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3-DSS-EXT-91

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Domestic Facilities D
Satellite Radio Bra

October 31, 1990

Federal Communications Commission
Common Carrier Domestic Satellites
Post Office Box 358160
Pittsburgh, Pennsylvania 15251-5160

Re: GE American Communications, Inc.
Application for Modification of Authorization
of Satcom H-1

Dear Sir:

On behalf of GE American Communications, Inc., we have enclosed an original and nine copies of an application for modification of the authorization of Satcom H-1. A check in the amount of $5,000.00 for the required filing fee is also enclosed. If any questions arise in connection with this matter, please contact the undersigned.

Respectfully,

HOGAN & HARTSON

By _____
Peter A. Rohrbach
Gerald E. Oberst, Jr.

Attorneys for GE American
Communications, Inc.

cc: Cecily Holiday
Fern Jarmulnek

Approved by OMB
3060-0440
Expires 12/31/90

FEDERAL COMMUNICATIONS COMMISSION

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SECTION I

APPLICANT NAME (Last, first, middle initial)

GE American Communications, Inc.

MAILING ADDRESS (Line 1) (Maximum 35 characters - refer to Instruction (2) on reverse of form)

c/o Peter A. Rohrbach, Hogan & Hartson

MAILING ADDRESS (Line 2) (if required) (Maximum 35 characters)

555 13th Street, N.W.

CITY

Washington, D.C.

STATE OR COUNTRY (if foreign address)	ZIP CODE	CALL SIGN OR OTHER FCC IDENTIFIER (If applicable)
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TOTAL AMOUNT REMITTED WITH THIS APPLICATION OR FILING	FOR FCC USE ONLY
$ 5,000.00	

BEFORE THE

Federal Communications Commission

WASHINGTON, D. C.

In the Matter of	)	
	)	
GE AMERICAN COMMUNICATIONS, INC.	)	File No.
	)	
Application for Modification of Construction Permit and License For the H-1 Domestic Fixed-Satellite Space Station	)	

APPLICATION FOR MODIFICATION OF AUTHORIZATION

GE AMERICAN COMMUNICATIONS, INC.

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October 31, 1990

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SUMMARY

GE American Communications, Inc. respectfully requests modification of its authorization for Satcom H-1 to permit it to address new customer communications requirements. GE Americom proposes technical changes to its Ku-band transponder frequency plan, and its C-band and Ku-band transponder power. Although these payload improvements will significantly increase spacecraft weight, they can be accommodated due to other new developments that allow GE Americom to make corresponding reductions in the weight of H-1. These technical modifications respond to significant unforeseen and still-evolving developments in the marketplace, including the near-term deployment of video compression systems. None of the proposed changes will result in additional interference with adjacent satellites.

After extensive discussions with its vendor, GE Americom has been advised that the necessary modifications cannot be accommodated within the current H-1 milestone schedule. GE Americom therefore requests an extension of time to complete construction and launch the satellite. GE Americom has executed a construction contract for Satcom H-1, and no issue of "warehousing" orbital locations is present. Moreover, the extension is consistent with similar modification authority already granted to GE Americom's major competitors for their own hybrid satellites.

BEFORE THE

Federal Communications Commission

WASHINGTON, D. C.

In the Matter of	)	
	)	
GE AMERICAN COMMUNICATIONS, INC.	)	File No.
	)	
Application for Modification of Construction Permit and License For the H-1 Domestic Fixed-Satellite Space Station	)	

APPLICATION FOR MODIFICATION OF AUTHORIZATION

GE American Communications, Inc. (GE Americom) hereby requests modification of its authorization for the H-1 hybrid satellite in order to implement important new technical developments and enhancements in the design of the spacecraft. These modifications will permit GE Americom to meet changing customer communications service requirements in an evolving environment, increase spacecraft performance at reduced cost, and help maintain effective competition in the satellite marketplace. The proposed modifications to H-1, however, will require extensions of the milestone dates for completion of construction and launch of the satellite. Such extensions are requested here.

This Application is consistent with similar modification authority granted to GE Americom's major competitors for their hybrid satellites that will compete with

H-1. As in those cases, favorable action on this Application would in all respects serve the public interest.

