

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

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AUG 2 1991

In the Matter of)
)
Orbital Communications Corporation)
)
Application to Construct a Low Earth)
Orbit Satellite System, Including)
a Major Amendment Thereto)

OFFICE OF CHIEF
DOMESTIC FACILITIES DIVISION
COMMON CARRIER BUREAU
File Nos. 22-DSS-MP-90(20)
22-DSS-MP-90(2)
RM-7399

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DOMESTIC FACILITIES DIVISION
SATELLITE RADIO BRANCH

RESPONSE OF LEOSAT CORPORATION

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August 2, 1991

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Summary

Orbcomm has failed to rebut LEOSAT's demonstrations that the amended Orbcomm application, like its original application, lacks the financial and legal qualifications to be authorized. In particular, Orbcomm conceded in its Reply Comments that its parent currently has only about 10% of the working capital needed to construct, launch and operate the 20 satellite system it applied for. Further, Orbcomm has failed to indicate what percentage of even this deficient capital is available to it, although the percentage must be very small because Orbcomm is but one of many components of its parent's cash requirements. Orbcomm has also failed to counter LEOSAT's legal presentation that a strict financial standard applies if multiple entry cannot be accommodated.

Orbcomm also failed to rebut LEOSAT's contention that a VHF MSS monopoly is contrary to FCC Rules, Regulations and policy, inimical to the public interest and wholly unnecessary. Furthermore, the objective record in this proceeding from independent commenters overwhelmingly supports an open skies approach to VHF MSS. LEOSAT herein squarely demonstrates with a Technical Certification that VHF MSS multiple entry can be practically implemented with a Technical Coordinating Committee, as has been done many times before for other satellite services, thereby eliminating Orbcomm's "monopoly is necessary" defense.

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RESPONSE OF LEOSAT CORPORATION

Summary of LEOSAT's Petition:

On July 17, 1991, LEOSAT CORPORATION ("LEOSAT") petitioned to deny grant of the above-captioned amended applications of Orbital Communications Corporation ("Orbcomm"). It was shown that the amended Orbcomm application lacked on its face the financial qualifications specified by the Commission's rules and policies to implement the non-multiple entry system it had described in its major amendment. Furthermore, LEOSAT's Petition to Deny showed that authorization of the amended Orbcomm system would preclude use of the 137/148 MHz frequency band by any other low earth orbit (LEO) mobile satellite service (MSS) operator, thereby depriving the public of competitively provided VHF MSS service. This result was shown to be especially odious to the public interest since given Orbcomm's lack of financial qualifications to construct, launch and

operate a 20 satellite constellation, grant of its application would leave the 137/148 MHz band warehoused, and mostly unused.

LEOSAT's Petition to Deny explained that due to the unique characteristics of the VHF frequency band (e.g. 137/148 MHz), there is no other MSS system technology (such as L-band), capable of providing MSS service to terminals costing \$100 or less. Accordingly, authorization of the amended Orbcomm system would create a monopoly in direct contravention of all prevailing FCC policies. Such a monopoly, when a competitive alternative is readily available, is fundamentally antithetical to the public interest. Accordingly, LEOSAT urged that the amended Orbcomm application also be denied on this basis of legal disqualification.

Finally, LEOSAT noted in its Petition to Deny that the Commission rules specified for the VHF MSS applications in Public Notice No. DS-982 -- Appendix B of Space Station Filing Procedures, 48 Fed. Reg. 40256 (September 6, 1983) -- limit initial domsat applications to two space stations, in the absence of historical satellite loading information. This is done to prevent orbit/spectrum hoarding. LEOSAT showed that Orbcomm's amended application was procedurally defective by seeking approval for 20 satellites, without any historical usage information, and to the preclusion of any multiple entry or open skies in VHF MSS. Accordingly, Orbcomm's amended application was shown to be not legally or procedurally qualified for grant.

Summary of Orbcomm's Reply:

Orbcomm failed to file an Opposition to LEOSAT's Petition to Deny, as required by the Commission's Rules, but instead merely filed "Reply Comments." Orbcomm's Reply Comments lacked so much as a Technical Certification. Indeed, even substantively, Orbcomm has not denied that its amended application precludes any multiple entry in the 137/148 MHz band, and hence constitutes a monopoly. Accordingly, both procedurally (lack of Opposition) and substantively (lack of denial) Orbcomm has now conceded LEOSAT's argument that the amended Orbcomm application seeks a monopoly.

