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FEDERAL COMMUNICATIONS COMMISSION REMITTANCE ADVICE

PAGE NO 1 OF 1

APPROVED BY OMB 3060-0589

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SECTION A - PAYER INFORMATION

(2) PAYER NAME (if paying by credit card, enter name exactly as it appears on your card)
AMSC Subsidiary Corporation

(3) TOTAL AMOUNT PAID (dollars and cents)
$ 85,045

(4) STREET ADDRESS LINE NO. 1
c/o Fisher Wayland Cooper Leader & Zaragoza L.L.P.

(5) STREET ADDRESS LINE NO. 2
2000 Pennsylvania Avenue, N.W., Suite 400:SJB

128 Sat-P/LA-98

(6) CITY: Washington | (7) STATE: DC | (8) ZIP CODE: 20006

(9) DAYTIME TELEPHONE NUMBER (include area code): (202) 659-3494

(10) COUNTRY CODE (if not in U.S.A.)

IF PAYER NAME THE AND APPLICANT NAME ARE DIFFERENT, COMPLETE SECTION B
IF MORE THAN ONE APPLICANT, USE CONTINUATION SHEETS (FORM 159-C)

SECTION B - APPLICANT INFORMATION

(11) APPLICANT NAME (if paying by credit card, enter name exactly as it appears on your card)
AMSC Subsidiary Corporation

(12) STREET ADDRESS LINE NO. 1
10802 Parkridge Boulevard

(13) STREET ADDRESS LINE NO. 2

(14) CITY: Reston | (15) STATE: VA | (16) ZIP CODE: 20191

(17) DAYTIME TELEPHONE NUMBER (include area code): (703) 758-6000

(18) COUNTRY CODE (if not in U.S.A.)

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SECTION C - PAYMENT INFORMATION

(19) FCC CALL SIGN/OTHER ID	(20) PAYMENT TYPE CODE (PTC)	(21) QUANTITY	(22) FEE DUE FOR (PTC) IN BLOCK 20	FCC USE ONLY
(19A) NEW	(20A) B N Y	(21A) 1	(22A) $ 85,045	
(19B)	(20B)	(21B)	(22B) $	
(19C)	(20C)	(21C)	(22C) $	
(19D)	(20D)	(21D)	(22D) $	

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(23C) FCC CODE 1 | (24C) FCC CODE 2

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SECTION D - TAXPAYER INFORMATION (REQUIRED)

(25) PAYER TIN 0 5 2 1 7 3 5 1 0 6

(26) COMPLETE THIS BLOCK ONLY IF APPLICANT NAME IN B-11 IS DIFFERENT FROM PAYER NAME IN A-2)
APPLICANT TIN 0 5 2 1 7 3 5 1 0 6

SECTION E - CERTIFICATION

(27) CERTIFICATION STATEMENT
I, Stephen J. Berman (PRINT NAME), Certify under penalty of perjury that the foregoing and supporting information are true and correct to the best of my knowledge, infomation and belief. SIGNATURE Stephen J. Berman

SECTION F - CREDIT CARD PAYMENT INFORMATION

(28) MASTERCARD / VISA

MASTERCARD/VISA ACCOUNT NUMBER:

EXPIRATION DATE: MONTH YEAR

I hereby authorize the FCC to charge my VISA or MASTERCARD for the service(s)/authorization(s) herein described.

AUTHORIZED SIGNATURE | DATE

SEE PUBLIC BURDEN ESTIMATE ON REVERSE

DUPLICATE

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

In the Matter of	)	
	)	
AMSC Subsidiary Corporation	)	
	)	
Application for Authority to Launch and	)	File No. SAT-LOA-1998
Operate a Second-Generation	)	0702-0006
Mobile Satellite System	)	

old file# 128SAT-P/LA-92

Received
JUL 16 1998
Satellite Policy Branch
International Bureau

APPLICATION

AMSC Subsidiary Corporation
10802 Parkridge Blvd.
Reston, VA 20191

Bruce D. Jacobs
Stephen J. Berman
Fisher Wayland Cooper Leader
& Zaragoza L.L.P.
2001 Pennsylvania Avenue, N.W.
Suite 400
Washington, D.C. 20006
(202) 659-3494

Lon C. Levin
Vice President and
Regulatory Counsel
AMSC Subsidiary Corporation
10802 Parkridge Boulevard
Reston, VA 20191
(703) 758-6000

July 2, 1998

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

In the Matter of	)	
	)	
AMSC Subsidiary Corporation	)	
	)	
Application for Authority to Launch and Operate a Second-Generation Mobile Satellite System	)))	File No.

APPLICATION

AMSC Subsidiary Corporation
10802 Parkridge Blvd.
Reston, VA 20191

Bruce D. Jacobs
Stephen J. Berman
Fisher Wayland Cooper Leader
& Zaragoza L.L.P.
2001 Pennsylvania Avenue, N.W.
Suite 400
Washington, D.C. 20006
(202) 659-3494

Lon C. Levin
Vice President and
Regulatory Counsel
AMSC Subsidiary Corporation
10802 Parkridge Boulevard
Reston, VA 20191
(703) 758-6000

July 2, 1998

EXECUTIVE SUMMARY

AMSC Subsidiary Corporation ("AMSC"), a wholly owned subsidiary of American Mobile Satellite Corporation, hereby requests authority to launch and operate the AMSC-2 mobile satellite, a second-generation follow-on to its existing mobile satellite system. AMSC's second-generation system is intended to:

Provide expansion capacity. Using a Hughes HS-702 satellite bus and a high gain antenna, AMSC-2 will be able to support up to 14,000 simultaneous voice users.

Increase flexibility. The second-generation system architecture, including an on-board digital beam forming processor, supports a variety of services, including data rates of up to 384 kbps.

Support existing users. The system will incorporate a "Skycell™ emulation" capability. In emulation mode, the system supports existing terminals used for AMSC's Skycell mobile telephone and dispatch services, Mobile Messaging Service and third-party services.

Retain or improve coverage. Like the existing system, AMSC-2 will be capable of covering all fifty states plus the Caribbean area, including Puerto Rico and the Virgin Islands.

Use existing spectrum and orbit slots with greater efficiency. AMSC proposes to use the same amount of L-band spectrum planned for AMSC-1 (14 MHz bi-directional) and to locate AMSC-2 at 101° W.L. The satellite will be capable of generating up to 200 spot beams over the coverage area, putting the maximum theoretical frequency reuse at 28:1. In practice, the uneven distribution of demand is expected to limit reuse to 5:1.

AMSC expects the second-generation system will be available 42 months after receipt of Commission approval.

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

In the Matter of	)	
	)	
AMSC Subsidiary Corporation	)	
	)	
Application for Authority to Launch and Operate a Second-Generation Mobile Satellite System	)	File No.

APPLICATION

AMSC Subsidiary Corporation ("AMSC") hereby applies for authority, pursuant to Sections 308 and 309 of the Communications Act of 1934, as amended, and Section 25.114 of the Commission's Rules, to launch and operate a second-generation mobile satellite system in the L-band.

1.0 INTRODUCTION

1.1 BACKGROUND

AMSC is licensed by the Commission to provide Mobile Satellite Service ("MSS") using frequencies in the L-band.[1/] AMSC launched its first satellite, AMSC-1, in 1995. From its assigned orbit location at 101° W.L., AMSC provides a wide range of mobile communications services, including telephone, point-to-multipoint dispatch, data communications, mobile messaging, and position reporting services. The company's shareholders include Hughes Communications, Inc., Motorola, Inc., Singapore Telecom, and AT&T Wireless Services, Inc.

1/ Memorandum Opinion, Order and Authorization, 4 FCC Rcd 6041 (1989); Final Decision on Remand, 7 FCC Rcd 266 (1992); *aff'd sub nom.* Aeronautical Radio, Inc. v. FCC, 983, F.2d 275 (D.C. Cir. 1993).

In March 1998, AMSC received permission to modify the operation of its service.[2] Instead of continuing to provide service on AMSC-1, AMSC will purchase a half-interest in an essentially identical satellite, MSAT-1. MSAT-1 was launched in 1996 and is currently owned and operated by AMSC's Canadian counterpart, TMI Communications and Company, L.P. ("TMI"). Under the satellite purchase agreement between AMSC and TMI, MSAT-1 will be relocated to 101° W.L. AMSC and TMI will each separately have access to half of MSAT-1's power and to whatever spectrum their respective administrations can coordinate. AMSC will continue providing service through its ground segment facilities in the Washington, D.C. area.

Meanwhile, the AMSC-1 satellite will be leased to African Continental Communications, Ltd. ("ACTEL"). ACTEL will move the satellite to a new orbital location where it will provide service to sub-Saharan Africa, an area of the world in urgent need of advanced mobile communications. The ACTEL lease runs for five years with a right to renew under certain circumstances. The ACTEL lease provides AMSC with a timely cash infusion and permits AMSC to expand the range of services it offers.

On March 31, 1998 AMSC completed its acquisition of ARDIS Company ("ARDIS") from Motorola. ARDIS owns and operates the nation's largest terrestrial, two-way wireless data communications network. With the merger, AMSC is positioned to leverage an integrated terrestrial/satellite network to advance its leadership in wireless data services.

2/ AMSC Subsidiary Corporation; Application for Modification of Mobile Satellite Service License; Application for Modification of Earth Station Licenses, *Order and Authorization*, File Nos. 29-SAT-ML-98, 627-SSA-MP/L-98(2) (March 13, 1998).

1.2 SYSTEM SUMMARY

AMSC's second-generation system is designed to take advantage of technological and marketplace developments since the first-generation system was designed almost ten years ago. The technological developments include large deployable satellite antennas and digital processors on board the satellite. The marketplace developments include the increased use of mobile voice and data networks by businesses and the increased use of low-cost portable and hand-held devices.

AMSC's new system must also support its existing users. AMSC-2 will provide the facilities for uninterrupted continuation of services operating on AMSC-1 as well as a mix of improved and new services. To support such a wide range of services, AMSC-2 will be able to provide a variety of ground-commanded, configurable antenna beam sizes and locations appropriate to the specific service. For example, point-to-point telephone and data services will be provided by multiple spot beams over the service area, maximizing spectrum efficiency and minimizing the demands placed on the mobile terminals. Simultaneously, point-to-multipoint dispatch services requiring nationwide coverage will use a single beam covering the whole service area.

Like AMSC's existing system, the second-generation system consists of a space segment and a ground segment. The space segment will consist of one geostationary satellite and associated ground tracking, telemetry, command, and control facilities. The satellite will be capable of providing services throughout the areas covered by AMSC-1, including all fifty states, Puerto Rico, the U.S. Virgin Islands, and U.S. coastal waters to at least 200 miles offshore.

There are two scenarios for space segment operations after launch and testing of AMSC-2, depending on the status of the lease of AMSC-1 to ACTEL. In one scenario, AMSC-1 will remain at 11.5° E.L, and AMSC traffic will be transitioned from MSAT-1 operating at 101° W.L. to AMSC-2. In the second scenario, the ACTEL lease will have terminated, AMSC-1 will have been relocated to 101° W.L., and AMSC traffic will be transitioned from AMSC-1 to AMSC-2 at that orbital location. AMSC-1 will then remain at 101° W.L., where it will be used as a spare satellite that could, in the event of a failure of AMSC-2, restore a portion of the AMSC-2 traffic.

The ground segment will consist of one or more Gateway Earth Stations, a Network Operations Center, and a variety of mobile, portable and fixed subscriber Terminals. The Gateway Earth Stations use the satellite to provide interconnection between terrestrial communications facilities and subscriber Terminals. AMSC's first-generation Network Operations Center in Reston, Virginia, will be augmented to provide the additional network management functions required by the AMSC-2 system.

2.0 PUBLIC INTEREST CONSIDERATIONS

The allocation of spectrum for, and licensing of, a U.S. MSS system was based on the need for a two-way mobile communications system that would provide service across the country, including the most rural and remote areas. AMSC's system meets this need. Since entering service in 1996, AMSC has been providing needed services throughout the United States. AMSC's MSS voice customers include AT&T, MCI, Maritime Cellular, Seven Seas, and CBS. MSS data customers include Sitton Motor Lines, CRST, and Tandem Transport. GEOLogisticom and Norcom Networks lease capacity from AMSC for their own networks. The American Red Cross and the Federal Emergency Management Agency are also among AMSC's satellite customers.

The second-generation system proposed herein will:

- Add capacity at an appropriate time in the growth of MSS;
- Take advantage of advances in technology to add new MSS services;
- Make more efficient use of orbit-spectrum resources; and
- Continue to support existing MSS users.

