

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

In the Matter of Application of)	
)	
SES AMERICOM, INC.)	File No. SAT-MOD-_____
)	Call Sign S2445
For Modification of the AMC-1 License)	
To Extend the License Term and)	
Seek Deorbit Authority)	

APPLICATION OF SES AMERICOM, INC.

SES Americom, Inc. (“SES Americom”) hereby applies for a five-year extension, through October 15, 2016, of the license for its AMC-1 spacecraft, call sign S2445, and seeks authority to deorbit the satellite at its end of life. Grant of the requested modification will serve the public interest by enabling SES Americom to continue to offer services using AMC-1, promoting efficient use of satellite and orbital resources.

A completed FCC Form 312 is attached, and SES Americom incorporates by reference the technical information previously provided regarding operations of AMC-1.¹ In addition, SES Americom is providing information regarding orbital debris mitigation in the attached Technical Appendix.

MODIFICATION

AMC-1 commenced operations at 103° W.L. on October 15, 1996 and is licensed to operate in both the conventional C-band (3700-4200 MHz and 5925-6425 MHz) and the

¹ See File Nos. SAT-MOD-19930805-00031; SAT-MOD-19911114-00033.

conventional Ku-band (11.7-12.2 GHz and 14.0-14.5 GHz).² The initial term of the AMC-1 license was ten years, but that term was extended to fifteen years when the Commission adopted revisions to Section 25.121 of its rules.³ By this application, SES Americom respectfully requests a further five-year extension of the spacecraft license term.

Such an extension is warranted in the circumstances. SES Americom calculates that there is sufficient fuel onboard the AMC-1 spacecraft for the spacecraft to continue providing reliable service during the requested extended license term.⁴ As a result, extending the license term for AMC-1 will serve the public interest by allowing SES Americom to continue to use the spacecraft to provide service to customers, promoting the efficient use of satellite and orbital resources.

SES Americom also seeks Commission authority to relocate AMC-1 at its end of life to a disposal orbit with a minimum perigee altitude of at least 150 km above the geostationary arc. Because AMC-1 was launched before March 18, 2002, the spacecraft is not subject to the minimum perigee requirements of Section 25.283(a).⁵ The Commission has previously authorized the use of a 150-km deorbit altitude for spacecraft launched prior to March

² See *Applications of GTE Spacenet Corp. and GE American Communications, Inc.*, Order and Authorization, 9 FCC Rcd 1271 (Com. Car. Bur. 1994) (reassigning the GE-1 satellite from 85° W.L. to 103° W.L.). SES Americom was formerly known as GE American Communications, Inc., and AMC-1 was previously designated GE-1.

³ See 47 C.F.R. § 25.121(a). See also *Amendment of the Commission's Space Station Licensing Rules and Policies*, First Report and Order and Further Notice of Proposed Rulemaking, FCC 03-102, 18 FCC Rcd 10760 (2003) at ¶ 266 (clarifying that the increase of satellite license terms to fifteen years applies to existing licenses).

⁴ In estimating the satellite's fuel life, SES Americom has taken into account the possibility that the satellite may commence inclined orbit operations as permitted by Section 25.280(a) of the Commission's Rules during the requested extension period.

⁵ See 47 C.F.R. § 25.283(d).

18, 2002.⁶ Calculations performed by SES Americom indicate that at the conclusion of the requested extension period, the spacecraft will have sufficient fuel to reach the proposed deorbit altitude, barring a catastrophic failure of satellite components. Grant of the requested deorbit authority is consistent with Commission precedent and will facilitate placement of AMC-1 in a disposal orbit at its end of life.

WAIVER REQUEST

SES Americom seeks any necessary waiver of Sections 25.114(d)(14)(ii) and 25.283(c) of the Commission's rules in connection with the requested AMC-1 modification.