Orbcomm's Reply Comments tries to justify its monopoly on three main grounds: (1) that Orbcomm's parent meets the financial qualification standard for a satellite licensee under conditions of no multiple entry [current resources to construct, launch and operate the applied for system for one year], (2) that Orbcomm will face competition from other low earth orbit satellite systems [referencing a Russian satellite system and proposals above 1 GHz], and (3) that there is no other practical alternative [dismissing the suggestion of a VHF MSS Technical Coordinating Committee].

GM/Hughes' Reply

Other Comments filed with the FCC uniformly expressed a strong preference for a competitive VHF-band MSS service. For example, the nation's largest automaker's Intelligent Vehicle Highway System (IVHS) group said:

"The system being proposed by LEOSAT shows promise of being the type of system we were looking for. We feel it is important to foster the development of competitive systems to ensure that the vital link between the vehicle and the highway infrastructure, upon which IVHS rests, will be an economically viable reality." Reply Comments of Hughes Aircraft Company in Support of LEOSAT Corporation, July 15, 1991. (emphasis supplied)

LEOSAT's Response to Orbcomm

1. Orbcomm Has Failed to Rebut LEOSAT's Proof that Orbcomm Lacks the Financial Qualifications to be a Licensee under Monopoly Conditions

Orbcomm buttresses its financial qualifications with a new "pro forma" balance sheet purportedly showing its parent's working capital of \$40 million. See Orbcomm Reply at page 4, note 6, July 17, 1991. However, Orbcomm never disputes or even discusses LEOSAT's demonstration that in other domsat proceedings (e.g. Equatorial's fate in the Fixed Satellite Service), when all applicants could not be granted licenses due to orbit/spectrum scarcity, failure to have working capital sufficient to construct, launch and operate the applied for system for one year required denial. Nor did Orbcomm make any effort to correlate its parent's \$40 million of working capital with the Orbcomm Application's \$386 million cost

to construct, launch and operate its system for one year. Also, Orbcomm nowhere demonstrated or even alleged that its parent's (Orbital Sciences) \$40 million of working capital was reserved for Orbcomm. Indeed, this is certainly not the case since Orbital Sciences' main business is launching the Pegasus rocket, and that business has an overwhelming claim on any Orbital Sciences' resources.

In summary, the fact that Orbital Sciences may have \$40 million in working capital is wholly irrelevant for two reasons: First, it represents barely 10% of the costs of the system Orbcomm has applied for; Second, there is no evidence that any portion of even this deficient sum of money is reserved for Orbcomm. Orbcomm has created its own financial disqualification by insisting upon a monopoly, designing a \$386 million VHF-band orbit/spectrum grab-it-all system, and then failing to meet the Commission's strict financial standards for such cases.

To the best of LEOSAT's knowledge, Orbcomm has the same number of full-time employees as does LEOSAT, and the same amount of cash resources under its own control. Orbcomm has not shown that it is any more or less financially qualified than is LEOSAT. Since LEOSAT's system is compatible with multiple entry and open skies, a liberal financial qualification standard applies. The logic is that no other system is being blocked by LEOSAT, and therefore the Commission should let the marketplace pick winners and losers. So long as Orbcomm insists upon a monopoly service

structure, a strict financial qualification standard must apply. A monopoly licensee must have the working capital to construct, launch and operate its system for one year to avoid speculative orbit/spectrum hoarding to the detriment of the public interest. This is a standard that Orbcomm obviously has not met.

2. Orbcomm Has Failed to Rebut LEOSAT's Demonstration that Grant of the Amended Orbcomm Application Would Constitute a Legally Disqualifying Monopoly That is Inimical to the Public Interest

The overwhelming theme of public comment on the Orbcomm and LEOSAT approaches to VHF MSS service is for the FCC to authorize this service on an "open skies" basis. As Digital Matrix Services (a world leader in Geographic Information Systems) observed:

"[I]t is especially important for there to be fair competition in mobile satellite services via low earth satellites around the VHF band. Failure to have fair competition could result in monopoly abuses." Comments of Digital Matrix Services in Support of LEOSAT Corporation, June 17, 1991, at page 2.