By allowing appropriate growth in the size and scope of MSS services, AMSC's second-generation system will continue to meet the Commission's public interest goals.

3.0 GENERAL SYSTEM DESCRIPTION

3.1 SYSTEM FACILITIES

The AMSC-2 system will consist of a space segment and a ground communications segment. The space segment will consist of one geostationary satellite and associated ground telemetry, tracking, and command ("TT&C") facilities. The satellite will be capable of providing services to all fifty States, Puerto Rico, the U.S. Virgin Islands, and U.S. coastal waters to at least 200 miles offshore.

The ground communications segment will consist of one or more Gateway Earth Stations ("GES"), a Network Operations Center ("NOC") and a variety of mobile, portable, and fixed subscriber Terminals ("MTs"). The GESs will provide interconnection between terrestrial communications facilities and MTs via the satellite. The first generation NOC will be augmented to provide the additional network management functions required by the AMSC-2 system.

3.2 SYSTEM OPERATIONS

The service links will operate between 1626.5 MHz and 1660.5 MHz in the Earth-to-Space ("uplink") direction and will operate between 1525 MHz and 1559 MHz in the space-to-Earth direction ("downlink"). The feeder links will operate in the 12.75 - 13.0 GHz uplink band

and in the 11.20 - 11.45 GHz downlink band.

The satellite will use transparent, frequency-translating transponders between the service links and the feeder links, allowing it to accommodate all first-generation services as well as new second-generation services without the restrictions imposed by demodulation/remodulation types of satellites. The satellite will be able to support multiple GESs and multiple types of services employing FDMA, TDMA, or CDMA multiple access methods.

During transfer orbit, TT&C will be performed in the 14/12 GHz FSS bands. Once on station, TT&C will be performed in the 13/11 GHz communications bands.

3.3 SYSTEM SERVICES

AMSC-2 will provide the facilities for uninterrupted continuation of services operating on AMSC-1 as well as a mix of improved and new services. AMSC-1 services include the Skycell Satellite Telephone Service, Skycell Plus Satellite Dispatch Service, Mobile Messaging Service, and a variety of point-to-multipoint and multipoint-to-point data services provided by third parties leasing satellite access from AMSC. AMSC-2 will make possible expansion and enhancements to these first-generation services, and will support the introduction of new services, especially focusing on point-to-multipoint applications.

To support a wide range of services, the satellite has been designed to provide a variety of ground-commanded, configurable antenna beam sizes and locations tailored to the specific needs of a service. For example, point-to-point telephone and data services will be provided by multiple spot beams over the service area, maximizing spectrum utilization and minimizing the demands placed on the MTs. At the other end of service types, point-to-multipoint dispatch services requiring national simultaneous coverage will use a single beam covering the whole service area.

The satellite utilizes a flexible frequency filtering, frequency translation, and feeder link-to-service link cross-connect scheme that is configurable by ground command. This capability permits efficient spectrum utilization in both the service links and feeder links, the matching of bandwidth and beam type to specific service needs, as well as providing flexibility in achieving frequency coordination with other MSS operators.

4.0 TECHNICAL DESCRIPTION

4.1 SPACE SEGMENT DESCRIPTION

4.1.1 NUMBER AND LOCATION OF SATELLITES

AMSC is requesting authority to launch and operate one satellite with a location in the geosynchronous orbital arc at 101° W.L. The reasons for selecting this orbital location are as follows:

- This orbital location provides satellite telephone users the highest overall elevation angles from anywhere in the continental U.S. ("CONUS"), a critical factor in mitigating the deleterious effects of propagation shadowing on mobile terminal performance.
- This orbital location permits service to Hawaii, Alaska, Puerto Rico, and the Virgin Islands with a single satellite. It is also compatible with service to the rest of North America, Central America, and the Caribbean Sea and islands.
- AMSC-2 feeder links will operate in the 13/11 GHz FSS allotment bands. The U.S. orbital slot allotment is 101° W.L., so that AMSC-2 operations will be in alignment with the U.S. allotment.

There are two scenarios for system operations after launch and testing of AMSC-2, depending on the status of the AMSC-1 lease to ACTEL at that time.

In the first scenario, AMSC-1 remains at 11.5° E.L. serving Southern Africa. At the time of launch, AMSC traffic would be operating via the MSAT-1 satellite. Adjacent feeder link frequencies would be used to facilitate possible restoral operations. After in-orbit testing of AMSC-2, AMSC's traffic would be moved from MSAT-1 to AMSC-2. When the ACTEL lease terminates and AMSC-1 returns to 101° W.L., operation of the communications payload of AMSC-1 would be suspended, and AMSC-1 would be used as a spare satellite that could, in the event of a failure of AMSC-2, restore a portion of the AMSC-2 traffic. AMSC-2 will have much greater capacity than AMSC-1, and some AMSC-2 services will have different technical characteristics than AMSC-1 services; as a result, not all AMSC-2 traffic could be restored by AMSC-1.

In the second scenario, AMSC-1 would have returned to operation at 101° W.L. In that scenario, at the time of launch, AMSC traffic would be operating via the AMSC-1 satellite. AMSC-2 would be launched and positioned at 101° W.L. with AMSC-1, and would use feeder link spectrum adjacent to that of AMSC-1. After in-orbit testing of AMSC-2, AMSC traffic would be moved from AMSC-1 to AMSC-2. Operation of the communications payload of AMSC-1 would then be suspended, and, as in the first scenario, AMSC-1 would be used as a spare satellite that could, in the event of a failure of AMSC-2, restore a portion of the AMSC-2 traffic.

4.1.2 SATELLITE DESIGN

The overall configuration of the satellites is illustrated in Figure 1. The satellites will be body-stabilized similar to the Hughes 702 design. The satellites will deliver a minimum of 4000 watts of useable power to the service link antenna to support multiple services and allow independent access to the satellite from multiple earth stations. The satellites will amplify and retransmit the signals sent between the feeder link earth station and the MTs. Table 1 lists the principal satellite system characteristics.

4.1.3 FREQUENCY PLAN AND POLARIZATION

AMSC proposes to use up to about 14 MHz of spectrum in each of the bands 1626.5 - 1660.5 MHz (uplink) and 1525 - 1559 MHz (downlink) for the service links. Polarization will be Right Hand Circular for both bands.

AMSC proposes to use 100 MHz of spectrum in the 12.75 - 13.00 GHz band and 100 MHz of spectrum in the 11.2 - 11.45 GHz band if AMSC-2 is co-located with AMSC-1 at 101° W.L. Polarization will be linear and orthogonal between transmit and receive frequencies. These bands are proposed as they are unused at this orbital position. The AMSC-1 and AMSC-2 satellites will therefore operate in either the same or adjacent portion of the feeder link band, making GESs easily capable of operating on either satellite, a critical capability in the event of satellite failure.

The feeder link bands will be divided into sub-bandwidths of 150 kHz, 300 kHz, and 600 kHz with sub-band center-to-center spacing in multiples of 100 kHz. The spacecraft filtering will be configurable so that any sub-bandwidth can be placed anywhere in the feeder link spectrum in a mix-and-match arrangement. The first sub-band center frequency will be located 2 MHz above the lowest band edge frequency. In addition, six sub-bands of 3.5 MHz each will be located at the top end of the bands. These sub-bands will be used primarily in the AMSC-1 emulation mode. The center frequency plan assignments are as follows:

Bandwidths of 150, 300 and 600 kHz: $F(n) = Fl + 2.0 + n \times 0.1$ MHz;
Bandwidth of 3.5 MHz: $F(k) = Fu - 2.0 - k \times 1.75$ MHz

Where:

F(n) is the center frequency of sub-band 'n'
Fl is the lower band edge frequency in MHz
F(k) is the center frequency of sub-band 'k'
Fu is the upper band edge frequency in MHz.

On the service link side, the sub-bands will be placed abutting one another without guard bands between them.

There will be a power control beacon, an unmodulated carrier, generated on the spacecraft and transmitted in the feeder link downlink band. The frequency of this beacon will be selected as part of the spacecraft contracting process. This beacon will be used by GESs for providing power control of uplink emissions.

4.1.4 ANTENNA SUBSYSTEMS

There will be separate antenna systems for the feeder links and the service links. The feeder links will utilize a single Ku-band antenna beam that provides broad coverage of the U.S., as illustrated in Figure 2. The technical performance characteristics of the antenna are listed in Table 1.

The service links will use a 12-meter reflector type antenna, capable of synthesizing up to 200 beams. The number, location, shape, and size of the beams is configurable within the total communications service area depicted in Figure 3. The theoretical maximum reuse factor with 200 beams is 28. Since fewer than 200 beams will blanket the service area, the potential spectrum reuse factor in the service area, assuming a uniform traffic distribution, is 16. In practice, the uneven distribution of demand is expected to limit the reuse factor to five ore less. To maintain compatibility with first- generation user terminals and services, a portion of the available spectrum may be configured with a set of large spot beams that emulate the beams on

AMSC-1, as illustrated in Figure 4. Another portion of the spectrum can be configured to serve a single beam covering the entire 48 States; this National beam is illustrated in Figure 5. This configuration is particularly applicable to nationwide point-to-multipoint services such as Skycell Plus Satellite Dispatch Service and Mobile Messaging Service. Another portion of the spectrum will be used for point-to-point services such as Skycell Satellite Telephone Service by employing an array of spot beams over the service area. The contours for one of these beams are illustrated in Figure 6. Approximately 58 such spot beams will cover the 50 States and surrounding waters, with a theoretical frequency reuse ratio of about 16. Peak spot beam gain is 42.5 dBic.

4.1.5 COMMUNICATIONS PAYLOAD SUBSYSTEM

The communication subsystem will have frequency translating transponders on the forward and the return links. A block diagram of the communications subsystem is shown in Figure 7. Signals received in the Ku-band receiver will be amplified and translated to the L-band downlink through a series of amplifiers and fixed and programmable digital filters that will map a section of the uplink feeder link into a section of the L-band downlink for transmission in a specific beam of the satellite. This flexible design will permit frequency and capacity management on a beam-by-beam basis.

The L-band power amplification will be done in a Butler matrix power amplifier, a method pioneered in AMSC's first satellite. The Butler matrix amplifier automatically and instantaneously directs power to the desired beam simply by inserting a carrier into an input port associated with the desired beam. The output power of the carrier is directly proportional to the carrier input power. This achieves maximum power transfer flexibility between beams and power use efficiency.

Signals received in the L-band receiver will be processed in a similar fashion. After an initial stage of amplification, each portion of the L-band will be filtered and translated to a specific portion of the Ku-band downlink that corresponds with the portion of the feeder link spectrum that was used in the forward direction. The individual portions of the L-band spectrum that are received and translated on an individual beam basis will be combined and input to a 100 watt TWTA for retransmission on the Ku-band downlink.

L-band and Ku-band receivers and transmitters may be interconnected efficiently by employing a combination of multiple frequency converters, fixed digital filters, programmable digital filters, and digital cross-connect routers. For example, the incoming Ku-band spectrum could be down converted to a convenient IF frequency and separated into sub-bands by a set of fixed filters. The output of each filter is converted into a digitized stream that is further subdivided using digital filtering techniques. The output of the digitized filters is routed to a digital combiner associated with a particular L-band beam whose output is converted to analog and then frequency-converted to L-band for transmission. The routing and digital filtering would be programmable via the command system. This design minimizes the amount of feeder link spectrum required.

There will be configurable beam-forming networks in the L-band receive and transmit paths. These beam-forming networks have the ability to form a beam of a specific size, shape, and location for individual frequency spectrum sub-bands. The beam-forming network configurations are controlled by ground-generated commands.

4.1.6 SPACECRAFT BUS SYSTEM

The Hughes HS 702 high-power spacecraft product supports the power and antenna mounting area required. The three-axis body stabilized HS 702 uses a five-panel solar array system and has outboard radiator panels attached to the body to dissipate heat generated by the HPAs. A TT&C subsystem will provide ample capacity for ground personnel to assess satellite health and status, and take corrective action as required. All components comprising the bus will be flight-qualified. All subsystems will be provided with direct or functional redundancy.

4.1.6.1 ATTITUDE CONTROL SUBSYSTEM ("ACS")

The HS 702 Attitude Control System ("ACS") is capable of controlling the spacecraft in transfer orbit and on-station using the Sun Sensor and Earth Sensor Assembly ("ESA"). Pointing control will be accomplished by the use of reaction wheels and pulsed firing of selected thrusters. With the use of the on-board Spacecraft Control Processor ("SCP"), pointing can be maintained for up to 30 days without any input from the ground control facility.