INTRODUCTION

In a decision released in December 1988 the Commission authorized GE Americom to construct, launch and operate the H-1 satellite at 79 degrees W.L.1/ GE Americom described the commencement of its first phase of construction for H-1 in a report to the Commission dated March 19, 1990. In compliance with Commission instructions, GE Americom is filing today its non-contingent construction contract for H-1. This contract was executed after lengthy design planning with GE Astro Space (GE Astro), which has built all of GE Americom's ten satellites.

In determining H-1's configuration GE Americom has taken into account the changing dynamics of the satellite industry. Customer requirements are in a state of flux due in part to recent technological developments in the high definition television (HDTV) and video compression areas. As the Commission is aware, these developments have accelerated in recent months, with several announcements of new video technologies that were not foreseeable even a year ago. The

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1/ GE American Communications, Inc., 3 FCC Rcd 6984 (1988)(File Nos. 6012 & 6013-DSS-P/L-87). GE Americom's legal, financial and technical qualifications were established in that proceeding, and are a matter of record at the Commission.

dynamics of the marketplace have created uncertainty as customers gauge their transponder requirements to take into account the ultimate effect of the recent technological developments.

GE Americom's discussions with potential H-1 customers regarding their service plans have demonstrated that certain payload changes are necessary to permit GE Americom to fully meet their still evolving requirements. Over the past several months GE Americom and its vendor have determined that these payload improvements are possible for H-1 despite the additional spacecraft weight they entail. GE Americom and GE Astro have conducted extensive satellite weight reduction analyses and determined that the H-1 payload improvements can be accommodated through other new design features that reduce weight without affecting spacecraft performance. Additional satellite technical enhancements also have recently been developed that will increase reliability. Collectively these modifications, certain of which require Commission approval, permit advances in satellite communications service capabilities and improve spacecraft performance. They are fully consistent with the Commission's commitment, in the words of Chairman Sikes, "to providing licensees the flexibility to respond to changes in the market." 2/

2/ Satellite News, January 15, 1990, at 4.

Approval of this Application is particularly important given the highly competitive nature of the satellite communications industry. A company's ability to remain viable in the marketplace directly depends upon its ability to provide innovative services in a cost effective manner. The Commission has recognized this fact insofar as it has recently approved modifications of the licenses of AT&T and of Hughes Communications Galaxy, Inc. (Hughes) for hybrid satellites that will compete with H-1, and granted corresponding extensions of the construction completion and launch deadlines for those spacecraft. The important innovations proposed here, and the milestone extensions necessary to accommodate them, similarly should be approved.

I. TECHNICAL MODIFICATIONS

The Commission has recognized that the technical design of satellites often changes during the construction process, and that these changes serve the public interest in obtaining service from the most advanced and efficient satellite technology. Thus, in authorizing changes to AT&T's Telstar 400 series of hybrid satellites, the Commission recently observed that:

> Given the two to three year construction period for a satellite, the Commission often receives requests from licensees to modify the technical design of their satellites while they are being built. If the proposed modification does not present any significant

interference problems and is otherwise consistent with Commission policies, it is generally granted. 3/

In response to a request by GE Americom several years ago, the Commission expressed the rationale behind this policy: "to allow state-of-the-art technology to be incorporated into the satellites and in-orbit performance optimized." 4/

The modifications proposed in this Application are entirely consistent with this Commission policy. The specific design changes are discussed in more detail below.

A. Communications Payload Improvements

1. Modified Ku-Band Frequency Plan

GE Americom is currently authorized to construct H-1 with sixteen 54 MHz transponders in the Ku-band. GE Americom proposes to modify this transponder frequency plan so that H-1 would have sixteen 27 MHz transponders and eight 54 MHz transponders. This modification to the frequency plan permits GE Americom to operate substantially more transponders and to better respond to Ku-band customer requests for advanced transponder services. Based on discussions with potential H-1

3/ American Telephone and Telegraph Company, 5 FCC Rcd 1184 (¶ 7) (1990).

4/ RCA American Communications, Inc., FCC 85-390 (released August 29, 1985). See also Licensing of Space Stations in the Domestic Fixed-Satellite Service ("Reduced Orbital Spacing"), 54 Rad. Reg.2d 577, 609 (¶ 103)(1983).

customers, GE Americom now anticipates substantial demand for Ku-band channels that support more efficient single channel per carrier (SCPC) and narrowband television service. The proposed bandwidth changes will increase GE Americom's flexibility to serve this market -- which was not foreseeable when GE applied for H-1 in 1987 -- while also providing service to those customers preferring the wider bandwidth.