LEOSAT petitioned to deny the amended Orbcomm application because it specified a single-system technology (Orbcomm), whereas LEOSAT has proposed an open skies technology (multiple entry). LEOSAT demonstrated that a monopoly application was legally disqualifying under the Commission's pro-competition

domsat policies, as expressed in the Appendix B Space Station Application Filing Procedures and numerous FCC decisions. See, Report No. DS-982, July 16, 1990.

By failing to file an Opposition to LEOSAT's Petition to Deny, Orbcomm has legally conceded that it is seeking a monopoly in the VHF band. Indeed, in all the filings in this proceeding, Orbcomm has never denied that it is seeking a monopoly, although it has yet to summon the forthrightness to say in writing "we want a monopoly."

In its Reply Comments, Orbcomm claims it will be subject to competition from various other services, and hence denies that a sole grant to Orbcomm would be inimical to the public interest. However, Orbcomm spends less than half a page (p. 11) supporting this bare (and untrue) contention. The fact of the matter, as demonstrated below, is that VHF MSS service is a wholly unique market. The only effective competition in the VHF MSS market is that which would be provided by multiple Commission licenses issued in this Proceeding.

The only VHF MSS system cited by Orbcomm as providing competition is a planned 1993 launch of the Russian "Gonets" system. Orbcomm Reply at p. 11, note 19. This contention is so obviously "far-out" that it demonstrates the truth of LEOSAT's position. If Orbcomm's counsel had to point to a planned Soviet satellite system as its competition, there must not be very much (if any) competition.

With regard to the Soviet "Gonets" system, Orbcomm has not indicated whether the system is funded, whether the service will be commercially provided, or even under what legal basis its services could be provided in the United States. To the best of LEOSAT's knowledge, no Soviet communications system provides competition today to any U.S. domestic satellite service.

Orbcomm also notes that it would be subject to competition from geostationary and terrestrial systems, and "depending on the amount of spectrum allocated by the Commission, there may be other commercial U.S. licensed LEO systems." Orbcomm Reply at p. 11. However, Orbcomm completely fails to identify any of these purportedly competitive systems, or to explain in any way how they provide effective competition to VHF MSS services. To show how incorrect Orbcomm is, LEOSAT provides below a key chart of competitive features and other satellite system concepts. It is clear from the chart that only VHF MSS can compete effectively with VHF MSS.

<u>KEY VHF MSS FEATURE</u>	<u>TERRESTRIAL SYSTEMS</u>	<u>GEO MSS SYSTEMS</u>	<u>L-BAND LEO PROPOSALS</u>
User terminal under \$100.	Teletrac & Lojack units are >\$500	Cheapest terminals are \$3000-\$4000 due to long transmit path to geo orbit.	Cheapest <u>proposed</u> units for transmitting are >\$1000 due to L-band
Coverage of Entire USA	Urban markets only	Coverage of Entire USA	Coverage of Entire USA
Service Fee Under \$5/month or none (bundled)	Low service fee	Service Fee \$45-\$100/mo.	Service Fee as high as cellular

As can be seen from the above chart, no technology other than VHF MSS has the three key features of low or no service fee, nationwide coverage, and \$100 price range terminals. It is simply illusion to think that either Lo-Jack type technology, Iridium, or AMSC is a competitive substitute for VHF MSS.

LEOSAT also hereby responds to Orbcomm's comment at page 11, note 18 that, based on Orbcomm's meetings with automakers, bundling smart car service technology into automobile purchase prices will not occur. On the other hand, Orbcomm received only one lukewarm supportive comment from an automaker (Ford) and none from automotive electronics manufacturers or IVHS interests. LEOSAT has found precisely the opposite response, and received numerous comments in support. What Orbcomm fails to realize is

that its \$1 per message intended charge is hopelessly absurd for the Intelligent Vehicle Highway System market. Vehicles will need frequent traffic routing information, and will have to automatically respond, as "smart cars", to interrogations from the highway infrastructure. Bundling LEOSAT service fees into new Smart Car purchase prices may well be the only practical way to serve this market.

As noted in the Comments of the smart car/smart highway group of General Motors, the world's largest automaker:

"Hughes Aircraft Company has prime responsibility for specifying the data communications system between the infrastructure and the vehicles [for the TravTek Intelligent Vehicle Highway System]. Therefore, Hughes Aircraft Company merits the qualifications to comment on the Public Notice of LEOSAT Corporation's proposal for a low earth orbit mobile satellite service targeting the Intelligent Vehicle Highway Systems market.