4.1.6.2 PROPULSION SUBSYSTEM

A liquid bi-propellant propulsion system will be used for transfer orbit control of the HS 702 spacecraft. It will use a hypergolic propellant: nitrogen-tetroxide (N2O4) oxidizer and monomethyl-hydrazine fuel. Xenon Ion Propulsion will be used for control of the spacecraft orbit and attitude through its 15-year life.

4.1.6.3 ELECTRICAL POWER SUBSYSTEM

The primary components of the electrical system include two 5-panel solar arrays, batteries, and Integrated Power Controllers ("IPCs") that supply, regulate, store, and distribute electrical power.

4.1.6.4 THERMAL CONTROL SUBSYSTEM

The thermal control subsystem will utilize heat pipes and radiators on the spacecraft body as well as outboard radiator panels also containing heat pipes that extend beyond the body of the spacecraft for maximum thermal dissipation. Spacecraft blankets and electrical heaters will also be used to manage temperatures. Temperature sensors will feed information to the telemetry system that will send the information to the ground or to the on-board SCP. Using the SCP, temperature can be autonomously maintained for up to 30 days without any input from the ground control facility.

4.1.6.5 TELEMETRY, TRACKING, AND COMMAND ("TT&C")

The TT&C system will perform numerous functions. The tracking function will phase-modulate onto the telemetry downlink ranging tones received by the command uplink, thereby allowing highly accurate ground determination of spacecraft range. The telemetry system will collect, format, modulate, and transmit command acknowledgments and information related to the spacecraft configuration and performance. The command system will receive, demodulate, decrypt, decode, and distribute command messages originated either internally from the attitude control subsystem or externally via the ground over the Ku-band command link.

The transfer orbit TT&C will be performed in the Ku-band through an omni-directional antenna. On station, TT&C will be performed through the Ku-band feeder link antenna. The narrow-band TT&C links will operate in the 14/12 GHz bands during transfer orbit in order to use existing TT&C ground segment facilities, and in the 13/11 GHz bands on-station.

AMSC expects that the satellite operational control will be subcontracted to a third party with experience in monitoring and controlling satellites.

4.1.7 SPACECRAFT OVERALL PROPERTIES

4.1.7.1 OVERALL MASS BUDGET

The overall launch mass of the satellite will be approximately 4800 kg and composed of the following major components:

Transponder	500	kg
L-band Antenna	360	kg
K-band Antenna	40	kg
Bus	1900	kg
Spacecraft Dry Mass (Total Mass in Orbit)	2800	kg
Propellant and XIPS	2000	kg
Total Mass at Launch	**4800**	**kg**

4.1.7.2 OVERALL POWER BUDGET

Each satellite payload and bus require approximately 11,000 Watts of power, which is well within the 12,000 Watt end-of-life capability of the solar arrays.

4.1.7.3 SATELLITE OPERATIONAL LIFETIME

Each satellite will be designed to sustain 15 years of service life.

TABLE 1

General Satellite System Characteristics

Spacecraft Bus	Hughes HS-702 or Equivalent
Mission Life	15 Years Nominal End-of-Life
Stabilization	3-Axis
Available DC Power	12 kW End of Life/13.3 kW Beginning
Eclipse Capability	100%
Deployed Length	Approximately 144 Feet (5 Panel Design)
End-to-End of Deployed Solar Panels	1328 inches
Length L-band reflector	482 inches
End-to-end height (main body)	219 inches
Approximate Weight	4800 kg with Propellant
Maintenance of Satellite Position	
East/West	±0.10°
North/South	±3.0°
Antenna Axis Attitude Accuracy	
Roll	0.04°
Pitch	0.05°
Yaw	0.35°

TABLE 2

Communications System Characteristics

LINK DIRECTION	FEEDER to SERVICE	SERVICE to FEEDER
Frequency band		
Receive	13.0 – 13.15, 13.2-13.25 GHz	1626.5 – 1660.5 MHz
Transmit	1525 – 1559 MHz	11750 –11950 MHz
Polarization		
Receive	Linear Horizontal	RHCP
Transmit	RHCP	Linear Vertical
Channelization	Fixed and Tunable	Fixed and Tunable
Peak Antenna Gain		
Receive	29 dBi	30 to 42.5 dBic
Transmit	30 to 42.5 dBic	29 dBi
System Temperature	780 K	450 K
Peak G/T	0 dBK	3.5 to 16 dBK
Power into Antenna	4000 W	50 W
Total EIRP @ Peak Max/beam	80 dBW Useable	46 dBW Saturated
Transponder Active Gain, Nominal	132 dB	126 dB
Gain Adjustment	+/- 6 dB	+/- 6 dB
Step Size	1.5 dB	1.5 dB
Receive Satellite Flux Density, Peak	-96.1 dBW/m2	-111 dBW/m2
PFD (max)	-139.7 dBW/4 kHz	-150 dBW/4 kHz
Emission Limitations (% authorized bandwidth)	Attenuation per 4 kHz	Attenuation per 4 kHz
50 to 100%	> 25 dB	> 25 dB
100 to 250 %	> 35 dB	> 35 dB
> 250%	> 60 dB	> 60 dB
Emission Designators		
	N0N	NON
	5K00G1D	5K00G1D
	6K00G1W	6K00G1W
	15K0G1W	15K0G1W
	190KG1W	190KG1W
	500KG1W	3M50G1D

TABLE 3

TT&C PARAMETERS

Antenna	Omni-directional	Directive
Command Parameters		
Frequency Band (MHz)	13000-13002	13248-13250
Flux Density (dBW/m2)	-85	-100
Polarization	Linear	Linear Vertical
Modulation	FM	FM
Peak Dev. (kHz)	300	300
Occupied BW (kHz)	800	800
Receiver BW (kHz)	1000	1000
Emission Designator	700KF9D	700KF9D
Telemetry Parameters		
Frequency Band (MHz)	11750-11752	11750-11752
Peak EIRP (dBW)	9	11
Polarization	Linear	Linear
Modulation	Phase, 1 Rad.	Phase, 1 Rad.
Occupied BW (kHz)	100	100
Emission Designator	138KGXD	138KGXD
Power Control Beacon		
Frequency Band (MHz)		11750-11752
Peak EIRP, dBW		25 dBW
Polarization		Linear Vertical
Modulation		None
Emission Designator		N0N

4.2 SERVICES AND GROUND SEGMENT

4.2.1 SERVICE DESCRIPTION

AMSC currently provides a variety of services to subscribers using mobile, portable, and fixed MTs. The AMSC-2 spacecraft will be able to provide continued service to these subscribers as the first-generation spacecraft is withdrawn from service. Current services include Skycell Satellite Telephone Service ("Skycell Service"), Skycell Plus Satellite Dispatch Service ("Skycell Plus Service"), Mobile Messaging Service ("MMS"), and a variety of third-party data services.

Skycell Service provides on-demand telephone connections between land vehicular, maritime, aeronautical, portable, and fixed MTs and the public switched telephone network. In addition to voice service, it supports 4.8 kbps circuit-switched data connections. Additional features such as international calling, call blocking, call waiting, call forwarding, call transfer, conference calling, and voice mail are available. Customer support features such as directory and operator assistance, credit card calling, and emergency referral are provided. In short, a full range of features and support functions are available.

Skycell Plus Service provides on-demand communications among participants belonging to a common talk group. In a talk group, any participant can speak to all other active group members at the same time. A mobile unit may belong to multiple talk groups, and a talk group may include up to 10,000 members. Any member may activate the talk group simply by entering the talk group identification code. Talk groups can also include terrestrial members. Skycell Plus Service includes an emergency override feature that permits a talk group member, in the event of an emergency, to override communications from all other talk group participants.

MMS is an on-demand data messaging service providing two-way messaging between MTs and private host computers. Subscribers can generate text or preformatted messages, automatically send messages either at regular intervals or in response to an event, and receive messages from the host computer. A built-in Global Positioning System ("GPS") receiver provides navigation information to the user, as well as location information to the customer's host computer system. MMS is used for a variety of mobile communications and tracking needs for fleets within the trucking, rail, and barge industries.

There are third-party service providers that provide their own communications equipment and lease satellite access from AMSC. One of the services available is differential GPS service, provided by broadcasting a data signal across the entire country. Another service is a two-way packet-data service, providing packet-data interconnection between MTs and public or private data networks. Other similar types of data services will be available soon.

The Skycell, Skycell Plus, and two-way packet data services require MTs with directive antennas. MTs must use relatively expensive, complex tracking antennas to obtain a satisfactory quality of service. The improved capabilities of the AMSC-2 spacecraft will permit the use of non-directive MT antennas, thereby decreasing terminal costs, easing installation and maintenance, and improving reliability.

In addition to supporting first-generation services, AMSC-2 will permit the provision of new and enhanced services on a more affordable basis. Enhancements will include such items as improved voice quality, higher circuit-switched data rates, and improved robustness in the mobile propagation environment. New services will include much higher-speed packet-data services, capable of providing multi-media interconnection to the Internet or other public and private data networks, and regional or national high-quality audio and data multi-casting services. Transmission rates up to 384 kbps are possible.

4.2.2 SUBSCRIBER TERMINALS

Currently there are a number of terminals available for Skycell and Skycell Plus service, all using directional antennas suitable for mounting on land vehicles, ships, boats, and aircraft. In addition, there is a notebook-sized portable terminal with an antenna built into the lid, and a fixed terminal using a parabolic or flat-plate antenna for use in remote telephone service applications. The MMS terminals utilize omni-directional antennas. All of these terminal types will continue in operation on AMSC-2.

For AMSC-2, it is anticipated that the primary services will be vehicle-mounted, fixed, and notebook-type portable terminals. It will be possible to design Skycell MTs with omni-directional antennas, while portable and fixed terminals will use directive antennas to support high-speed, high-throughput applications. These terminals will be multi-functional, capable of supporting Skycell-type voice, voice dispatch, packet-data, and multi-cast services with common hardware.

4.2.3 CONTROL SEGMENT AND EARTH STATION PARAMETERS

Network operational control will be centered at the GES. Operational personnel will be present at the GES 24 hours-per-day to ensure continuity of service. These operational personnel will provide in-house maintenance of the transmission facilities and on-line troubleshooting support. Transmission problems can originate at the GES or on one of the terrestrial transmission facilities that interconnect the earth station with the PSTN. All active components at the GES will be monitored through a centralized earth station monitoring system. This system will monitor the status of all of the active components of the GES and switch over to redundant active components when an alarm is sensed. The system will also monitor power levels at critical junctions of the uplink chain to insure that the transmission levels remain within the tolerances of the system.

In addition, the GES will have line-monitoring equipment to insure the continuity of the terrestrial transmission lines that interconnect the earth station with the PSTN or private networks. It is expected that diversely-routed redundant routes will be used for these facilities, particularly if the need extends beyond the local dialing area. Line-monitoring equipment will monitor the performance of the facility and switch to the redundant path, if necessary.

Operation personnel will also monitor satellite usage, which is critical if multiple feeder link earth stations are to access the satellite. Each of the carriers present in the satellite transponders must be maintained within the frequency assignment and power allocation tolerances of the system to protect the integrity of all the signals being received by the satellite. Spectrum analyzers, in conjunction with network data base computers maintaining a record of all carrier and associated power and bandwidth information, will be used on a daily basis to scan transponder usage to ensure that all carriers are operating within their design parameters and that no alien or unidentified carriers are present in the satellite. AMSC-2 will utilize the software and databases developed for AMSC-1 to manage the transponder activity on this satellite. The NOC software and databases will be expanded to include control of the new satellite.

The Skycell Network Control Center used with AMSC-1 is designed to accommodate a multiple satellite system. The basic set of signaling protocols that was developed for call initiation for that satellite is also applicable here.

Figure 5 is a layout of a GES. The GES will have one Ku-band 11-meter antenna that will be used to access the satellites. On the uplink transmission path, the antenna will be connected to a redundant pair of HPAs that will be used to support feeder link transmissions to the satellite. Standard redundant Ku-band upconverters tuned to the band will be used to translate channels converted to a common IF frequency to the feeder link frequencies. On the downlink transmission path, the received signal will first be amplified with a redundant 180 LNA system. The output of this system will be fed to a redundant pair of downconverters that will convert the RF signals to a common IF frequency. The common IF will serve as the input/output frequencies of the baseband channel units that serve as the MSS interface to switching equipment and the terrestrial network.

