factors for allocating specific orbital locations among applicants, then alternating orbital assignments in the manner suggested above might ultimately prove useful in maximizing interference protection, thereby enabling the delivery of new, consumer-based Ka-band services to the public.

Principle 8

Because of the urgency of associating particular orbital locations with particular Ka-band applicants, this process must be completed prior to any final licensing decision by the Commission regarding the pending Ka-band applications. If an applicant that has been assigned one or more orbital locations is ultimately denied an FCC license, those orbital locations should be made available as alternative locations for the remaining applicants. However, while no applicant should receive more orbital locations than it originally applied for, an applicant should have an opportunity to trade a less desirable orbital location which it has been assigned for one that subsequently

becomes available. Until May 17, 1996, when the AP3 filings must be received by the ITU, any change in an orbital location should not compromise the priority of a given proposal for ITU coordination purposes. However, a change in orbital locations following submission of AP3 documents to the ITU could place at risk the priority status accorded by the filing of the AP3. Any orbital assignment changes after May 17, 1996, would therefore need to be addressed on a case-by-case basis.

Principle 9

Until May 17, 1996, when AP3 documents must be submitted to the ITU, an applicant should be permitted to modify an orbital location that has been assigned, based on coordination considerations and the applicant's own best judgment as to the feasibility of coordinating its system. Satellite system developments over the next several months, especially those involving foreign Ka-band proposals, could present opportunities for U.S. Ka-band applicants to utilize different orbital locations better suited to the requirements of their proposed systems. The Commission should afford applicants the flexibility to modify their assigned orbital locations in this way, provided the proposed new location does not result in a spacing of less than 2° from any other U.S. orbital location for which AP4 materials have been submitted.

* * * * *

Lockheed Martin recognizes the complicated nature of the Commission's task to assign specific orbital locations to particular Ka-band applicants. While difficult, an assignment of orbital locations should be completed well in advance of the May 17, 1996 deadline for filing AP3 documents with the ITU, so that priority status for U.S. Ka-band systems can be maintained. Lockheed Martin believes the Commission should take action as soon as possible to facilitate the assignment of orbital locations to specific Ka-band applicants. Initially, the Commission should convene a meeting of the Ka-band applicants and interested government officials for the purpose of reaching mutually-acceptable agreements regarding the assignment of orbital locations. If deliberations by this working group do not lead to a comprehensive resolution of orbital assignment issues, the Commission should resolve any remaining disputes concerning the assignment of orbital locations in accordance with the principles outlined above.

III. Any Financial Qualifications Standard For Ka-Band Systems Should Take Into Account Unique Circumstances Surrounding Global Satellite Networks

The pending Ka-band satellite applications propose diverse technical and service features that will be offered from a variety of domestic and international system configurations. The financial resources required to construct, launch and operate these advanced satellite networks for the first year range from

$207 million to $5.1 billion. The domestic systems, which typically propose one satellite over the domestic arc for service within the United States, are generally less ambitious from a financial standpoint than the international proposals, which by virtue of their hemispheric or global coverage require greater levels of capital investment.

Data furnished by the Ka-band applicants to show their financial qualifications varies widely from applicant to applicant. While some applicants submit detailed financial data showing a clear-cut ability to implement their proposals, other applicants offer only minimal information or request a waiver of the financial rules. Still others seek confidential treatment for their financial arrangements.

Perhaps one reason for these disparate financial showings is the lack of clarity currently surrounding a financial standard that should apply to new Ka-band satellite proposals. Historically, the financial qualifications test for domestic satellites has required evidence of full financing before a license would be awarded.[9/] Separate international satellite systems, while they must ultimately demonstrate the same level of financial commitment as domestic satellites, are currently permitted to make their financial showings in two stages to

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9/ Licensing Space Stations in the Domestic-Fixed Satellite Service, 50 FR 36071 (September 5, 1985). See also 47 CFR § 25.140(d), which requires domestic satellite applicants to demonstrate current assets or irrevocably committed external debt or equity financing sufficient to cover construction, launch and first-year operating costs.