...

In solving the data communications problem for TravTek, we found no available communications product that could meet our requirements for coverage area, data rate, and reasonable cost. We were forced to adopt a communications approach which was practical for our small fleet but cost prohibitive for large scale use. The system being proposed by LEOSAT shows promise of being the type of system we were looking for. ... Therefore, we urge the FCC to approve the FCC Application by LEOSAT Corporation. Comments of TravTek Project, Hughes Aircraft Company, July 15, 1991.

LEOSAT believes that the divergence in marketing philosophy between Orbcomm and LEOSAT is evidence of the grave danger to the public interest that would occur if either company received a monopoly license. Divergences in marketing and product distribution

philosophy is what free competition and open skies is all about. Such different approaches should be resolved in the marketplace, not by regulatory edict.

Contrary to Orbcomm's representations, General Motors/Hughes Aircraft Company does not believe there are any viable current alternatives to VHF MSS service for the IVHS market, and does not believe Orbcomm's monopoly approach will result in an "economically viable reality." Comments of Hughes Aircraft Company in Support of LEOSAT Corporation, July 15, 1991 at page 2.

In summary, Orbcomm has failed to rebut LEOSAT's contention that the amended Orbcomm application is legally unqualified as a monopoly application inimical to the public interest. LEOSAT has demonstrated herein that the purported sources of competition identified by Orbcomm are not real, and that, based on the public comment record, the public interest strongly favors an open skies approach to VHF MSS.

3. Orbcomm Has Failed to Rebut LEOSAT's Demonstration that Multiple Entry and Open Skies for VHF MSS is Feasible and Practical

Orbcomm's last line of defense for its requested monopoly is that any other approach is impractical. LEOSAT had explained in its original application, and in its various comments and petitions in this proceeding, that a simple Technical Coordinating Committee structure -- like that set up by the FCC for other services -- would

be highly likely to enable multiple entry through voluntary coordination. Instead of addressing the merits of LEOSAT's proposal, Orbcomm has used a "cloud and confuse the issue" strategy of claiming that LEOSAT wants to impose a consortium structure upon the VHF MSS service, hoping to paint LEOSAT with an "AMSC brush."

As any review of LEOSAT's filings will show, Orbcomm's allegation is blatantly untrue. LEOSAT has never proposed a consortium. LEOSAT has consistently, without change from its Application, proposed a standard, domestic multiple entry regulatory structure, with voluntary structured technical coordination.

If any party in this Proceeding bears resemblance to AMSC, it is Orbcomm itself, claiming, as did AMSC, that multiple entry is impossible. The recent flurry of apparently compatible RDSS/MSS L-band applications should give the Commission great caution in buying into any "multiple entry is impossible" argument.

Exhibit 1 hereto is a Technical Certification from one of the country's leading experts on satellite system technology, Robert D. Briskman, whose career spans from Early Bird to SBS to RDSS, encompassing the technical coordination of dozens of satellite networks. This Technical Certification clearly evidences that a Technical Coordination Committee approach to VHF MSS is likely to work, and in fact has worked for other similar circumstances. As noted by Mr. Briskman:

"The concept of having only a single commercial communications satellite system for a particular service and its ensuing technical advantages have been advanced since the inception of such space capabilities. In almost all cases, multiple co-frequency satellite systems now exist and exist without undue spectrum inefficiency or significant radio interference."

...
"Almost identical to the situation herein, Technical Coordinating Committees have been effective in the previously noted United States domestic satellite system interoperability agreements, Intelsat interference coordination on orbital locations and in the technical development of the RDSS. The latter is of particular note since the coordination occurred rapidly and efficiently despite two of the four licensees (i.e., OMNINET and Geostar) having a distinct adversarial relationship." (See Exhibit 1 hereto).

It is also interesting to note that, at page 9 note 15 of its Reply, Orbcomm does concede that it will commence providing service with its initial two satellites. Hence the only regulatory difference between Orbcomm's and LEOSAT's approach is that Orbcomm wants all 20 satellites authorized upfront, and to be given until the middle of the decade to launch them, whereas LEOSAT is asking only for authority to construct and launch its first two satellites. LEOSAT's approach is that it will come back to get more construction and launch authority after the capacity of the first two satellites is largely sold. LEOSAT's approach is consistent with the Appendix B filing procedures whereas Orbcomm's is not. Under LEOSAT's approach Orbcomm can still eventually get 20 satellites licensed (assuming its earlier satellites are actually launched and

used), but orbit/spectrum hoarding is avoided in the event that Orbcomm never launches more than a few satellites.