In particular, new video compression technology, which allows one transponder to be used to provide a number of video channels, has played a role in the determination of the Ku-band frequency plan that GE Americom will use. Very recent breakthroughs have indicated that video compression technology is now viable. The proposed H-1 revisions reflect our judgment of how that technology can best be used on the H-1 spacecraft. Compression obviously offers major improvements in the use of the available bandwidth. GE Americom could not properly or prudently ignore these recent technological advances in determining the final configuration of the H-1 satellite.

2. Increase in C-Band Power Output

GE Americom also requests authority to increase the output power of H-1's solid state power amplifiers (SSPAs) for all 24 C-band transponders from 10 watts to 17 watts. This modification will provide improved performance and increased system margin at customers' receive earth stations. In addition, use of 17 watt SSPAs will facilitate the transmission

of two television channels through a single C-band transponder. Both of these results will significantly benefit our customers and the viewing public and will enable GE Americom to compete more effectively in an increasingly competitive industry. Improved system margin and performance provide obvious benefits such as fewer service outages and, for video, better quality reception. C-band customers will be able to use smaller, and so less costly, terrestrial equipment. For example, the proposed increase in transponder power will allow 6.9 meter antennas to be used in lieu of 9 meter antennas with no degradation in reception quality. In addition, the higher power SSPAs will allow antenna owners to use lower power and less expensive low noise amplifiers. These improvements will be particularly important for service to the growing backyard antenna market. The enhanced ability to transmit two television channels through a single transponder will provide major economic benefits to our cable and other video customers.

The 17 watt SSPAs that GE Americom requests have only recently become commercially available. We could not have included this design in our original 1987 application because the technology was not sufficiently developed. Within the last six months, AT&T sought and was granted authorization to increase the power output of some of its C-band transponders to 20 watts on its Telstar 400 series of satellites, and GE Americom believes it is commercially necessary to incorporate

similar technology in its own next generation hybrid satellite. 5/

These alterations should not increase any interference potential. Appendix A provides an interference analysis demonstrating the compatibility of the modified H-1 with adjacent satellites. GE Americom recognizes its obligation to coordinate its operations with existing and future adjacent satellites, and pledges to take all reasonable steps necessary to avoid potential objectionable interference.

B. Technical Design Improvements to Reduce Spacecraft Weight

The communications payload improvements described above -- the increase in the number of Ku-band transponders and the increase in power output of the C-band transponders -- add significantly to the size and weight of H-1. Because launch vehicles only can accommodate satellites up to a maximum size, the proposed payload improvements could not be made unless other design changes could be incorporated that permit corresponding reductions in the spacecraft's weight.

5/ AT&T was authorized to increase its C-band power in American Telephone and Telegraph Company, DA 90-1221 (released September 19, 1990)(File Nos. 25 to 27 DSS-ML-90) (hereafter, "AT&T Modification Order"). GE Americom notes that several design components of H-1 are modeled after the Telstar 400 series, and that both H-1 and the Telstar 400 satellites are being constructed by GE Astro.

Therefore, once it was obvious that technology permitted the payload improvements, and that the marketplace demanded them, GE Americom and its satellite vendor began to search for solutions to the weight problem. After considerable study, GE Americom has modified its H-1 satellite program to incorporate the necessary changes, reflecting important new satellite design innovations.

1. Reduction in Ku-band Transponder Power

First, GE Americom proposes to reduce the power of the H-1 Ku-band transponders from 60 watts to 50 watts. This modest change will reduce spacecraft weight without noticeable effect on satellite performance. We expect that the design of the deployable H-1 antenna ultimately will permit substantial achievement of the orginally specified EIRP levels with the lower power 50 watt transponders.