accommodate unique circumstances applicable to separate systems.[10/] However, the Commission has proposed to eliminate the two-stage process applicable to separate systems in favor of the one-stage process currently used for domestic satellites.[11/] While the financial standard applicable to new Ka-band systems has not yet been resolved, the Commission has suggested that a rigorous financial qualifications test might be appropriate, but requested comments in the Ka-band rulemaking on the merits of this proposal.[12/]

Although the Commission imposes a rigorous financial standard for some satellite services, notably the domestic fixed-satellite services, in other contexts it has applied a less stringent test where public interest factors justify a more relaxed approach. For example, in the Non-Voice, Non-Geostationary Mobile Satellite Service ("NVNG"), the Commission required NVNG applicants only to show that they are financially capable of implementing *a portion of their system*, i.e., to

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10/ Establishment of Satellite Systems Providing International Communications, Report and Order, 101 FCC 2d 1046 (1985), recon. 61 RR 2d 649 (1986), further recon., 1 FCC Rcd. 439 (1986).

11/ Amendment of the Commission's Regulatory Policies Governing Domestic Fixed-Satellites and Separate International Satellite Systems, Notice of Proposed Rulemaking, IB Docket No. 95-41, 10 FCC Rcd. 7789 (1995).

12/ Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed-Satellite Services, Third Notice of Proposed Rulemaking, CC Docket No. 92-297, released July 28, 1995.

construct, launch and operate the first two satellites in their network.[13/] Moreover, in the Radio Determination Satellite Service ("RDSS"), the Commission required only the submission of a detailed business plan before a license would be awarded.[14/] A primary reason for permitting a relaxed financial showing in the NVNG and RDSS services was that all pending applicants could be accommodated technically and future entry was possible. Consequently, a grant to an under-financed applicant would not preclude another qualified entity from going forward.[15/]

In the Big LEO Mobile Satellite Service, by comparison, the Commission adopted stricter financial requirements because the available spectrum for Big LEO services would not accommodate all pending applicants, and the Commission sought to ensure that parties awarded Big LEO licenses would have the financial ability to proceed.[16/] However, because of unique circumstances in the

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13/ Amendment to the Commission's Rules to Establish Rules and Policies Pertaining to a Non-Voice, Non-Geostationary Mobile Satellite Service, Report and Order, CC Docket No. 92-76, 8 FCC Rcd. 8450 (1993).

14/ Amendment of the Commission's Rule to Allocate Spectrum for, and to Establish Other Rules and Policies Relating to, a Radio Determination Satellite Service, Second Report and Order, 104 FCC 2d 650 (1986).

15/ See also EarthWatch Incorporated, Order and Authorization, (DA95-1707, released August 1, 1995)(granting applicant a license to construct, launch and operate a low-Earth orbit remote sensing satellite system). The Commission there held that because grant of a space station license to EarthWatch would not prevent others from implementing competing remote sensing satellite systems, it was not necessary to hold EarthWatch to any particular financial standard.

16/ Amendment to the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the

Big LEO proceeding, the Commission crafted a creative solution by affording applicants who could not immediately meet the strict financial test an additional period of time to establish their qualifications.

As the foregoing shows, the Commission has displayed flexibility and creativity in adopting financial qualifications standards attuned to the needs of the various satellite services, taking full account of relevant facts and circumstances in each given context. The Commission should pursue the same flexible approach in evaluating the financial qualifications of the current round of Ka-band applicants that are proposing global systems. Indeed, the Commission should specifically acknowledge that special factors apply to Ka-band systems intending to offer global coverage, and should adopt a financial qualifications standard to accommodate such factors.

Lockheed Martin has the financial ability to satisfy any financial test the Commission ultimately applies to global Ka-band systems. However, Lockheed Martin recommends that the Commission not apply the strict domestic financial standard to systems proposing global coverage. Instead, the Commission should adopt a financial standard that accommodates the unique circumstances surrounding global satellite networks, including the following:

1610-1626.5/2483.5-2500 MHz Frequency Bands, Report and Order, CC Docket No. 92-166, 9 FCC Rcd. 5936 (1994)("Big LEO Report and Order").

First, implementing new Ka-band systems on a global scale will require the investment of enormous financial resources. While global Ka-band satellite networks will contribute meaningfully towards a Global Information Infrastructure and introduce a new era in international satellite communications, they will also necessitate unprecedented levels of capital investment. Based on information furnished to the Commission, the estimated construction, launch and first-year operating costs for Ka-band systems that intend to provide global coverage range from $3.9 billion to $5.1 billion.[17/] Given the magnitude of these costs, it would be unrealistic for the Commission to adopt a strict financial qualifications test requiring an up-front "commitment" of funds from either internal or external sources.