Since Orbcomm admits that it is going to provide service with many fewer than 20 satellites, LEOSAT fails to see why the Commission needs to authorize more satellites than Orbcomm is actually ready to launch. Indeed, LEOSAT notes that Orbcomm has not paid launch fees for any of its satellites.

LEOSAT is an interested party in this proceeding because the ORBCOM application is mutually exclusive with LEOSAT's application for a 137/148 MHz band LEO MSS system targeted to serve smart car and smart highway needs throughout the United States. Unlike Orbcomm, LEOSAT is compliant with the FCC's rules by commencing with only two orbit/spectrum assignments, and not precluding other systems.

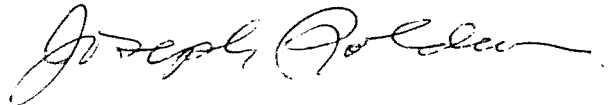
CONCLUSION

In summary, Orbcomm has failed to rebut LEOSAT's demonstrations that Orbcomm is not financially qualified to construct, launch and operate for one year a 20 satellite constellation. Orbcomm has also failed to rebut LEOSAT's proofs that the monopoly structure proposed by Orbcomm is contrary to the public interest, contrary to the public record in this proceeding, and wholly unnecessary. Accordingly, the Orbcomm amended application

is legally unqualified. For these reasons of legal and financial disqualification, the amended Orbcomm application should be denied.

LEOSAT has no objection to competing with Orbcomm in an open skies marketplace. Were Orbcomm to further amend its application to be compatible with multiple entry, LEOSAT would have no objection to it.

Respectfully Submitted,

A handwritten signature in cursive script, appearing to read "Joseph Roldan".

LEOSAT CORPORATION
Joseph Roldan
President
1819 Tufa Terrace
Silver Spring, MD 20904

August 2, 1991

CERTIFICATE OF SERVICE

I, Karen Muller, hereby certify that a true copy of the foregoing Response Comments of Leosat was mailed, first class postage paid, this 2nd day of August, 1991 to:

Albert Halprin, 901 Fifteenth Street, NW, Wash., D.C. 20005
(Orbcomm)

Raul Rodriguez, 2000 K St., NW, Wash., D.C. 20006-1809 (Starsys)

Henry Norman, 1815 North Lynn St., Arlington, VA 22209 (Vita)

And by Hand to:

Tom Stanley, Chief Scientist, 2025 M Street, NW

Gerald Vaughan, FCC, 1919 M St., NW

Jim Keegan, FCC, 2025 M St., NW

Cecily Holiday, FCC, 2025 M St., NW

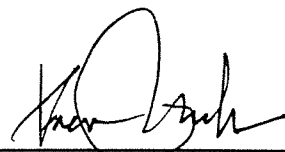
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Karen Muller

EXHIBIT 1

2 August 1991

EXHIBIT 1

TECHNICAL CERTIFICATION OF
ROBERT D. BRISKMAN
REGARDING MULTIPLE ENTRY AND
TECHNICAL COORDINATING COMMITTEES FOR VHF MSS

ORBCOMM has commented on Leosat's proposals to permit multiple entry. Besides several comments on business and regulatory matters, ORBCOMM states concerns of "technical. . . .problems with multiple systems"¹ and of perceived difficulties with Technical Coordinating Committees for accomplishing interoperability. The following addresses the technical issues of these ORBCOMM comments.

The concept of having only a single commercial communications satellite system for a particular service and its ensuing technical advantages have been advanced since the inception of such space capabilities. In almost all cases, multiple co-frequency satellite systems now exist and exist without undue spectrum inefficiency or significant radio interference. As examples:

1. The INTELSAT system now co-exists with many international, regional and national systems (e.g., PanAmSat, Asiasat, STATIONAR, etc.)
2. The first United States domestic satellite system proposal (Pilot Program by COMSAT in 1966; FCC Docket 16495) was for a single, unified system. Currently, there are several independent United States domestic satellite systems, each with multiple satellites, operating simultaneously.