The channelization equipment will interface with a switch that will be used to terminate the channels on the terrestrial side of the network. The NOC and the switch will work closely together to convert signaling parameters originating on the MSS or PSTN portions of the network into beam and frequency assignments on the satellite and channel card assignments on the terrestrial portion of the network. Additional signaling protocol exchanges between the NOC and the terrestrial switch will be developed to accommodate additional services and channel types.

Baseband equipment that will be used for the transmission of point-to-multipoint channels will also be developed. It is premature to specify what the channelization equipment will be, since, to date, the standardization effort has identified service types but not implementation details. A number of different options with respect to coding, modulation format, and access schemes are being considered at this time. Different transmission rates may be used for the same service type and the rate chosen at the time of transmission will be a function of the terminal type and the propagation environment. Channel cards will need to operate at different transmission rates, apply different coding schemes, provide unique interfaces (i.e., fax), and send and receive control signals between the NOC and the MT.

4.3 TRANSMISSION CHARACTERISTICS

AMSC-2 will continue to support first-generation system transmissions in an AMSC-1 emulation mode. Table 4 lists the principal service link transmission characteristics for these first-generation systems.

In addition to the first-generation systems, other transmission systems will be available. Table 5 lists representative service link transmission characteristics for second-generation systems using the spot beam mode. Information rates of 2.4 – 4.8, 9.6, 144, and 384 kbps are listed. Systems A and B provide demand-assigned circuit-switched services to any second-generation MT, while systems C and D provide high-speed packet-data services to portable and fixed MTs. Service D time hops the uplink and downlink carriers across two or more beams to match uneven beam traffic demands to carrier capacity. Dwell time on a beam is proportional to the amount of traffic required in the beam.

Table 6 lists a representative data multicasting system using the national beam mode. High-quality audio and data services are broadcast across the entire nation using a single carrier. Any MT type can be used to receive these broadcasts.

GESs will have feeder link transmission characteristics complementary to those of the service links. A typical GES will use an 11-meter antenna and employ uplink power control to maintain service during propagation fades. The AMSC main-site GES has a remote diversity site used for reducing fade outages and for backup during maintenance on the main-site antenna.

Table 4

First-Generation Systems Satellite Telephone (MT) Service Link Transmission Characteristics

System	Skycell		MMS		DGPS	Data N	
Direction	Forward	Return	Forward	Return	Forward	Forward	Return
Access Mode	SCPC	SCPC	TDM	ALOHA/ TDMA	TDM	TDM	Spread ALOHA
Modulation	QPSK	QPSK	BPSK	BPSK	BPSK	BPSK	DS-SS BPSK
Symbol Rate, kbps	3.375	3.375	1.2	1.2			2000
Information Rate, kbps	2.4 – 4.8	2.4 – 4.8	0.6	0.6			
Bandwidth, kHz	6	6	5	5		5	3500
EIRP(max.) dBW	x	16	x	4	x		0
Threshold C/No, dB-Hz	47	47	33	33			
Receive G/T, dB/K	-16	x	-21	x			x
MT Antenna Type	Directive	Directive	Omni	Omni	Omni	Omni	Omni

Table 5

AMSC-2 MT Service Link Transmission Characteristics, Spot Beam Mode

System	A	A	B	B	C	C	D	D
Direction	Forward	Return	Forward	Return	Forward	Return	Forward	Return
Access Mode	SCPC	SCPC	SCPC	SCPC	TDM	Aloha TDMA	Beam Hopped TDMA	Beam Hopped TDMA
Modulation	QPSK	QPSK	QPSK	OQPSK	QPSK	OQPSK	QPSK	OQPSK
Symbol Rate, kbps	3.375	3.375	10	10	150	150	400	150
Information Rate, kbps	2.4 – 4.8	2.4 – 4.8	9.6	9.6	144	144	384	144
Bandwidth, kHz	6	6	15	15	190	190	500	190
EIRP, max., dBW	x	4	x	4	x	14	x	14
Threshold C/No, dB-Hz	47	47	47	47	57	57	61	57
Receive G/T. dB/K	-21	x	-21	x	-12	x	-12	x
MT Antenna Type	Omni	Omni	Omni	Omni	Directive	Directive	Directive	Directive

Table 6

AMSC-2 MT Service Link Transmission Characteristics, National Beam Mode

System	E	F
Direction	Forward	
Access Type	TDM	
Modulation	QPSK	
Symbol Rate, kbps	150	
Information Rate, kbps	144	
Bandwidth, kHz	190	
Threshold C/No, dB-Hz	57	
Receive G/T, dB/K	-21	
MT Antenna Type	Omni	

4.3.1 LINK BUDGETS

Nominal link budgets, describing relevant service link transmission characteristics, are provided in Tables 7–13.

Table 7

Skycell Link Budget, AMSC-1 Emulation Mode

		SKYCELL EMULATION MODE			
PARAMETER	UNITS	FORWAR		RETURN	
Noise Bandwidth	kHz	4	4	4	4
Boltzmann's constant	dBW/Hz-K	-228.6	-228.6	-228.6	-228.6
UPLINK		Clear	Faded	Clear	Faded
Frequency	GHz	13	13	1.64	1.64
E.S. EIRP	dBW	46.7	53.7	12	12
Path Loss	dB	-206.7	-206.7	-188.3	-188.3
Fade	dB	0	7	0	0
Sat antenna gain, EOC	dB	27	27	32	32
Carrier Power	dBW	-133	-133	-144.3	-144.3
Sat Temperature	dB-K	28	28	27	27
Interference Allowance	dB	0.5	0.5	1	1
C/No		67.1	67.1	56.3	56.3
C/Imo	dB-Hz	55.0	55.0	57.7	57.7
Freq. Reuse Allowance	dB	x	x	1	1
Frequency reuse C/Io	dB-Hz	60.0	60.0	x	x
Satellite C/(No+Io)	dB-Hz	53.6	53.6	52.9	52.9
DOWNLINK					
Frequency	GHz	1.55	1.55	11	11
Satellite Active Gain	dB	129	129	120	120
Sat. antenna gain, EOC	dBi	32	32	27	27
Sat. EOC EIRP	dBW	28	28	2.7	2.7
Path Loss	dB	-188.5	-188.5	-205.2	-205.2
E S G/T	dB/K	-16	-16	38	35
Interference Allowance	dB	1	1	0.5	0.5
C/No	dB-Hz	51.1	51.1	63.6	60.6
LINK					
Link C/(No+Io)	dB-Hz	49.2	49.2	52.6	52.2
Required C/No	dB-Hz	45	45	45	45
Uplink PC Margin	dB	4.2	4.2	7.6	7.2
Downlink Margin	dB	5.5	5.5	17.8	14.8

Table 8

MMS Link Budget, AMSC-1 Emulation Mode

		MMS EMULATION MODE			
PARAMETER	UNITS	FORWARD		RETURN	
Noise Bandwidth	kHz	1.5	1.5	1.5	1.5
Boltzmann's constant	dBW/Hz-K	-228.6	-228.6	-228.6	-228.6
UPLINK		Clear	Faded	Clear	Faded
Frequency	GHz	13	13	1.64	1.64
E.S. EIRP	dBW	40	47	0	0
Path Loss	dB	-206.7	-206.7	-188.3	-188.3
Fade	dB	0	7	0	0
Sat antenna gain, EOC	dB	27	27	32	32
Carrier Power	dBW	-139.7	-139.7	-156.3	-156.3
Sat Temperature	dB-K	28	28	27	27
Interference Allowance	dB	0.5	0.5	1	1
C/No		60.4	60.4	44.3	44.3
C/Imo	dB-Hz	48.3	48.3	45.7	45.7
Freq. Reuse Allowance	dB	x	x	1	1
Frequency reuse C/Io	dB-Hz	60.0	60.0	x	x
Satellite C/(No+Io)	dB-Hz	47.8	47.8	40.9	40.9
DOWNLINK					
Frequency	GHz	1.55	1.55	11	11
Satellite Active Gain	dB	129	129	120	120
Sat. antenna gain, EOC	dBi	32	32	27	27
Sat. EOC EIRP	dBW	21.3	21.3	-9.3	-9.3
Path Loss	dB	-188.5	-188.5	-205.2	-205.2
E S G/T	dB/K	-21	-21	38	35
Interference Allowance	dB	1	1	0.5	0.5
C/No	dB-Hz	39.4	39.4	51.6	48.6
LINK					
Link C/(No+Io)	dB-Hz	38.8	38.8	40.6	40.2
Required C/No	dB-Hz	33	33	33	33
Uplink PC Margin	dB	5.8	5.8	7.6	7.2
Downlink Margin	dB	6.3	6.3	17.8	14.8

Table 9

System A Link Budget, Spot Beam Mode

System A					
PARAMETER	UNITS	FORWARD		RETURN	
Noise Bandwidth	kHz	4	4	4	4
Boltzmann's constant	dBW/Hz-K	-228.6	-228.6	-228.6	-228.6
UPLINK		Clear	Faded	Clear	Faded
Frequency	GHz	13	13	1.64	1.64
E.S. EIRP	dBW	46.2	53.2	1	8
Path Loss	dB	-206.7	-206.7	-188.3	-188.3
Fade	dB	0	7	0	7
Sat antenna gain, EOC	dB	27	27	39	39
Carrier Power	dBW	-133.5	-133.5	-148.3	-148.3
Sat Temperature	dB-K	28	28	27	27
Interference Allowance	dB	0.5	0.5	1	1
C/No		66.6	66.6	52.3	52.3
C/Imo	dB-Hz	57.5	57.5	59.7	59.7
Freq. Reuse Allowance	dB	x	x	1	1
Frequency reuse C/Io	dB-Hz	57.5	57.5	x	x
Satellite C/(No+Io)	dB-Hz	54.2	54.2	50.6	50.6
DOWNLINK					
Frequency	GHz	1.55	1.55	11	11
Satellite Active Gain	dB	132	132	126	126
Sat. antenna gain, EOC	dBi	39	39	27	27
Sat. EOC EIRP	dBW	37.5	37.5	4.7	4.7
Path Loss	dB	-188.5	-188.5	-205.2	-205.2
E S G/T	dB/K	-21	-21	38	35
Interference Allowance	dB	1	1	1	1
C/No	dB-Hz	55.6	55.6	65.1	62.1
LINK					
Link C/(No+Io)	dB-Hz	51.8	51.8	50.4	50.3
Required C/No	dB-Hz	45	45	47	47
Uplink PC Margin	dB	6.8	6.8	3.4	3.3
Downlink Margin	dB	10.0	10.0	15.6	12.6

Table 10

System B Link Budget, Spot Beam Mode

System B					
PARAMETER	UNITS	FORWARD		RETURN	
Noise Bandwidth	kHz	12	12	12	12
Boltzmann's constant	dBW/Hz-K	-228.6	-228.6	-228.6	-228.6
UPLINK		Clear	Faded	Clear	Faded
Frequency	GHz	13	13	1.64	1.64
E.S. EIRP	dBW	48.2	55.2	1	8
Path Loss	dB	-206.7	-206.7	-188.3	-188.3
Fade	dB	0	7	0	7
Sat antenna gain, EOC	dB	27	27	39	39
Carrier Power	dBW	-131.5	-131.5	-148.3	-148.3
Sat Temperature	dB-K	28	28	27	27
Interference Allowance	dB	0.5	0.5	1	1
C/No		68.6	68.6	52.3	52.3
C/Imo	dB-Hz	59.5	59.5	59.7	59.7
Freq. Reuse Allowance	dB	x	x	1	1
Frequency reuse C/Io	dB-Hz	59.5	59.5	x	x
Satellite C/(No+Io)	dB-Hz	56.2	56.2	50.6	50.6
DOWNLINK					
Frequency	GHz	1.55	1.55	11	11
Satellite Active Gain	dB	132	132	126	126
Sat. antenna gain, EOC	dBi	39	39	27	27
Sat. EOC EIRP	dBW	39.5	39.5	4.7	4.7
Path Loss	dB	-188.5	-188.5	-205.2	-205.2
E S G/T	dB/K	-21	-21	38	35
Interference Allowance	dB	1	1	1	1
C/No	dB-Hz	57.6	57.6	65.1	62.1
LINK					
Link C/(No+Io)	dB-Hz	53.8	53.8	50.4	50.3
Required C/No	dB-Hz	47	47	47	47
Uplink PC Margin	dB	6.8	6.8	3.4	3.3
Downlink Margin	dB	10.0	10.0	15.6	12.6