2. Stationkeeping Improvements To Reduce Fuel Requirements

The reduction in Ku-band power alone is not sufficient to accommodate the payload improvements required by customers. GE Americom and GE Astro therefore have focused their attention on reducing a major contributor to satellite weight -- the hydrazine fuel required to perform north/south stationkeeping maneuvers over the lifetime of the spacecraft. GE Americom proposes to incorporate two innovative design changes to minimize the fuel required for H-1. While these changes do not

affect any technical parameters that require modification of the H-1 license, they are an integral part of GE Americom's proposed changes to the satellite, and also have required time to assess and implement into the H-1 design.

a) Arcjet Thrusters

First, the new H-1 design relies on the use of hydrazine arcjet thrusters only now being qualified by Rocket Research Company. These thrusters provide a significantly higher specific impulse than conventional electrohydrazine thrusters. They operate by converting electrical energy to thermal energy through direct contact of the propellant decomposition products with an electric arc. The improvement in specific impulse translates directly into a significant decrease in the amount of hydrazine fuel required for north-south stationkeeping, with a corresponding decrease in satellite weight. For the proposed twelve year mission life of H-1, the use of arcjet thrusters is critical to meeting the weight constraints of current launch vehicles.

b) Ground Reprogrammable Computer

Second, H-1 will be the first GE Americom satellite to rely on an on-board ground reprogrammable computer to direct stationkeeping maneuvers. This technology has just recently become available for use in the United States commercial space program, and represents a significant spacecraft advance. Because the computer can be regularly reprogrammed, GE Americom

will be able to minimize fuel use by improving maneuver accuracy (which again translates into lower satellite weight). The improved spacecraft computer also will substantially reduce the time needed to program and execute stationkeeping maneuvers, thereby reducing operating costs.

C. Power and Thermal Subsystem Improvements

GE Americom also intends to adopt other design innovations that were developed during the period that the H-1 weight reduction features were analyzed and approved. These design modifications solve specific problems that GE Americom has observed on previous spacecraft. After considerable work, GE Americom and GE Astro have very recently completed development of solutions that will enhance system reliability over H-1's twelve year lifetime.

First, the H-1 power bus will be regulated to provide voltages at specific levels to the various components. On previous GE Americom satellites the power bus was unregulated in favor of controls in other components. The new design will eliminate the regulation circuitry from individual components, thereby improving reliability and reducing costs and weight.

Second, the H-1 battery cells have been redesigned to employ an internal wick that maintains the electrolyte within the active elements of the cell. This design considerably improves battery performance and ensures sufficient power to operate the satellite during eclipse periods over the mission life.

Third, the new H-1 design compartmentalizes satellite subsystems into individual modules. This design improves thermal balance within the satellite, contributing to improved component reliability and performance. The modular approach also enables greater flexibility in parallel assembly and integration of subsystems, resulting in important construction cost savings.

D. Summary

The design innovations discussed above are described more fully in the Technical Description of the H-1 satellite which will be submitted as Appendix B to this application in the next few days. GE Americom requests that the Commission modify the H-1 authorization as necessary to reflect the revised transponder power, bandwidth and related changes proposed here. These modifications, as well as other related design enhancements discussed above, will allow GE Americom to provide better service to its customers, with no adverse effect on adjacent satellites. Approval of these changes also will allow GE Americom to remain competitive with other satellite carriers who recently have been granted similar approval to enhance their next-generation hybrid satellites.

II. EXTENSION OF MILESTONE DATES

GE Americom commenced construction of the H-1 spacecraft on a timely basis in 1989, 6/ and has now fixed its final construction requirements in a contract with its vendor which meets Commission requirements. However, the technical design innovations discussed above require an extension of the milestone date to complete construction from May 1993 to July 1994, and an extension of the milestone launch date from August 1993 to September 1994.

These milestone extensions are consistent with Commission policy and actions in similar cases. Adherence to milestone schedules is required to "prevent[] orbital locations from being 'warehoused' by licensees who have not yet decided whether to proceed with their plans." 7/ However, that issue is not raised by GE Americom's request.

GE Americom has been a pioneer in the United States commercial satellite industry: it has repeatedly shown the will and the ability to construct, launch and operate satellites, having done so on ten occasions in the past. In two instances when GE Americom determined that it could not

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6/ See Letter from Counsel, GE Americom, to James Keegan, Chief, Domestic Facilities Division (March 19, 1990).

7/ MCI Communications Corp., 2 FCC Rcd 233, at ¶ 5 (1987).

construct and launch an authorized satellite within the Commission's specified time frames, GE Americom voluntarily and without Commission prompting relinquished the authorizations. 8/

Here GE Americom has executed a construction contract. Further, GE Americom is projecting the use of a substantial portion of H-1 capacity by several of its current customers migrating to H-1 from their current assignments, and is actively marketing the satellite to other parties. The procurement process for launch services with Arianespace and General Dynamics has been modified to reflect changes in the spacecraft weight and other design considerations. The additional months requested are reasonable based on the substantial design improvements that will enhance satellite performance for our customers.