¹ORBCOMM Reply Comments, July 17, 1991 at page 10

3. The original Geostar proposal for a mobile radio positioning system became a RDSS system with four FCC licensees each permitted to operate three satellites (FCC Docket 84-689).

The above examples involve geostationary satellites and the applicability of the examples to the subject low earth orbit satellites must be addressed. The examples are applicable in that the same technical concerns were raised as to spectrum efficiency and interference which are now raised by ORBCOMM and these concerns were unfounded. Some of the specific technical issues are summarized below.

The basic problem facing all Applicants is that the proposed spectrum allocation in the subject Proceeding is narrow in bandwidth and contains some unquantifiable amounts of external interference. The desire is to use earth terminal antennas of low directivity and uncertain orientation towards the moving satellites making polarization discrimination unavailable. Basically, discrimination by frequency (spectrum segmentation), by modulation and by time are three remaining possibilities. To the extent that almost continuous coverage is desired by all Applicants and differing satellite orbits, orbital configuration and orbital control may be utilized, time discrimination may be difficult to employ. Spectrum segmentation is deprecated by ORBCOMM on the basis that the capacity of each operational system is reduced assuming ground user terminals are only allowed to access (or choose only to access) one operational system. Although technically correct if one agrees with the assumptions, ORBCOMM also comments on the superiority of its services which, if correct, would lead to the failure of

competing systems. Thus, if the systems were initially of an interoperable design, ORBCOMM will end up with the full spectrum available to their system. ORBCOMM's objections are therefore unclear. ORBCOMM also includes in their comments on this subject the "reducing the efficacy of the DCAAS spectrum sharing approach."² It is noted:

1. The DCAAS approach of ORBCOMM requires complication of the satellite electronics which, for very long life, reliable and low cost satellites, must be balanced against the benefits.
2. The DCAAS benefits depend on the amounts and time variation of interference within these frequency bands. If the interference is much less than assumed, DCAAS may be unnecessary. If the interference is much higher, DCAAS will not be efficient. It is most unfortunate that the ORBCOMM-X, which was launched by ORBCOMM to measure the interference, has failed, and it is sincerely hoped that another attempt will be made.

Lastly, the matter of discrimination by modulation must be considered. The use of spread spectrum modulation, originally proposed by STARSYS, has been debated in previous Filings and Comments. Without repeating various previously filed pros and cons, spread spectrum modulation can provide a 23 dB interference rejection factor coupled with very high capacities for the services projected by the Applicants.

²Op cit p. 9 & 10.

The final matter concerns ORBCOMM's comments noted earlier on a Technical Coordinating Committee. Such Committees have been used on many FCC matters, and are the norm for United States standards setting activities where groups are formed of competing manufacturers and users to formulate industry standards. Such Committees do similar work in CCIR and CCITT fora.

Almost identical to the situation herein, Technical Coordinating Committees have been effective in the previously noted United States domestic satellite system interoperability agreements, Intelsat interference coordination on orbital locations and in the technical system development of the RDSS. The latter is of particular note since the coordination occurred rapidly and efficiently despite two of the four licensees (i.e., OMNINET and Geostar) having a distinct adversarial relationship. It is believed a Technical Coordinating Committee would be effective in the subject Proceeding since all Applicants will wish to maximize the potential communications capacity and will wish to resolve the necessary technical matters so system implementation can proceed. Protection of ORBCOMM's "proprietary expertise" can certainly be arranged, although the degree of such expertise is unknown.

It is concluded that ORBCOMM's technical concerns as expressed in the Comments are unfounded. Multiple systems appear technically feasible, and coordinated efforts to achieve interoperability should be implemented. Accomplishing this through a Technical Coordinating Committee (authorized and provided guidelines by the FCC) is an excellent and time proven approach.

ENGINEERING CERTIFICATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in the Response of Leosat Corporation; that I am familiar with Parts 2 and 25 of the Commission's Rules and Regulations, and that it is complete and accurate to the best of my knowledge.

By: Robert D. Briskman
Robert D. Briskman
President
TEC

Date: August 2, 1991

TEC

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ROBERT D. BRISKMAN

Biography

Robert D. Briskman is President of Telecommunications Engineering Consultants (TEC) which was founded in 1991 to provide quality engineering and implementation services worldwide. Primary efforts of TEC are directed to fixed, mobile and broadcast telecommunications systems and to tracking, telemetry and command facilities.