Table 11

System C Link Budget, Spot Beam Mode

System C					
PARAMETER	UNITS	FORWARD		RETURN	
Noise Bandwidth	kHz	190	190	190	190
Boltzmann's constant	dBW/Hz-K	-228.6	-228.6	-228.6	-228.6
UPLINK		Clear	Faded	Clear	Faded
Frequency	GHz	13	13	1.64	1.64
E.S. EIRP	dBW	52	59	10	15
Path Loss	dB	-206.7	-206.7	-188.3	-188.3
Fade	dB	0	7	0	5
Sat antenna gain, EOC	dB	27	27	39	39
Carrier Power	dBW	-127.7	-127.7	-139.3	-139.3
Sat Temperature	dB-K	28	28	27	27
Interference Allowance	dB	0.5	0.5	1	1
C/No		72.4	72.4	61.3	61.3
C/Imo	dB-Hz	63.3	63.3	68.7	68.7
Freq. Reuse Allowance	dB	x	x	1	1
Frequency reuse C/Io	dB-Hz	63.3	63.3	x	x
Satellite C/(No+Io)	dB-Hz	60.0	60.0	59.6	59.6
DOWNLINK					
Frequency	GHz	1.55	1.55	11	11
Satellite Active Gain	dB	132	132	126	126
Sat. antenna gain, EOC	dBi	39	39	27	27
Sat. EOC EIRP	dBW	43.3	43.3	13.7	13.7
Path Loss	dB	-188.5	-188.5	-205.2	-205.2
E S G/T	dB/K	-12	-12	38	35
Interference Allowance	dB	1	1	1	1
C/No	dB-Hz	70.4	70.4	74.1	71.1
LINK					
Link C/(No+Io)	dB-Hz	59.6	59.6	59.4	59.3
Required C/No	dB-Hz	57	57	57	57
Uplink PC Margin	dB	2.6	2.6	2.4	2.3
Downlink Margin	dB	10.4	10.4	13.6	10.6

Table 12

System D Link Budget, Spot Beam Mode

System D					
PARAMETER	UNITS	FORWARD		RETURN	
Noise Bandwidth	kHz	480	480	190	190
Boltzmann's constant	dBW/Hz-K	-228.6	-228.6	-228.6	-228.6
UPLINK		Clear	Faded	Clear	Faded
Frequency	GHz	13	13	1.64	1.64
E.S. EIRP	dBW	56.5	63.5	10	15
Path Loss	dB	-206.7	-206.7	-188.3	-188.3
Fade	dB	0	7	0	5
Sat antenna gain, EOC	dB	27	27	39	39
Carrier Power	dBW	-123.2	-123.2	-139.3	-139.3
Sat Temperature	dB-K	28	28	27	27
Interference Allowance	dB	0.5	0.5	1	1
C/No		76.9	76.9	61.3	61.3
C/Imo	dB-Hz	67.8	67.8	68.7	68.7
Freq. Reuse Allowance	dB	x	x	1	1
Frequency reuse C/Io	dB-Hz	67.8	67.8	x	x
Satellite C/(No+Io)	dB-Hz	64.5	64.5	59.6	59.6
DOWNLINK					
Frequency	GHz	1.55	1.55	11	11
Satellite Active Gain	dB	132	132	126	126
Sat. antenna gain, EOC	dBi	39	39	27	27
Sat. EOC EIRP	dBW	47.8	47.8	13.7	13.7
Path Loss	dB	-188.5	-188.5	-205.2	-205.2
E S G/T	dB/K	-12	-12	38	35
Interference Allowance	dB	1	1	1	1
C/No	dB-Hz	74.9	74.9	74.1	71.1
LINK					
Link C/(No+Io)	dB-Hz	64.1	64.1	59.4	59.3
Required C/No	dB-Hz	61	61	57	57
Uplink PC Margin	dB	3.1	3.1	2.4	2.3
Downlink Margin	dB	11.3	11.3	13.6	10.6

Table 13

System E Link Budget, National Beam Mode

		System E	
PARAMETER	UNITS	FORWARD	
Noise Bandwidth	kHz	480	480
Boltzmann's constant	dBW/Hz-K	-228.6	-228.6
UPLINK		Clear	Faded
Frequency	GHz	13	13
E.S. EIRP	dBW	61	68
Path Loss	dB	-206.7	-206.7
Fade	dB	0	7
Sat antenna gain, EOC	dB	27	27
Carrier Power	dBW	-118.7	-118.7
Sat Temperature	dB-K	28	28
Interference Allowance	dB	0.5	0.5
C/No		81.4	81.4
C/Imo	dB-Hz	84.3	84.3
Freq. Reuse Allowance	dB	x	x
Frequency reuse C/Io	dB-Hz	73.3	73.3
Satellite C/(No+Io)	dB-Hz	72.4	72.4
DOWNLINK			
Frequency	GHz	1.55	1.55
Satellite Active Gain	dB	144	144
Sat. antenna gain, EOC	dBi	28	28
Sat. EOC EIRP	dBW	53.3	53.3
Path Loss	dB	-188.5	-188.5
E S G/T	dB/K	-21	-21
Interference Allowance	dB	1	1
C/No	dB-Hz	71.4	71.4
LINK			
Link C/(No+Io)	dB-Hz	68.9	68.9
Required C/No	dB-Hz	61	61
Uplink PC Margin	dB	7.9	7.9
Downlink Margin	dB	10.1	10.1

4.4 SYSTEM CAPACITY

AMSC-2 has sufficient power to support about 14,000 channels, were the satellite devoted entirely to Spot Beam Type A voice service. The actual capacity of AMSC-2 will be determined by the mix of traffic types, the beam configurations utilized, and the geographic distribution of traffic. Based on Type A voice traffic, the spectrum required to fully utilize the satellite power capability is 16.8 MHz in each direction, assuming a frequency reuse ratio of 5.

5.0 SCHEDULES AND PROGRAM MILESTONES

AMSC proposes the following program milestones for the construction and bringing into operation of AMSC-2:

Table 14

AMSC-2 Program Milestones

Time	Milestone
T	Award of license
T + 3 months	Issue spacecraft RFP
T + 7 months	Select spacecraft contractor
T + 9 months	Begin spacecraft construction
T + 37 months	Construction of spacecraft completed
T + 40 months	Spacecraft launched
T + 42 months	Spacecraft in service

6.0 SYSTEM COST AND FINANCIAL PLAN

The AMSC-2 satellite will have a useful life of fifteen (15) years. The cost of developing, launching, and operating the satellite is $770 million. (Costs for MTs are not included.) This includes:

- Design and development of the system
- Construction of two spacecraft
- In-orbit delivery of one spacecraft
- Delivery of the second spacecraft as a ground spare

- Construction of the ground segment
- Costs to operate the ground segment for one year

AMSC believes that it is financially qualified to construct and operate the proposed MSS system. Should the Commission conclude that AMSC does not meet the relevant financial requirements, AMSC asks the Commission to grant AMSC a waiver of this requirement. Pursuant to Section 1.3 of the Commission's rules, the Commission may waive its rules for "good cause shown." Such waivers may be granted in accordance with sound administrative procedure, and a grant of a waiver in this case would promote the use of the L-band spectrum as well as facilities-based competition with other technologies, thereby benefitting the public interest.[3/]

In the satellite context, the Commission has established financial qualification rules in order to "accomplish [its] objective of providing the public with satellite delivered services in an efficient and timely manner" and to avoid a situation where a permittee could "tie up orbital locations for several years while attempting to bring their financing plans to fruition."[4/] At the same time, the Commission has explained that "[w]aivers are appropriately granted when such relief would not undermine the policy objective of the rule in question and would otherwise serve the public interest." *See* In re Application of Mobile Communications Holdings, 12 FCC Rcd 9663 (1997) *citing* WAIT Radio v. FCC, 418 F.2d 1153, 1157 (D.C. Cir. 1969). A waiver in the current instance would further the objective of the Commission's financial rules; AMSC has developed its MSS L-band system over the past nine years and has been providing mobile satellite service in this band for more than two and a half years, and with its resulting experience and expertise, AMSC is well positioned to expeditiously develop its second-generation satellite system and begin offering an expanded array of services.

3/ *See* Northeast Cellular Telephone Co. v. FCC, 897 F.2d 1154, 1166 (D.C. Cir. 1990). *See also* WAIT Radio v. FCC, 418 F.2d 1153, 1159 (D.C. Cir. 1969).

4/ Licensing Space Stations in the Domestic Fixed Satellite Service, CC Docket No. 85-135, 50 FR 36071, paras. 2, 8 (1985).

7.0 LEGAL INFORMATION

7.1 NAME AND ADDRESS OF APPLICANT AND LEGAL COUNSEL

Attached at Appendix 3 on Form 312 is information describing the legal qualifications of AMSC. In addition, the following information is provided.

(1) Name, address, and telephone number of the applicant:

AMSC Subsidiary Corporation
10802 Parkridge Boulevard
Reston, VA 20191
(703) 758-6000

(2) Name, address, and telephone number of the person(s), including counsel, to whom inquiries or correspondence should be directed:

Gary M. Parsons
Chairman and Chief Executive Officer
AMSC Subsidiary Corporation
10802 Parkridge Boulevard
Reston, VA 20191
(703) 758-6000

Lon C. Levin
Vice President and Regulatory Counsel
AMSC Subsidiary Corporation
10802 Parkridge Boulevard
Reston, VA 20191
(703) 758-6000

Bruce D. Jacobs
Stephen J. Berman
Fisher Wayland Cooper Leader & Zaragoza L.L.P.
2001 Pennsylvania Ave., NW
Suite 400
Washington, DC 20006
(202) 659-3494

8.0 CONCLUSION

For the reasons set forth in this application, AMSC hereby respectfully requests that the Commission promptly grant this application, thereby enabling AMSC to bring to the public the significant benefits of described above at the earliest possible time.

Respectfully submitted:

Gary M. Parsons
Chairman and Chief Executive Officer
AMSC Subsidiary Corporation
10802 Parkridge Boulevard
Reston, VA 20191
(703) 758-6000

Lon C. Levin
Vice President
and Regulatory Counsel
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Bruce D. Jacobs
Stephen J. Berman
Fisher Wayland Cooper Leader & Zaragoza L.L.P.
2001 Pennsylvania Ave., NW
Suite 400
Washington, DC 20006
(202) 659-3494