Grant of the waiver is consistent with Commission policy:

The Commission may waive a rule for good cause shown. Waiver is appropriate if special circumstances warrant a deviation from the general rule and such deviation would better serve the public interest than would strict adherence to the general rule. Generally, the Commission may grant a waiver of its rules in a particular case if the relief requested would not undermine the policy objective of the rule in question and would otherwise serve the public interest.⁷

Sections 25.114(d)(14)(ii) and 25.283(c) address requirements relating to venting stored energy sources at the spacecraft's end of life.⁸ AMC-1 is a Lockheed Martin A2100A model spacecraft and was constructed and launched before the venting requirement in Section 25.283(c) was even proposed. As described in more detail in the attached Technical Appendix, the oxidizer tanks on the spacecraft were sealed following completion of the launch

⁶ See, e.g., *SES Americom, Inc.*, Application for Modification of Satcom SN-4 Fixed Satellite Space Station License, DA 05-1812, 20 FCC Rcd 11542 (Sat. Div. 2005) at ¶ 15.

⁷ *PanAmSat Licensee Corp.*, 17 FCC Rcd 10483, 10492 (Sat. Div. 2002) (footnotes omitted).

⁸ Section 25.283(c) contains the substantive venting requirement, and Section 25.114(d)(14)(ii) requires applicants to submit information that addresses "whether stored energy will be removed at the spacecraft's end of life." 47 C.F.R. § 25.114(d)(14)(ii).

phase and will therefore retain residual pressure at end of life. Given the spacecraft design, it is physically impossible for SES Americom to vent the oxidizer tanks in order to comply with Section 25.283(c).

Under Commission precedent, grant of a waiver is warranted. In a number of cases involving various spacecraft models with similar limitations, the Commission has waived Section 25.283(c) to permit launch and operation of spacecraft that do not allow for full venting of pressure vessels at end of life, based on a finding that modifying the space station design at a late stage of construction would pose an undue hardship.⁹ In the case of AMC-1, which was launched and operational before the venting requirements were even proposed, there is no question of bringing the satellite into compliance with the rule. The Commission has expressly recognized this, finding a waiver of Section 25.283(c) to be justified for in-orbit spacecraft that cannot satisfy the rule's requirements. For example, in a decision involving the SES Americom AMC-2 satellite, which like AMC-1 was launched before Section 25.283(c) was adopted, the Commission waived the rule on its own motion, observing that venting the spacecraft's sealed oxidizer tanks "would require direct retrieval of the satellite, which is not currently possible."¹⁰

⁹ See, e.g., *EchoStar Satellite Operating Corp.*, File No. SAT-LOA-20071221-00183, Call Sign S2746, grant-stamped Mar. 12, 2008, Attachment at ¶ 4 (granting a partial waiver of Section 25.283(c) for AMC-14, a Lockheed Martin A2100 model spacecraft, on grounds that requiring modification of satellite would present an undue hardship); *DIRECTV Enterprises LLC*, File No. SAT-LOA-20090807-00086, Call Sign S2797, grant-stamped Dec. 15, 2009, Attachment at ¶ 4 (same for DIRECTV 12, a Boeing 702 model spacecraft); *PanAmSat Licensee Corp.*, File Nos. SAT-MOD-20070207-00027, SAT-AMD-20070716-00102, Call Sign S2237, grant-stamped Oct. 4, 2007, Attachment at ¶ 7 (same for Intelsat 11, an Orbital Sciences Star model spacecraft).

¹⁰ File No. SAT-MOD-20101215-00261, Call Sign S2134, grant-stamped Mar. 8, 2011, Attachment at ¶ 4. See also *XM Radio Inc.*, File No. SAT-MOD-20100722-00165, Call Sign S2616, grant-stamped Oct. 14, 2010, Attachment at ¶ 2 (waiving Section 25.283(c) for XM-4, a Boeing 702 model spacecraft, because "modification of the spacecraft would present an undue hardship, since XM-4 is an in-orbit space station and venting XM-4's helium and xenon tanks would require direct retrieval of the satellite, which is not currently possible").

The same practical obstacle is present here. Because AMC-1 is already in orbit, SES Americom can do nothing to enable full venting of residual pressure in the oxidizer tanks. Given this reality, waiver is clearly warranted; there is no possible public interest benefit in requiring strict adherence to a rule with which the licensee is incapable of complying.

CONCLUSION

For the foregoing reasons, SES Americom hereby respectfully requests that the Commission modify the license for AMC-1 to extend its term through October 15, 2016 and authorize maneuvers to place AMC-1 in a disposal orbit at its end of life.

Respectfully submitted,

SES AMERICOM, INC.