GE Americom has had extensive discussions with its vendor regarding the ability of the vendor to incorporate the technical modifications discussed in this Application within the current milestone schedule. However, we are advised that the current schedule cannot be accommodated in light of the modifications required. The revised H-1 is a more complex

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8/ GE Americom followed this course of action in the case of the authorizations for the C-band Satcom VI and the Ku-band K-3 satellites.

satellite that will take longer to assemble. Notwithstanding the reductions in hydrazine fuel and related changes, H-1 will be 40% heavier and contain 45% more electronics than H-1 as originally proposed. The advanced H-1 features, as well as the substantially increased number of electronic components, also will require considerably more testing as well as additional fabrication and integration. The vendor has informed GE Americom that given its heavy current workload and the complex H-1 production requirements, construction of H-1 cannot be completed within the period allowed by the present milestone schedule. The milestone extensions requested here reflect the minimum additional construction period prudently required, 9/ and do not amount to "warehousing" additional locations.

Extension of the H-1 milestones is fully consistent with Commission policy. The Commission has traditionally granted requests for milestone extensions "when delay in implementation is due to circumstances beyond the control of the licensee." 10/ As we have discussed, in this case GE Americom requires additional time due to unforeseeable

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9/ GE Americom originally estimated that its satellite vendor would require 42 months from execution of the final contract to complete construction of H-1. See GE Americom Application at 7.

10/ MCI Communications Corp., 2 FCC Rcd 233, at ¶ 5 (1987).

technical developments and changing customer requirements that have resulted, and the complexity of meeting those demands while accounting for satellite size and weight constraints -- all factors beyond GE Americom's control. Without repeating all of the previous discussion, we would recall by way of example that GE Americom could not have foreseen the new compression technologies that have led to customer requirements that the H-1 Ku-band transponders be reconfigured. Similarly, 17 watt SSPAs have only recently become commercially available. The H-1 stationkeeping innovations -- the arcjet thruster and reprogrammable on-board computer -- are only now available to permit GE Americom to reduce fuel requirements, and thus to adopt the communications payload improvements required by customers. And the newly-developed improvements to the power and thermal subsystems similarly advance satellite efficiency and reliability in significant respects. Collectively these developments in marketplace demand and technology constitute circumstances beyond GE Americom's control, but circumstances it cannot prudently ignore today.

The need to revise an authorized satellite design to incorporate technical changes, resulting in milestone extensions, is not unique to GE Americom. The extensions that GE Americom requests are consistent with Commission actions in similar cases. For example, as noted above AT&T recently requested authority to revise its Telstar 400 hybrid

satellites, modifying the Ku-band frequency plan, increasing C-band transponder power capability from 10 to 20 watts, and making other technical adjustments. AT&T also asked for extensions of the milestone dates for completion of construction and launch of the satellites. AT&T justified its requests by noting that the changes to the spacecraft were mandated by changes in marketplace demand, a circumstance beyond AT&T's control.

On September 19, 1990, the Commission granted AT&T's modification application. 11/ The Commission stated that incorporation of the technical features into the Telstar satellites would serve the public interest. The Commission also revised the construction and launch milestone schedules as requested by AT&T. On this latter point, the Commission noted (a) that AT&T had begun the construction process, (b) that since the satellites were intended to provide continued service to existing customers, there was no reason to believe AT&T might abandon the satellites, and (c) that the requested extensions were brief. In these circumstances, the Commission concluded, a grant of the extensions would not allow AT&T to warehouse orbital locations and thereby block entry by other qualified entities. This analysis applies directly to GE

11/ See AT&T Modification Order, supra.

Americom's modification request here because the relevant circumstances facing us are substantially the same as those faced by AT&T.

Similarly, earlier this year the Commission granted a twenty-two month extension of construction and launch deadlines requested by Hughes in order to permit consolidation of previously authorized C-band and Ku-band satellites into a single hybrid satellite. 12/ In granting the extension request, the Commission emphasized the technical and operational advantages that the enhanced hybrid satellite would have. These factors are very comparable to GE Americom's situation with H-1 (although in GE Americom's case the time needed is considerably shorter).