Dated: July 2, 1998

APPENDIX 1

SYSTEM CONFIGURATION

Spacecraft Configuration

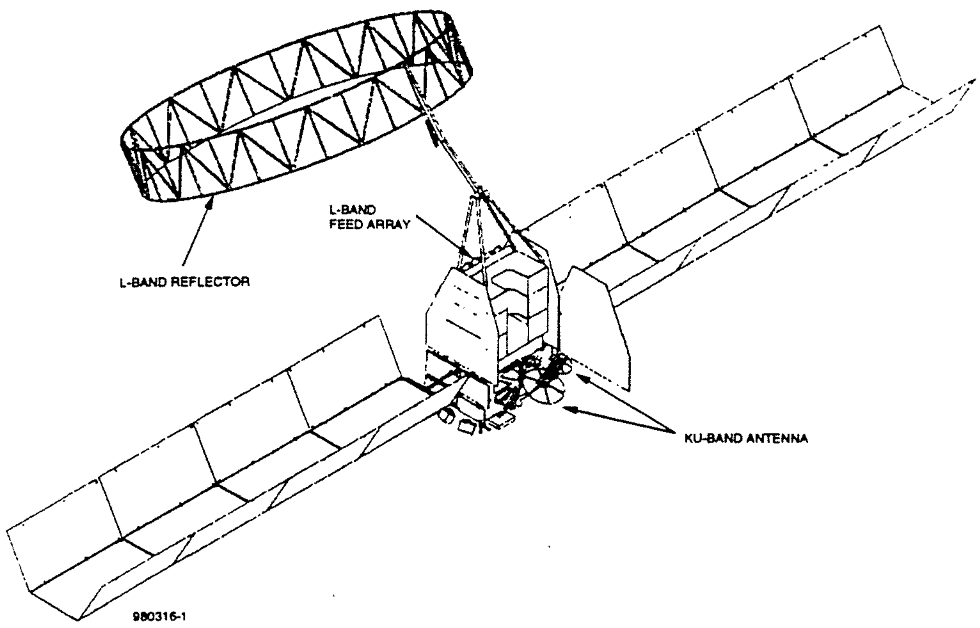

Figure 1. Spacecraft Configuration Illustration

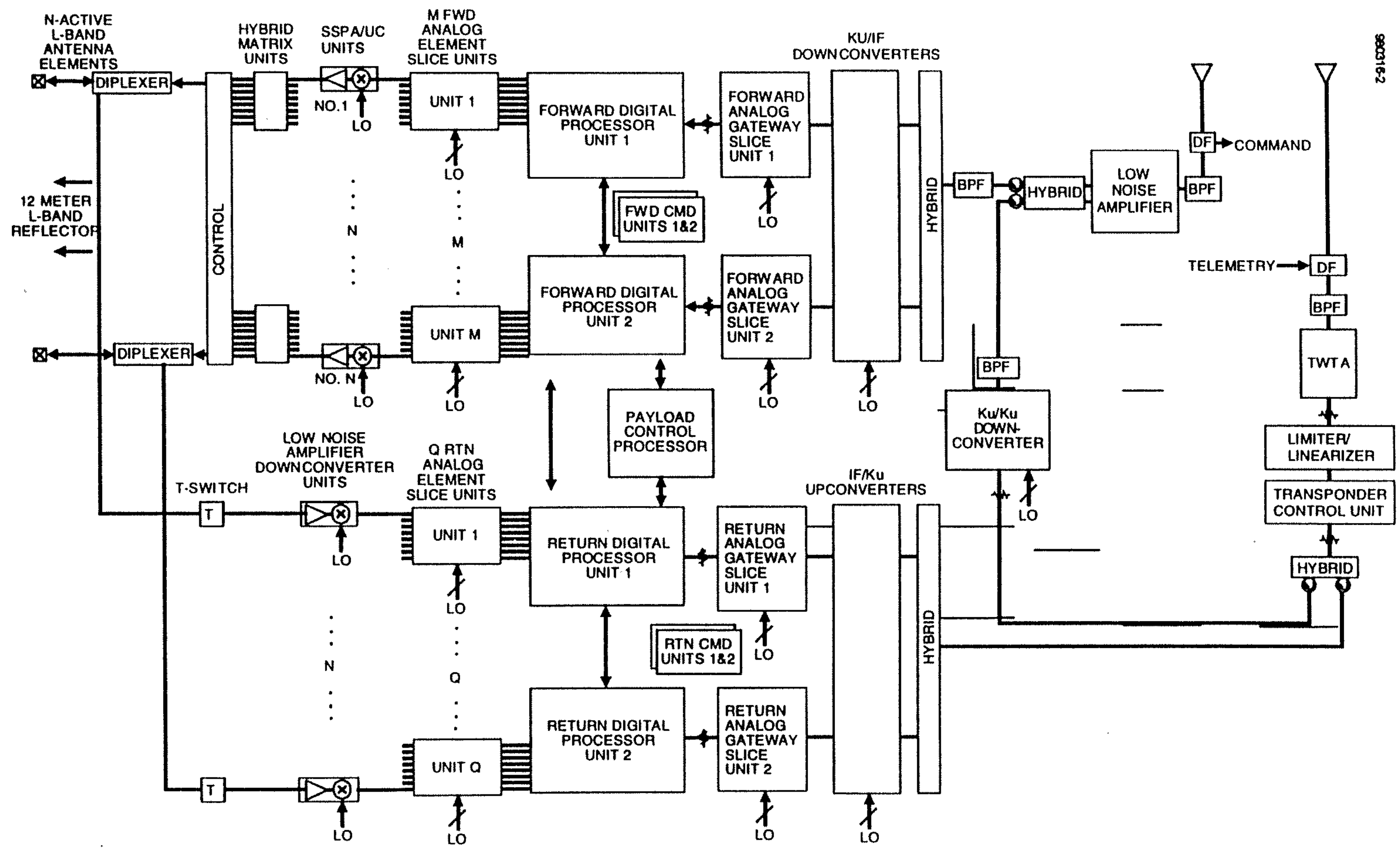

Figure 2. Communications Payload Block Diagram

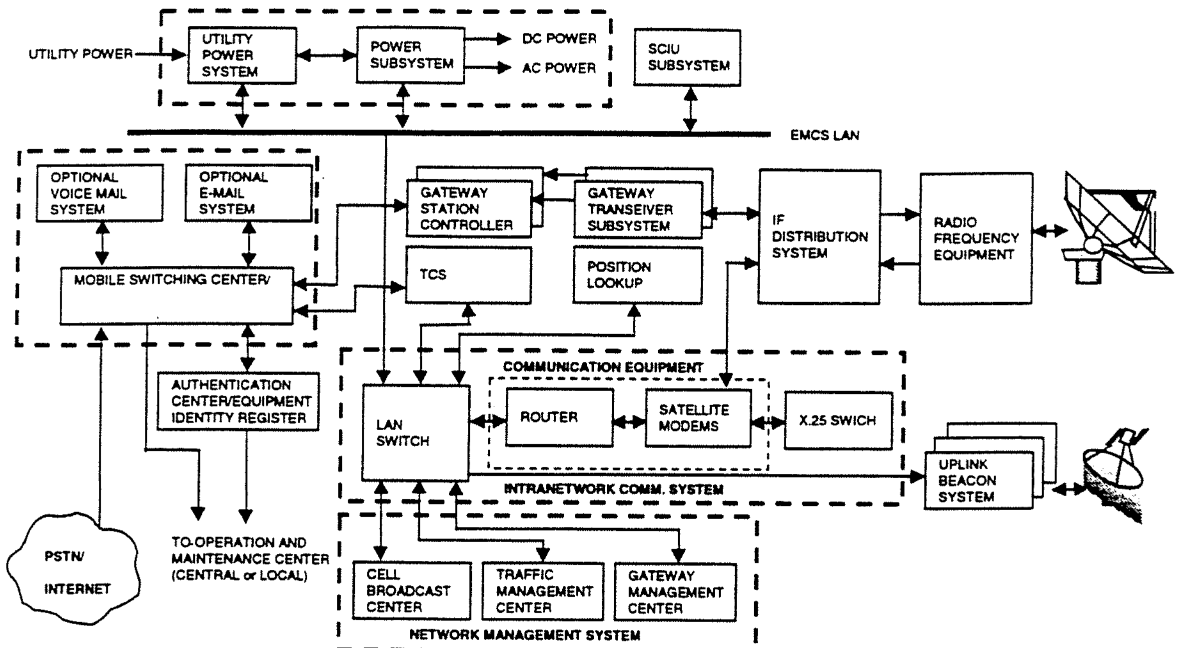

Figure 3. Gateway Earth station Block Diagram

APPENDIX 2

ANTENNA CONTOURS

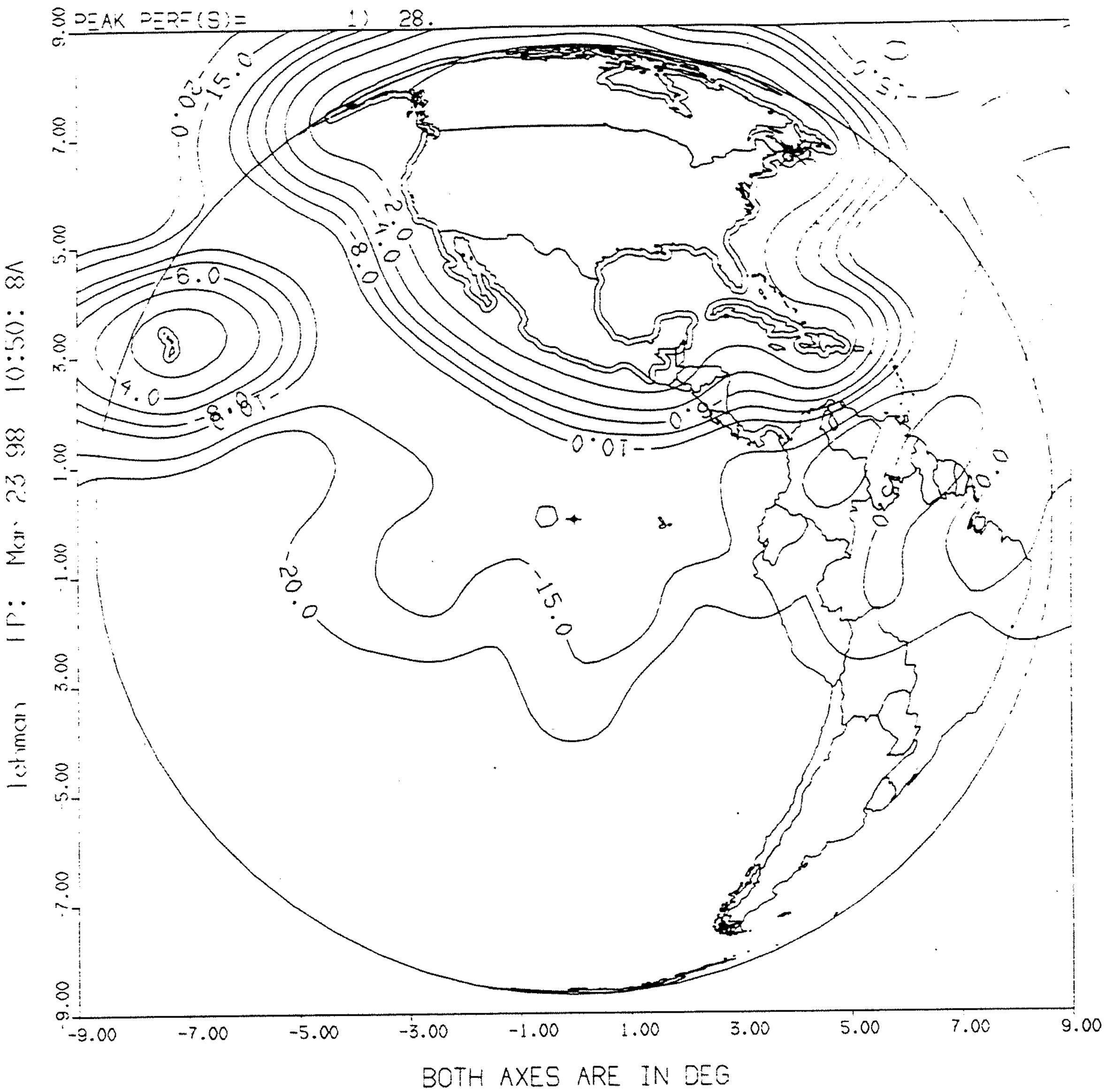

Figure 4. Ku-band Antenna Gain Contours

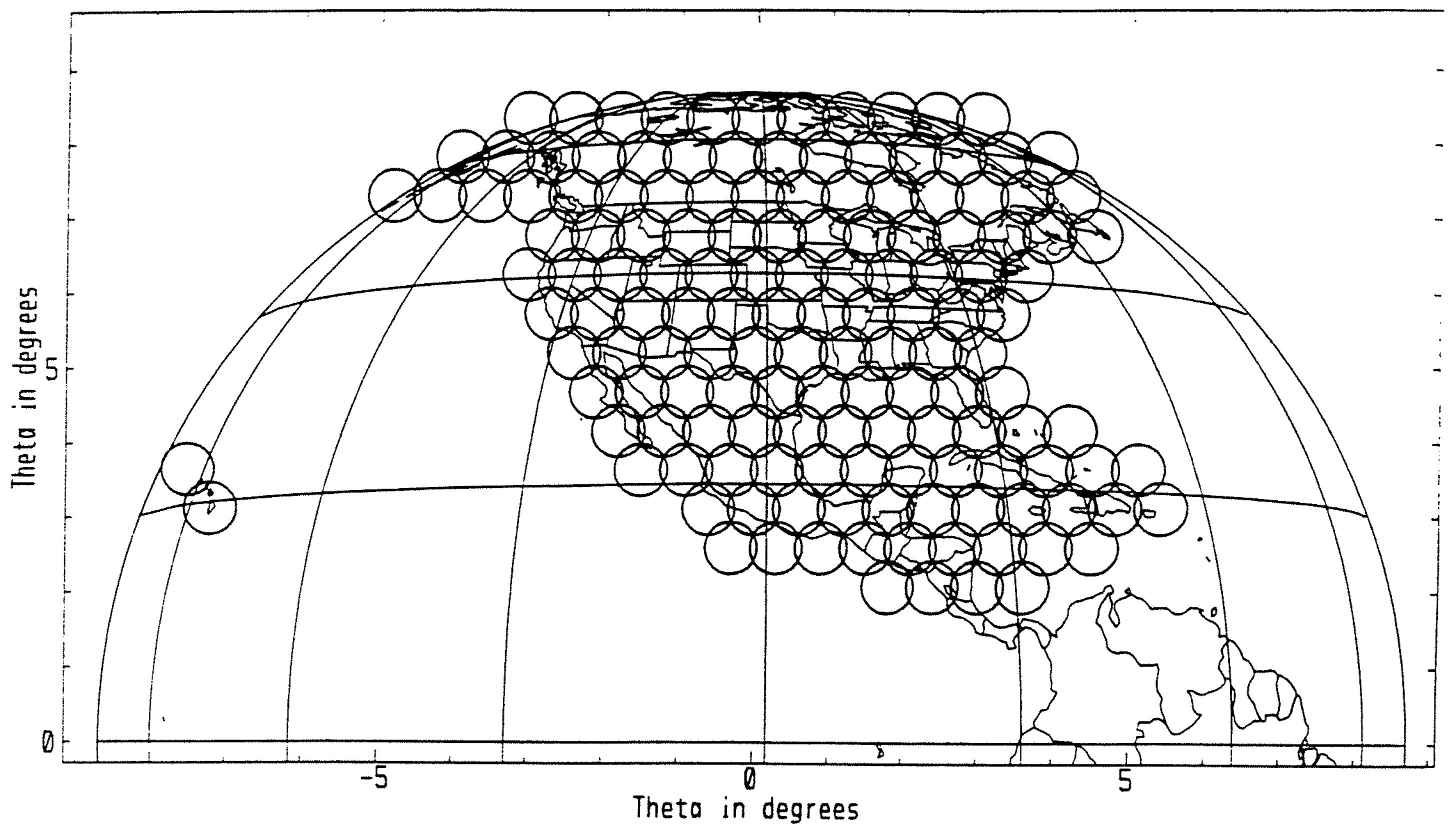

Figure 5. Composite Mobile Communications Service Area

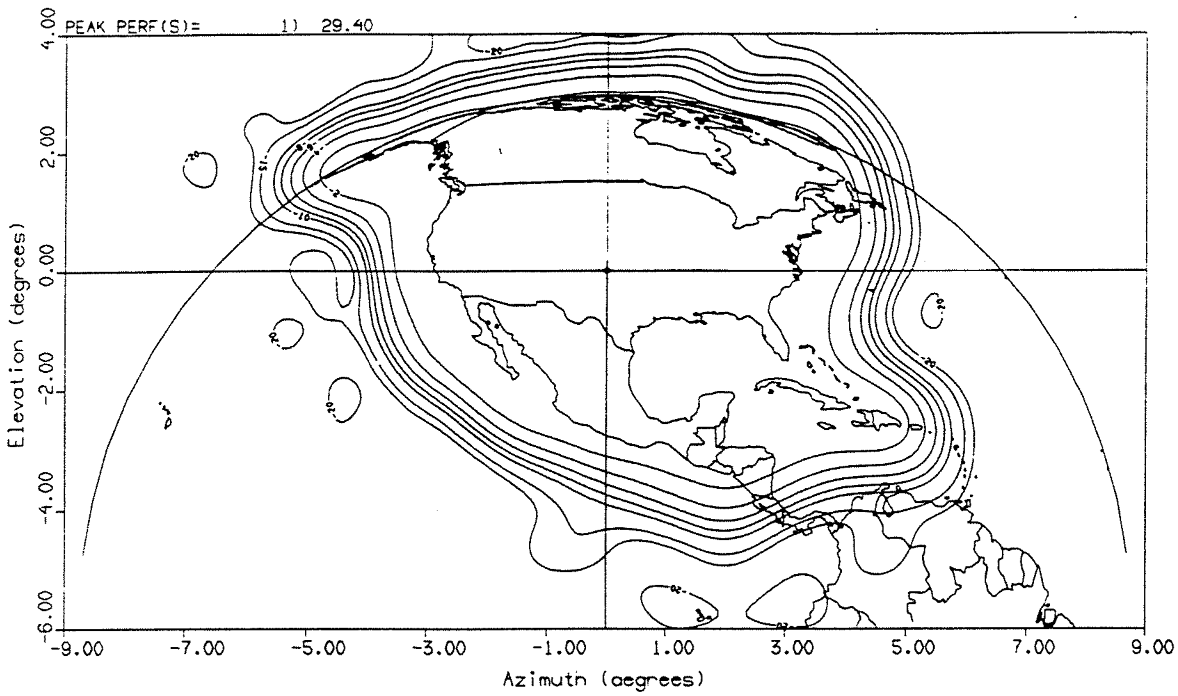

Figure 6. National Service Area Beam Contours

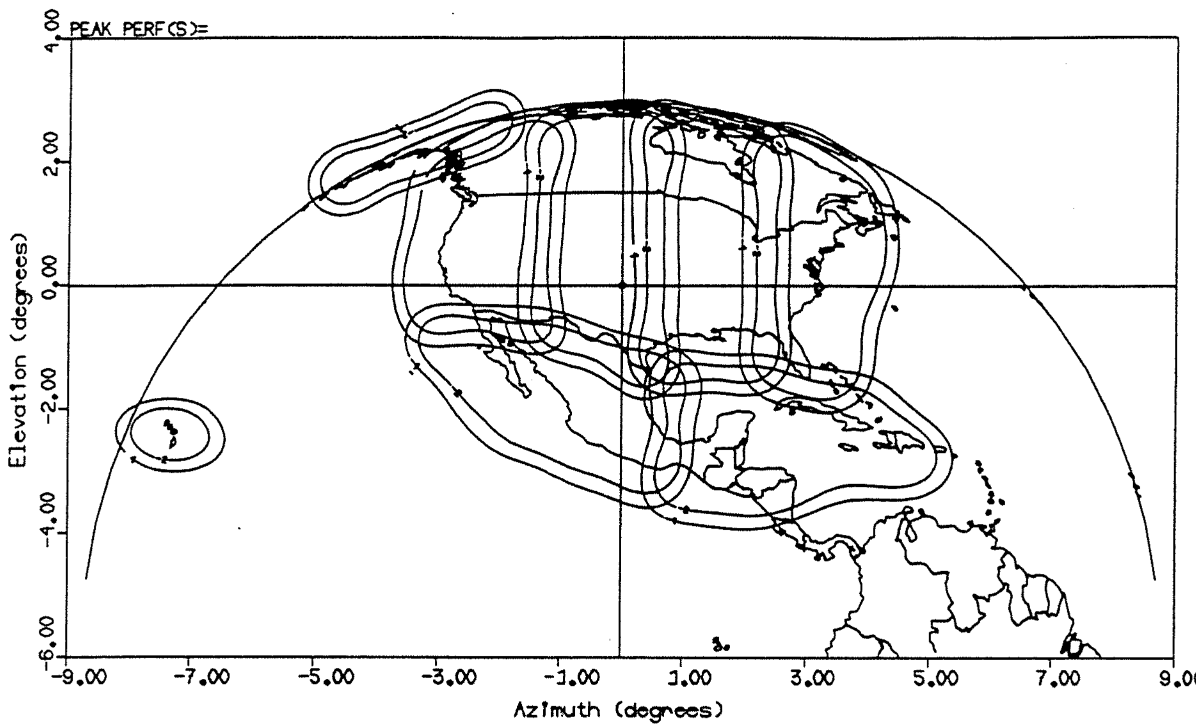

Figure 7. AMSC-1 Emulation Mode Beam Contours

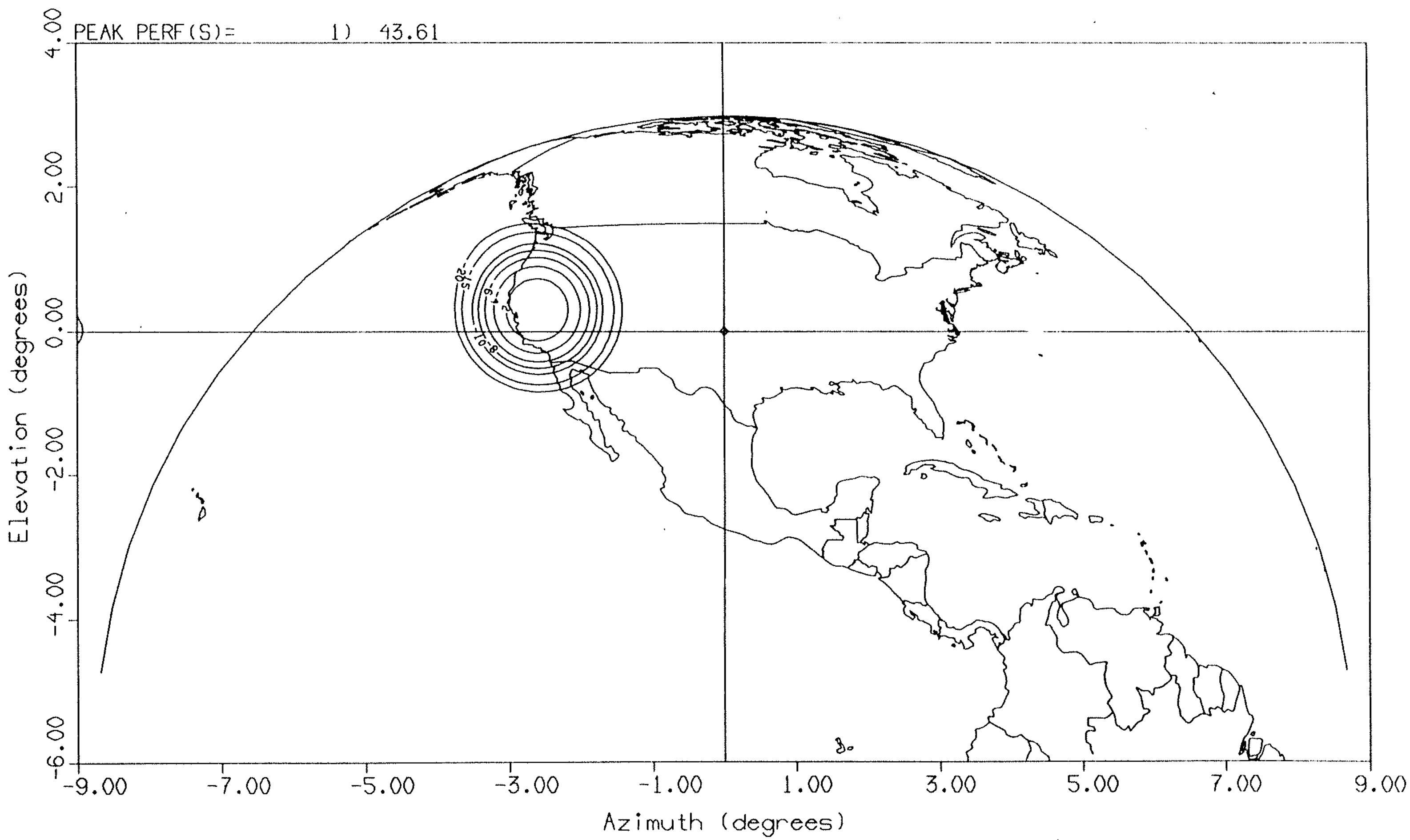

Figure 8. Example Spot Beam Contours.

APPENDIX 3

FCC FORM 312

FCC 312
Main Form

FEDERAL COMMUNICATIONS COMMISSION
APPLICATION FOR SATELLITE SPACE AND EARTH STATION AUTHORIZATIONS

Approved by OMB 3060-0678
Est Avg Burden Hours Per Response: 10 Hrs.

FCC Use Only
File Number:
Call Sign:

PAYOR AND FILING FEE INFORMATION

a. Payor Name: AMSC Subsidiary Corporation			b. Daytime Telephone Number: (202) 659-3494