Second, the coordination of orbital locations for new Ka-band systems through the International Telecommunications Union ("ITU") is currently marked by uncertainty. Indeed, the recent spate of ITU filings by numerous Administrations at Ka-band will at the very least complicate the ITU process, will no doubt lead to delay, and may mean that U.S. applicants will not be able to obtain prime orbital locations which they desire or need over the international arc. Just as the Commission has recognized that uncertainties inherent in Intelsat consultation procedures require flexibility in framing financial requirements for

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17/ Other Ka-band applicants propose international satellite services in discrete regions of the globe, with estimated construction, launch and first-year operating costs for such regional systems ranging from $409 million to $2.3 billion.

separate systems,[18] so too uncertainties surrounding ITU coordination on the part of global Ka-band systems make obtaining irrevocably committed financing up-front from a bank or other financial institution equally doubtful.

Third, Ka-band applicants proposing international systems have other unique requirements stemming from the global nature of their proposals, including the need to attract foreign investment to support these global networks; the need to obtain licenses to operate abroad; and the need to resolve a myriad of global issues involving interconnection, equipment authorizations and other matters. Again, it is entirely unrealistic to assume that an applicant could obtain an irrevocable commitment of financing from a bank or other financial institutions for a global satellite system until these international financial, licensing and other relationships have become better defined.

As noted earlier, the Commission has allowed separate international system applicants to demonstrate their financial qualifications over time, a procedure which the FCC adopted to accommodate special circumstances surrounding Intelsat consultations and the pursuit of foreign contractual arrangements. Similar tasks confronting global Ka-band applicants are no less challenging -- financing the high cost of global systems; completing ITU coordination efforts; attracting foreign investors; gaining "landing rights" around the globe; and

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18/ Establishment of Separate Systems Providing International Communications, Report and Order, 101 FCC 2d 1046, 1164-65 (1985).

other factors which set global Ka-band networks apart from purely domestic systems. Any financial qualification rules that apply to global Ka-band systems should consider these realities.

The unique factors surrounding global Ka-band systems mean not only that irrevocable commitments from external financial sources will not be readily forthcoming, but also that it would be unrealistic for the Commission to expect an applicant to "commit" its own internal funds for the full financial requirements of a global Ka-band system. In reality, no Ka-band applicant actually plans to implement a global satellite system solely by using its own internal resources. Significantly, the Big LEO applicants were required a year ago to commit to expend their own internal resources if necessary to cover the full cost of their global systems. However, the Big LEOs actually had four years during extensive FCC proceedings to arrange critical portions of their financing before being required to meet any FCC financial test.

As the Commission is aware, the proposed IRIDIUM, GlobalStar and Odyssey networks are not being financed solely from the internal financial resources of the licensees. Instead, these ventures had already attracted substantial funds from global partners and other sources by the time they submitted their financial commitments to the FCC, and they continue to pursue financing from a variety of external sources. Ka-band applicants, on the other hand, will not have any such long lead time to arrange financing in advance of FCC licensing, especially

since FCC action on Ka-band applications is expected by mid-1996. In this context, to require Ka-band applicants to "commit" internal resources to implement their global systems, when in reality the nature and extent of global networks necessitate financing by other means, would lead to FCC regulation that is fundamentally at odds with financial reality.

Finally, while ITU coordination may prove difficult given the number of Ka-band systems that have been proposed around the globe, no technical bar exists that precludes the FCC's licensing of all pending Ka-band applicants who are otherwise qualified. Thus, a principal rationale for imposing a strict financial qualifications standard in other satellite contexts, such as the Big LEO service, does not apply to the pending round of Ka-band applicants.[19/]

While a "strict" financial test should not apply to Ka-band systems proposing global coverage, traditional public interest considerations suggest that applicants for global systems should be required to show their financial qualifications in accordance with some threshold test. One approach might be to require a global Ka-band applicant to submit a balance sheet or other financial statement showing the capability of financing the construction, launch and first-year operation of its proposed