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TECHNICAL APPENDIX

1. Introduction

This technical appendix is submitted in support of the application of SES Americom, Inc. ("SES Americom") for a modification of its license for the AMC-1 spacecraft at 103° W.L. to extend the license term and seek authority to deorbit the satellite at its end of life. SES Americom incorporates by reference herein the technical information it has already provided with respect to AMC-1.¹¹ No changes to the satellite's operation are proposed. SES Americom provides here information regarding orbital debris mitigation.

2. Schedule S

The proposed modification of the AMC-1 license will not result in any changes to the spacecraft's operating characteristics or to the interference environment. As a result, the information requested in Schedule S duplicates information that is already on file with the Commission concerning the technical parameters of AMC-1's operation. In similar cases involving requests extension of a satellite's license term, the Satellite Division has not required the submission of a Schedule S.¹² Accordingly, SES Americom is not filing a Schedule S with this application. SES Americom will nevertheless prepare and submit a Schedule S if requested to do so by the Satellite Division.

3. Orbital Debris Mitigation Statement

This section provides the information required under Section 25.114(d)(14) of the Commission's Rules.

§25.114(d)(14)(i): SES Americom has assessed and limited the amount of debris released in a planned manner during normal operations of AMC-1. No debris is generated during normal on-station operations, and the spacecraft will be in a stable configuration. On-station operations require stationkeeping within the +/- 0.05 degree N-S and E-W control box, thereby ensuring adequate collision avoidance distance from other satellites in geosynchronous orbit. In the event that co-location of this and another satellite is required, use of the proven Inclination-Eccentricity (I-E) separation method can be employed. This strategy is presently in use by SES to ensure proper operation and safety of multiple satellites within one orbital box..

SES Americom has also assessed and limited the probability of the space station becoming a source of orbital debris by collisions with small debris or meteoroids that could cause loss of control and prevent post-mission disposal. The design of AMC-1 locates all sources of stored energy within the body of the structure, which provides protection from small orbital debris. SES Americom requires that spacecraft manufacturers assess the probability of micrometeorite damage that can cause any loss

¹¹ See File Nos. SAT-MOD-19930805-00031; SAT-MOD-19911114-00033.

¹² See, e.g., File No. SAT-MOD-20090217-00024, grant-stamped May 5, 2009 (XM Radio request for extension of XM-1 satellite license).

of functionality. This probability is then factored into the ultimate spacecraft probability of success. Any significant probability of damage would need to be mitigated in order for the spacecraft design to meet SES Americom’s required probability of success of the mission. SES Americom has taken steps to limit the effects of any collisions through shielding, the placement of components, and the use of redundant systems.

§25.114(d)(14)(ii): SES Americom has assessed and limited the probability of accidental explosions during and after completion of mission operations. As part of the Safety Data Package submission for SES Americom spacecraft, an extensive analysis is completed by the spacecraft manufacturer, reviewing each potential hazard relating to accidental explosions. A matrix is generated indicating the worst-case effect, the hazard cause, and the hazard controls available to minimize the severity and the probability of occurrence. Each subsystem is analyzed for potential hazards, and the Safety Design Package is provided for each phase of the program running from design phase, qualification, manufacturing and operational phase of the spacecraft. Also, the spacecraft manufacturer generates a Failure Mode Effects and Criticality Analysis for the spacecraft to identify all potential mission failures. The risk of accidental explosion is included as part of this analysis. This analysis indicates failure modes, possible causes, methods of detection, and compensating features of the spacecraft design.

The design of the AMC-1 spacecraft is such that the risk of explosion is minimized both during and after mission operations. In designing and building the spacecraft, the manufacturer took steps to ensure that debris generation will not result from the conversion of energy sources on board the satellite into energy that fragments the satellite. All propulsion subsystem pressure vessels, which have high margins of safety at launch, have even higher margins in orbit, since use of propellants and pressurants during launch decreases the propulsion system pressure. Burst tests are performed on all pressure vessels during qualification testing to demonstrate a margin of safety against burst. Bipropellant mixing is prevented by the use of valves that prevent backwards flow in propellant and pressurization lines. All pressures, including those of the batteries, are monitored by telemetry.