Prior to TEC, Mr. Briskman was with the Geostar Corporation from 1986-1991. He was responsible at Geostar for the development, design, implementation and operation of the Radio Determination Satellite Service provided by Geostar which allows positioning and message communications between mobile users nationwide and their dispatch centers. Mr. Briskman directed the construction of Geostar's space segment, the control and operations center and the development of the mobile terminals used on land, sea and airborne vehicles built by the SONY, HUGHES Network Systems and KENWOOD Corporations. He was responsible for the development of a miniaturized handheld transceiver by Motorola which was the world's smallest satellite earth terminal. Mr. Briskman served as Senior Vice President, Engineering and Operations.

Mr. Briskman was employed by the Communications Satellite Corporation (COMSAT) in January 1964, and was responsible initially for satellite command and control activities, including those involved with the launching of INTELSAT I (Early Bird). He was later a Department Manager in the Transmission Systems Division, where he was involved with the development and implementation of the INTELSAT global communications system. Among his efforts, early work in demand assigned single carrier per channel, radio frequency interference minimization and terrestrial interconnection was accomplished. Mr. Briskman was responsible from 1967-1973 for the technical planning involved with the provision of domestic communications services via satellites, including systems for use by AT&T and by the television broadcasting networks.

Mr. Briskman joined COMSAT General Corporation on its founding in 1973 and was Assistant Vice President, Space and Information Systems. He was responsible for the COMSTAR satellite system, the development of earth resource and information systems, and the implementation of the first remote satellite data collection system in conjunction with the United States Geological Survey and Telesat Canada. He directed the construction of the Southbury and Santa Paula earth stations which were used for command and control of both MARISAT and COMSTAR satellites and for shore communications to the Atlantic and Pacific MARISAT satellites. Mr. Briskman joined Satellite Business Systems in mid-1977 where he was responsible for the Pre-Operational Program which provided voice and data communications services to many IBM facilities in the United States using the first demand-assigned, time division multiple access system ever placed in commercial operations.

Mr. Briskman returned to COMSAT General in 1980 where he was responsible as Vice President, Systems Implementation for the engineering of satellites, earth stations and communications technical facilities of COMSAT General and of clients, both within and external to COMSAT. His organization provided a complete range of technical services nationally and internationally, including those involved with software, spectrum engineering and teleconferencing. Mr. Briskman was responsible for the PALAPA (Indonesia's domestic satellite system), ARABSAT and ITALSAT programs as well as for providing support to the INMARSAT, INTELSAT, STC (Direct broadcast), TELSTAR-3, ALASCOM, SATCOL, UNISAT, INTELNET, NORDSAT, CHINASAT AND CAMEROON programs.

Prior to COMSAT, Mr. Briskman joined the National Aeronautics and Space Administration (NASA) during its founding in 1959. At NASA, Mr. Briskman was Chief of Program Support for the Office of Tracking and Data Acquisition. He was involved with the development of ground instrumentation for such projects as APOLLO, GEMINI, RANGER, MARINER, and ECHO. Mr. Briskman received the APOLLO Achievement Award from NASA for the design and implementation of the Unified S-Band System. Before NASA, he was employed by IBM in 1954 and worked on the design of asynchronous buffer systems. After two years of military service as an Electronic Countermeasures Analyst Officer, for which he was awarded the Army Commendation Medal, Mr. Briskman was employed by the Army Security Agency. He was engaged in communications systems development and analysis.

Mr. Briskman is a Fellow and past Secretary-Treasurer, Vice President for Technical Activities and Director of the Institute of Electrical and Electronics Engineers (IEEE). He has been President of the Aerospace and Electronics Systems Society, Director of the National Telecommunications Conference, Chairman of the EASCON Board of Directors, and Chairman of the IEEE Standards Board. Mr. Briskman has authored over forty technical papers, holds three United States patents, served on the Industry Advisory Council to NASA, and is a licensed professional engineer. He is a Fellow of the AIAA and the Washington Academy of Science, past President of the Washington Society of Engineers, and a member of IAA, AFCEA and the Old Crows. He is also a recipient of the IEEE Centennial Medal. Mr. Briskman holds a B.S.E. degree from Princeton University and a M.S.E.E. degree from the University of Maryland.

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