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19/ In the Big LEO proceeding, the Commission adopted a stringent financial standard based on its view that "granting an under-financed space station applicant a license may preclude an applicant that possesses the necessary financial resources from implementing its plans." Big LEO Report and Order, 9 FCC Rcd. at 5950. No analogous situation applies to the present Ka-band processing round.

system. An applicant proposing global coverage should be permitted to rely upon such internal resources as powerful evidence sufficient to assure the Commission that its proposed system can be built and implemented. But a global Ka-band applicant *should not be required to "commit" those resources to the full extent of the project.* Indeed, as the Commission acknowledged in the Big LEO proceeding:

> *** The availability of internal funds sufficient to cover a system's cost provides adequate assurance at the time the Commission acts on the application that the system can be built and launched. Current assets--which includes cash, inventory, and accounts receivable--provide a general measure of a company's ability to finance the project itself or to raise funds from lenders and equity investors on the basis of its on-going operations. Highly capitalized companies possess more collateral and, thus, are in a better position to borrow money than thinly capitalized companies.[20/]

Lockheed Martin agrees that applicants who demonstrate internal resources sufficient to construct, launch and operate global satellite networks are well-positioned to be able to finance their proposals through a combination of internal funds and external financing. In other words, the availability of internal funds sufficient to cover a global system's cost should provide confidence, in and of itself, that an applicant can finance its proposed system through various debt and equity arrangements. However, an applicant demonstrating its own internal financial strength to cover the entire costs of a global system should not

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20/ Big LEO Report and Order, 9 FCC Rcd. at 5950.

be required to "commit" internal funds for the full financial requirements of such a global project.

A second approach would be to require a Ka-band applicant proposing a global system to meet a strict financial showing *for a portion of its system only*. This would mirror the financial requirements adopted for the NVNG satellite service. A Ka-band applicant could be required, for example, to show sufficient "committed" funds from internal or external sources for construction, launch and first-year operation of one geostationary satellite in its system. Such a test would ensure that only serious global Ka-band applicants are licensed, but would not impose an undue or unrealistic requirement that a Ka-band applicant commit its own internal resources to the full extent of a global network, or that it obtain irrevocably committed external financing for a global project in advance of licensing.

A third approach might be to permit Ka-band applicants proposing global systems to demonstrate their financial qualifications over a period of time. For example, system milestone requirements could provide a useful mechanism by which to monitor system implementation, and the Commission could revoke the licenses of entities who do not satisfy milestone requirements because they are not financially capable of going forward.[21/]

21/ See EarthWatch Incorporated, supra note 7, at ¶11.

In view of the foregoing considerations, Lockheed Martin urges the Commission to evaluate the financial qualifications of Lockheed Martin and other Ka-band applicants who are proposing global systems in a flexible and realistic way, recognizing that special circumstances apply to global satellite networks. Any financial qualifications standard applicable to such systems should acknowledge the realities inherent in financing global satellite projects. Irrevocably committed external financing is not likely to be forthcoming in advance of FCC licensing, nor should applicants for global satellite networks be expected to "commit" their own internal funds to the full extent of these projects. Instead, Ka-band applicants proposing global systems must raise financing from various domestic and international sources. The Commission should acknowledge this fact and adopt a financial qualifications standard appropriate for global Ka-band systems so that the FCC's licensing rules will properly reflect the requirements of these new global satellite networks.

CONCLUSION

For the foregoing reasons, Lockheed Martin urges the Commission to consider these comments in connection with

licensing the current processing round of Ka-band satellite applications.

Respectfully submitted,

LOCKHEED MARTIN CORPORATION

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December 15, 1995

ENGINEERING CERTIFICATE

I hereby certify that I am the technically qualified person responsible for the preparation of the engineering information contained in the attached "Comments of Lockheed Martin Corporation," that I have either prepared or reviewed the engineering information contained in these Comments, and that the technical information is complete and accurate to the best of my knowledge, information and belief.

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December 15, 1995

CERTIFICATE OF SERVICE

I, Deborah E. Buhner, hereby certify that a copy of the foregoing "Comments of Lockheed Martin Corporation" has been served this 15th day of December, 1995, via first class mail, postage prepaid or by hand delivery to the following:

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