c. Mailing Street Address or P.O. Box: c/o Fisher Wayland Cooper Leader & Zaragoza L.L.P. 2001 Pennsylvania Avenue, NW, Suite 400			d. FCC Account Number: 0521735106
e. City: Washington	f. State: DC	g. Zip Code: 20006	h. Country Code (if not U.S.A.)

i. Payment Type Code	j. Quantity	k. Fee Due for Payment Type Code in (i)	l. Total Amount Paid	FCC Use Only
BNY	1	$85,045.00	$85,045.00	

APPLICANT INFORMATION

1. Legal Name of Applicant: AMSC Subsidiary Corporation		2. Voice Telephone Number: (703) 758-6000
3. Other Name Used for Doing Business (if any): N/A		4. Fax Telephone Number: (703) 758-6111
5. Mailing Street Address or P.O. Box: 10802 Parkridge Boulevard ATTENTION:	6. City: Reston 7. State / Country (if not U.S.A.): Virginia	8. Zip Code: 20191
9. Name of Contact Representative (If other than applicant): Bruce D. Jacobs		10. Voice Telephone Number: (202) 659-3494
11. Firm or Company Name: Fisher Wayland Cooper Leader & Zaragoza L.L.P.		12. Fax Telephone Number: (202) 296-6518
13. Mailing Street Address or P.O. Box: 2001 Pennsylvania Avenue, NW, Suite 400 ATTENTION:	14. City: Washington 15. State / Country (if not U.S.A.): DC	16. Zip Code: 20006

CLASSIFICATION OF FILING

17. Place an "X" in the box next to the classification that applies to this filing for both questions a. and b. Mark only one box for 17a and only one box for 17b.