Thus, the Commission has permitted GE Americom's major competitors to implement technical changes that they deem are required by marketplace factors in time frames their satellite vendors estimate are needed for construction and launch. It would severely hamper GE Americom's ability to compete with the next generation of satellites in the mid and late 1990s if GE Americom's similar request is not authorized.

12/ Hughes Communications Galaxy, Inc., 5 FCC Rcd 3423 (1990).

CONCLUSION

GE Americom has demonstrated that the modifications it proposes for H-1 will serve the public interest by permitting GE Americom to address evolving customer needs in a rapidly changing environment. The technical changes will allow GE Americom to provide the communications services we believe will be required by customers, improve spacecraft reliability and performance, and maintain effective competition in the satellite marketplace. These technical changes are only possible with a corresponding extension of the current construction and launch milestones. For these reasons, the Commission should authorize a modification of GE Americom's license to incorporate the technical changes requested in this application, and should extend the milestone dates as requested.

Respectfully submitted,

By _____
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October 31, 1990

APPENDIX A

INTERFERENCE ANALYSIS

SATCOM H-1

Application for Modification of Authorization

October 31, 1990

TECHNICAL SHOWING

INTERFERENCE FROM 17 WATT C-BAND TRANSPONDERS ON THE SATCOM H-1 SATELLITE INTO ADJACENT SATELLITES

1.0 INTRODUCTION

This Technical Showing demonstrates that increase of the C-Band transponder power on the Satcom H-1 satellite from 10 watts to 17 watts will not cause excessive or harmful interference into adjacent satellites.

The orbital assignments of Satcom H-1 and the adjacent satellites are as follows:

Orbital Slot	Satellite	Polarization
o 81° West Longitude	Galaxy 5-E	Vertical
o 79° West Longitude	Satcom H-1	Horizontal
o 76° West Longitude	Comstar D-2/D-4	Vertical
o 74° West Longitude	Galaxy 2-R	Horizontal

Analyses of the interference from Satcom H-1 into the adjacent satellites are presented in the following sections.

2.0 INTERFERENCE FROM SATCOM H-1 INTO GALAXY 5-E

The worst-case interference from H-1 into an adjacent satellite would occur in the situation in which a video signal would be transmitted through a transponder of H-1 and single channel per

carrier (SCPC) signals would be transmitted through the co-frequency transponder on the adjacent satellite. Adjacent satellite interference from H-1 into Galaxy 5-E is calculated below for such a case. In the example shown below, 100 narrowband FM audio SCPC carriers would be transmitted through a transponder of Galaxy 5-E. The communications parameters assumed in the calculation are:

Interfered-With Satellite: Galaxy 5-E

Input Backoff of Transponder	=	6.8 dB
Output Backoff of Transponder	=	4.2 dB
Input Backoff of Carrier	=	26.8 dB
Output Backoff of Carrier	=	24.2 dB
Uplink Flux Density/Carrier	=	-110.8 dBW/m^2
EIRP Carrier	=	12.8 dBW
Diameter of Receive Antenna	=	4.5 meters
Gain of Receive Antenna	=	44.0 dB
Bandwidth of FM SCPC Audio Carrier	=	50 kHz

Interfering Satellite: H-1

Saturated Satellite EIRP (Edge of CONUS Coverage)	= 37 dBW
Saturation Flux Density (Flux Control Attenuator Setting = 8 dB)	= -86 dBW/m2
Diameter of Transmit Antenna	= 10 meters
Gain of Transmit Antenna	= 54.5 dB

The FCC's Advisory Committee for the Implementation of Reduced Orbital Spacings Between United States Domestic Fixed-Satellites (2° Spacing Advisory Committee) has established criteria for adjacent satellite interference. Each criterion is stated in terms of a single-entry carrier-to-interference ratio, C/I_{SE}, for a particular communications traffic mode. In its Phase One Report the 2° Spacing Advisory Committee recommended that, for interference into FM SCPC program audio signals, C/I_{SE} be a minimum of 24 dB.