At the end of operational life, after the satellite has reached its final disposal orbit, onboard sources of stored energy will be depleted or secured, and the batteries will be discharged. However, at the end of AMC-1’s operational life, there will be oxidizer remaining in the tanks that cannot be vented. Following insertion of the spacecraft into orbit, the spacecraft manufacturer permanently sealed the oxidizer tanks by firing pyrotechnic valves. Information regarding the residual oxidizer in the tanks is as follows:

Tank	Volume [l]	pressure [bar]	temp. [deg C]	Oxidizer mass [kg]
Ox 1	229	18.75	21	7.9
Ox 2	229	18.75	21	7.9

The oxidizer tanks are well shielded, and the residual pressure in the tanks will be well below their maximum rating. In the narrative portion of this application, SES Americom

requests any necessary waiver of Sections 25.114(d)(14)(ii) and 25.283(c) in connection with the residual oxidizer that will remain in these tanks at the end of the satellite's life.

§25.114(d)(14)(iii): SES Americom has assessed and limited the probability of the space station becoming a source of debris by collisions with large debris or other operational space stations. Specifically, SES Americom has assessed the possibility of collision with satellites located at, or reasonably expected to be located at, the requested orbital location or assigned in the vicinity of that location.

Regarding avoidance of collisions with controlled objects, in general, if a geosynchronous satellite is controlled within its specified longitude and latitude stationkeeping limits, collision with another controlled object (excluding where the satellite is collocated with another object) is the direct result of that object entering the allocated space.

The instant application seeks authority for continued operation of AMC-1 at the 103° W.L. orbital location. SES Americom is not aware of any other FCC- or non-FCC licensed spacecraft that are operational or planned to be deployed at 103° W.L. or to nearby orbital locations such that there would be an overlap with the requested stationkeeping volume of AMC-1.

SES Americom uses the Space Data Center ("SDC") system from the Space Data Association to monitor the risk of close approach of its satellites with other objects. Any close encounters (separation of less than 10 km) are flagged and investigated in more detail. If required, avoidance maneuvers are performed to eliminate the possibility of collisions.

During any relocation, the moving spacecraft is maneuvered such that it is at least 30 km away from the synchronous radius at all times. In most cases, much larger deviation from the synchronous radius is used. In addition, the SDC system is used to ensure no close encounter occurs during the move. When de-orbit of a spacecraft is required, the initial phase is treated as a satellite move, and the same precautions are used to ensure collision avoidance.

§25.114(d)(14)(iv): Post-mission disposal of the satellite from operational orbit will be accomplished by carrying out maneuvers to a higher orbit. The upper stage engine remains part of the satellite, and there is no re-entry phase for either component. The fuel budget for elevating the satellite to a disposal orbit is included in the satellite design.

SES Americom plans to maneuver AMC-1 to a disposal orbit at end of life and has selected a target minimum perigee of 150 km above the normal operational altitude. SES Americom intends to reserve 10.3 kg of fuel in order to account for postmission disposal of AMC-1. SES Americom has assessed fuel gauging uncertainty and has provided an adequate margin of fuel reserve to address the assessed uncertainty.

AMC-1 is not subject to the minimum perigee requirement of Section 25.283(a) of the Commission's Rules because the satellite was launched prior to March 18, 2002. However, for the Commission's information, the disposal orbit altitude resulting from the IADC formula would be 287.6 km based on the following calculation:

Area of the satellite (average aspect area): 55.15 m²

Mass of the spacecraft: 1306.15 kg

CR (solar radiation pressure coefficient): 1.245

Therefore the minimum disposal orbit perigee altitude as calculated under the IADC formula is:

$36,021 \text{ km} + (1000 \times \text{CR} \times \text{A/m}) = 36073.6 \text{ km}$, or 287.6 km above the GSO arc (35,786 km).

DECLARATION OF KRISH JONNALAGADDA

I, Krish Jonnalagadda, hereby certify under penalty of perjury that I am the technically qualified person responsible for preparation of the technical information contained in the foregoing exhibit; that I am familiar with the technical requirements of Part 25; and that I either prepared or reviewed the technical information contained in the exhibit and that it is complete and accurate to the best of my knowledge, information and belief.

/s/ Krish Jonnalagadda
SES Americom, Inc.

Dated: July 18, 2011