- [ ] a1. Earth Station
- [X] a2. Space Station

- [X] b1. Application for License of New Station
- [ ] b2. Application for Registration of New Domestic Receive-Only Station
- [ ] b3. Amendment to a Pending Application
- [ ] b4. Modification of License or Registration
- [ ] b5. Assignment of License or Registration
- [ ] b6. Transfer of Control of License or Registration
- [ ] b7. Notification of Minor Modification
- [ ] b8. Other (Please Specify): ____

18. If this filing is in reference to an existing station, enter:
Call sign of station:
AMSC-1

19. If this filing is an amendment to a pending application enter: N/A
(a) Date pending application was filed:
(b) File number of pending application:

TYPE OF SERVICE

20. NATURE OF SERVICE: This filing is for an authorization to provide or use the following type(s) of service(s): Place an "X" in the box(es) next to all that apply.

☐ a. Fixed Satellite ☒ b. Mobile Satellite ☐ c. Radiodetermination Satellite ☐ d. Earth Exploration Satellite ☐ e. Other (please specify) ______

21. STATUS: Place an "X" in the box next to the applicable status. Mark only one box.

☒ a. Common Carrier ☐ b. Non-Common Carrier

22. If earth station applicant, place an "X" in the box(es) next to all that apply.

☐ a. Using U.S. licensed satellites ☐ b. Using Non-U.S. licensed satellites

23. If applicant is providing INTERNATIONAL COMMON CARRIER service, see instructions regarding Sec. 214 filings. Mark only one box. Are these facilities:

☒ a. Connected to the Public Switched Network ☐ b. Not connected to the Public Switched Network

24. FREQUENCY BAND(S): Place an "X" in the box(es) next to all applicable frequency band(s).

☐ a. C-Band (4/6 GHz)
☐ b. Ku-Band (12/14 GHz) ☒ c. Other (Please specify) Feeder Links: 12.75 GHz-13.25 GHz; 10.75 GHz-10.95 GHz; 11.20 GHz-11.45 GHz; TT&C: 13.000 GHz-13.002 GHz; 13.248 GHz-13.250GHz; 11.750 GHz - 11.752 GHz

TYPE OF STATION

25. CLASS OF STATION: Place an "X" in the box next to the class of station that applies. Mark only one box.

☐ a. Fixed Earth Station ☐ b. Temporary-Fixed Earth Station ☐ c. 12/14 GHz VSAT Network ☐ d. Mobile Earth Station ☒ e. Space Station ☐ f. Other Specify ______

If space station applicant, go to Question 27.

26. TYPE OF EARTH STATION FACILITY Mark only one box. N/A

☐ a. Transmit/Receive ☐ b. Transmit-Only ☐ c. Receive-Only

PURPOSE OF MODIFICATION OR AMENDMENT

27. The purpose of this proposed modification or amendment is to: Place an "X" in the box(es) next to all that apply. N/A

☐ a – authorization to add new emission designator and related service
☐ b – authorization to change emission designator and related service
☐ c – authorization to increase EIRP and EIRP density
☐ d – authorization to replace antenna
☐ e – authorization to add antenna
☐ f – authorization to relocate fixed station
☐ g – authorization to change assigned frequency(ies)
☐ h – authorization to add Points of Communication (satellites & countries)
☐ i – authorization to change Points of Communication (satellites & countries)
☐ j – authorization for facilities for which environmental assessment and radiation hazard reporting is required
☐ k – Other (Please specify) ______

ENVIRONMENTAL POLICY

28. Would a Commission grant of any proposal in this application or amendment have a significant environmental impact as defined by 47 CFR 1.1307? ☐ YES ☒ NO

If YES, submit the statement as required by Sections 1.1308 and 1.1311 of the Commission's rules, 47 C.F.R. §§ 1.1308 and 1.1311, as Exhibit A to this application.

A Radiation Hazard Study must accompany all applications as Exhibit B for new transmitting facilities, major modifications, or major amendments. Refer to OET Bulletin 65.

ALIEN OWNERSHIP

29. Is the applicant a foreign government or the representative of any foreign government?	☐ YES	☒ NO
30. Is the applicant an alien or the representative of an alien?	☐ YES	☒ NO
31. Is the applicant a corporation organized under the laws of any foreign government?	☐ YES	☒ NO
32. Is the applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	☐ YES	☒ NO
33. Is the applicant a corporation directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	☐ YES	☒ NO
34. If any answer to questions 29, 30, 31, 32 and/or 33 is Yes, attach as Exhibit C an identification of the aliens or foreign entities, their nationality, their relationship to the applicant, and the percentage of stock they own or vote.		

BASIC QUALIFICATIONS

35. Does the applicant request any waivers or exemptions from any of the Commission's Rules? If Yes, attach as Exhibit D, copies of the requests for waivers or exceptions with supporting documents.	☐ YES	☒ NO
36. Has the applicant or any party to this application had any FCC station authorization or license revoked or had any application for an initial, modification or renewal of FCC station authorization, license, or construction permit denied by the Commission? If Yes, attach as Exhibit E, an explanation of the circumstances. See Exhibit E	☒ YES	☐ NO
37. Has the applicant, or any party to this application, or any party directly or indirectly controlling the applicant ever been convicted of a felony by any state or federal court? See Exhibit E	☒ YES	☐ NO
38. Has any court finally adjudged the applicant, or any person directly or indirectly controlling the applicant, guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement or any other means or unfair methods of competition?	☐ YES	☒ NO
39. Is the applicant, or any person directly or indirectly controlling the applicant, currently a party in any pending matter referred to in the proceeding two items? See Exhibit E	☒ YES	☐ NO
40. By checking Yes, the undersigned certifies, that neither the applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. See 47 CFR 1.2002(b) for the meaning of "party to the application" for these purposes.	☒ YES	☐ NO

41. Description. (Summarize the nature of the application and the services to be provided).

See Exhibit A

CERTIFICATION

The Applicant waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application. The applicant certifies that grant of this application would not cause the applicant to be in violation of the spectrum aggregation limit in 47 CFR Part 20. All statements made in exhibits are a material part hereof and are incorporated herein as if set out in full in this application. The undersigned, individually and for the applicant, hereby certifies that all statements made in this application and in all attached exhibits are true, complete and correct to the best of his or her knowledge and belief, and are made in good faith.

42. Applicant is a (an): (Place an "X" in the box next to applicable response.)

☐ a. Individual ☐ b. Unincorporated Association ☐ c. Partnership ☒ d. Corporation ☐ e. Governmental Entity ☐ f. Other (Please specify) ____________

43. Typed Name of Person Signing	44. Title of Person Signing
Gary M. Parsons	Chairman and Chief Executive Officer

45. Signature	46. Date
[signature]	7/2/98

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).

AUTHORIZATIONS REVOKED
(Response to Item 36)

Space Technologies Investments, Inc. ("SpaceTech"), formerly called McCaw Space Technologies, Inc., is a minority shareholder of American Mobile Satellite Corporation ("AMSC"). SpaceTech held a conditional authorization to construct, launch, and operate a private satellite system providing international communications services between the Indian and Pacific Ocean regions, and had filed a request with the FCC for a one-year extension of time for demonstrating permanent financial qualifications for its conditionally authorized system. On January 26, 1993, the FCC denied this extension request and declared this conditional authorization of SpaceTech null and void. *See* Memorandum Opinion & Order, FCC File No CSS-86003-LA, DA-93-108 (Comm. Carr. Bur., released Feb. 5, 1993).

The denial of SpaceTech's extension request did not involve actual or alleged misconduct. In addition, as a minority shareholder of AMSC, SpaceTech will have no control over AMSC, AMSC Acquisition Company, Inc., or AMSC Subsidiary Corporation, nor any of their operations. Further, the Commission has granted other applications of AMSC and found AMSC and its subsidiaries qualified to be Commission licensees notwithstanding the denial of SpaceTech's extension request.

FELONY CONVICTIONS
(Response to Item 37)

Hughes Communications Satellite Services, Inc. ("HCSSI") is a minority shareholder of AMSC. In 1990 and 1992, HE Holdings, Inc. (formerly known as Hughes Aircraft Company), a second-tier parent of HCSSI, pleaded guilty to or was found guilty of felony offenses for conduct unrelated to HCSSI's FCC and communications-related activities. For further information regarding these felony matters, please refer to HCSSI's FCC Form 430s filed with the Commission.

The conduct leading to HE Holdings, Inc.'s guilty plea or finding of guilt was not related to FCC or communications-related matters. In addition, as a second-tier parent of a minority shareholder of AMSC, HE Holdings, Inc. will have no control over AMSC, AMSC Acquisition Company, Inc., or AMSC Subsidiary Corporation, nor any of their operations. Further, the Commission has granted other applications of AMSC Subsidiary Corporation and found AMSC and its subsidiaries qualified to be Commission licensees notwithstanding the actual or alleged involvement of HE Holdings, Inc.

PENDING MATTERS
(Response to Item 39)

In July 1992, Radio Satellite Corporation ("RSC") filed an amended complaint in the U.S. District Court for the District of Columbia against American Mobile Satellite Corporation ("AMSC"), the 100% stockholder of AMSC Acquisition Company, Inc. The amended complaint prayed for actual damages "estimated to be no less than $100 million," trebled under the antitrust laws, plus punitive damages, interest, attorney's fees, and costs. RSC's amended complaint alleges (1) violation of Sections 201 and 202 of the Communications Act, based on AMSC's claimed breach of an alleged obligation to enter into a forward contract with RSC to provide satellite capacity to RSC on terms deemed acceptable to RSC years in advance of satellite launch; (2) violations of Sections 1 and 2 of the Sherman Act, based on AMSC's alleged unlawful monopolization of the sale and resale of mobile satellite service and alleged unlawful conspiracy with its stockholders; and (3) common law tort and breach of contract for failing to enter into an agreement with RSC and allegedly interfering with RSC's ability to obtain satellite service from Telesat Mobile, Inc. In July 1992, AMSC filed its answer to RSC's amended complaint denying all allegations of wrongdoing and asserting a number of affirmative defenses, including failure to state a claim, illegality, lack of ripeness, and absence of damages. In March 1994, AMSC filed a motion for summary judgment against RSC's amended complaint. This motion was denied on April 18, 1996. The matter, originally set for trial in November, 1996, has been rescheduled for trial in September, 1998.

AMSC has not been found liable of any misconduct, and it has denied all allegations of wrongdoing in this matter. In addition, the Commission has granted other applications of AMSC and found AMSC and its subsidiaries to be qualified to be a Commission licensee notwithstanding the allegations levied by RSC.

DESCRIPTION OF TRANSACTION
(Response to Items 41)

By this instant application, American Mobile Satellite Corporation ("AMSC"), requests authority, pursuant to Sections 308 and 309 of the Communications Act of 1934, as amended, and Section 25.114 of the Commission's Rules, to launch and operate a second-generation mobile satellite system in the L-Band ("AMSC-2").

AMSC-2 is intended to provide the facilities for uninterrupted continuation of services operating on AMSC-1 as well as a mix of improved and new services. AMSC-1 services include the Skycell mobile telephone service, Skycell Plus voice dispatch service, Mobile Messaging Service and a variety of point-to-multi-point and multi-point-to-point data services provided by third parties leasing satellite access from AMSC.

To support such a wide range of services, AMSC-2 will be able to provide a variety of ground-commanded, configurable antenna beam sizes and locations appropriate to the specific service. For example, point-to-point telephone and data services will be provided by multiple spot beams over the service area, maximizing spectrum efficiency and minimizing the demands placed on the mobile terminals. Simultaneously, point-to-multipoint dispatch services requiring nationwide coverage will use a single beam covering the whole service area.

APPENDIX 4

ENGINEER'S CERTIFICATION

Technical Certification

I, Richard O. Evans, Senior Scientist of American Mobile Satellite Corporation, ("AMSC"), certify under penalty of perjury that:

I am the technically qualified person with overall responsibility for preparation of the technical information contained in AMSC's application for a license to launch and operate a second-generation mobile satellite system in the L-band. I am familiar with the requirements of Part 25 of the Commission's rules, and the information contained in the application is true and correct to the best of my belief.

Richard O. Evans

Dated: June 25, 1998