Interference into the Galaxy 5-E SCPC carriers is calculated as follows:

Downlink Parameters

$$E_W = 12.8 \text{ dBW}$$

$$E_i = 17.0 \text{ dBW}$$

$$\Delta G_R = 22.5 \text{ dB}$$

Cross-Polarization Discrimination = 10.0 dB

$$C/I_{d}_{2^\circ} = 28.3 \text{ dB}$$

Uplink Parameters

$$W_W = -110.8 \text{ dBW/m}^2$$

$$W_i = 106.0 \text{ dBW/m}^2$$

$$\Delta G_T = 33.0 \text{ dB}$$

Cross-Polarization Discrimination = 10.0 dB

$$C/I_{u}_{2^\circ} = 38.2 \text{ dB}$$

$$C/I_{SE} = C/I_{u}_{2^\circ} \oplus C/I_{d}_{2^\circ} = 28.3 \oplus 27.9 = 27.0 \text{ dB}$$

Margin with respect to protection ratio = 3.9 dB

The video spectral mask used in the above interference calculation was the one recommended by the 2° Spacing Advisory Committee in its Phase Two or Final Report. In the above analysis it was assumed that the SCPC carriers would not be placed in the region $\pm$ 3 MHz about the center frequency of the transponder.

3.0 INTERFERENCE FROM SATCOM H-1 INTO COMSTAR D-2/D-4

Comstar D-2 and Comstar D-4 are currently co-assigned to the orbital slot at 76° West Longitude. In this section C/I_{SE} is calculated for the case in which 100 FM SCPC program audio carriers (with characteristics indicated in Section 2.0 above) would be transmitted through one of the transponders of the collocated satellites. It is assumed that a video channel would be transmitted through the co-frequency (cross-polarized) transponder on Satcom H-1.

Downlink Parameters

$$E_W = 7.0 \text{ dBW}$$

$$E_i = 17.0 \text{ dBW}$$

$$\Delta G_R = 26.9 \text{ dB}$$

$$\text{Cross-Polarization Discrimination} = 10.0 \text{ dB}$$

$$C/I_{d}{}_{3^\circ} = 26.9 \text{ dB}$$

Uplink Parameters

$$W_W = -113.0 \text{ dBW/m}^2$$

$$W_i = -106.0 \text{ dBW/m}^2$$

$$\Delta G_T = 37.4 \text{ dB}$$

$$\text{Cross-Polarization Discrimination} = 10.0 \text{ dB}$$

$$C/I_{U}{}_{3^\circ} = 40.4 \text{ dB}$$

$$C/I_{SE} = C/I_{U}\underset{3^\circ}{\oplus} C/I_{d}\underset{3^\circ}{} = 40.4 \oplus 26.9 = 26.7 \text{ dB}$$

Margin with respect to protection ratio = 2.7 dB

It should be noted that Comstar D-2 and Comstar D-4 were launched in 1976 and 1981 respectively. It is anticipated that these satellites will have reached end of life before the proposed launch date of Satcom H-1 (May, 1994). In the event that a replacement satellite were not assigned to 76° West Longitude, the satellite immediately adjacent to Satcom H-1 would be Galaxy 2-R at 74° West Longitude.

4.0 INTERFERENCE FROM SATCOM H-1 INTO GALAXY 2-R

In this section C/I_{SE} is calculated for the case in which 100 FM SCPC program audio carriers (with characteristics indicated in Section 2.0 above) would be transmitted through one of the transponders of Galaxy 2-R. It is assumed that a video channel would be transmitted through the co-frequency co-polarized transponder on Satcom H-1.

Downlink Parameters

$$E_W = 12.8 \text{ dBW}$$

$$E_i = 17.0 \text{ dBW}$$

$$\Delta G_R = 32.5 \text{ dB}$$

$$C/I_{d}{}_{5^\circ} = 28.3 \text{ dB}$$

Uplink Parameters

$$W_W = -110.8 \text{ dBW/m}^2$$

$$W_i = -106.0 \text{ dBW/m}^2$$

$$\Delta G_T = 43.0 \text{ dB}$$

$$C/I_{u}{}_{5^\circ} = 38.2 \text{ dB}$$

$$C/I_{SE} = C/I_{u}{}_{5^\circ} \oplus C/I_{d}{}_{5^\circ} = 38.2 \oplus 28.3 = 27.9 \text{ dB}$$

Margin with respect to protection ratio = 3.9 dB

5.0 CONCLUSION

The analyses presented in this Technical Showing have demonstrated that increase of the C-Band transponder power on the H-1 satellite from 10 watts to 17 watts will not cause excessive or harmful interference into adjacent satellites.

APPENDIX B

TECHNICAL DESCRIPTION

SATCOM H-1

Application for Modification of Authorization

October 31, 1990

(To be submitted)