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

In the Matter of	)	
	)	
Gogo LLC	)	File No. SES-MOD-_____
	)	Call Sign E120106
Modification to Blanket License for Operation of	)	
1000 Technically Identical Ku-Band	)	
Transmit/Receive Earth Stations Aboard Aircraft	)	

MODIFICATION

Gogo LLC ("Gogo") hereby requests a modification of its blanket license to operate 1000 technically identical Ku-band transmit/receive earth stations aboard aircraft ("ESAAs") on domestic and international flights.[1] Specifically, Gogo requests that the Commission modify the Gogo ESAA License to: (1) add the Eutelsat 172A, Intelsat 904, Satmex 5, and SES-6 satellites as authorized points of communication for the Gogo ESAA network; (2) modify the terms of operation using the SES-1 and NSS-703 spacecraft to reflect coordination of higher power levels with operators of adjacent satellites; (3) revise the license conditions to reflect the allocation changes made in the *ESAA Order*, including the primary status of ESAA operations in the 11.7-12.2 GHz band,[2] and other provisions of new Section 25.227.

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[1] *Gogo LLC*, Call Sign E120106, File Nos. SES-LIC-20120619-00574, SES-AMD-20120731-00709 & SES-AFS-20121008-00902, granted May 1, 2013 (the "Gogo ESAA License").

[2] *Revisions to Parts 2 and 25 of the Commission's Rules to Govern the Use of Earth Stations Aboard Aircraft Communicating with Fixed-Satellite Service Geostationary-Orbit Space Stations Operating in the 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.2 GHz and 14-14.5 GHz Frequency Bands*, Notice of Proposed Rulemaking and Report and Order, IB Docket Nos. 12-376 & 05-20, 27 FCC Rcd 16510 (2012) ("*ESAA Order*") at ¶¶ 16-17 and new footnote NG55 to the Table of Allocations. In addition to according ESAAs primary status in the 11.7-12.2 GHz

A narrative description of the relevant changes is provided here, and Gogo is attaching an FCC Form 312 and Schedule B that identifies the new points of communication and reflects the updated operational characteristics. Supplemental technical information and copies of relevant coordination letters are attached as well. Pursuant to Section 25.117(c) of the Commission's rules, Gogo is providing herein information that is changing as a result of the modification. Gogo certifies that the remaining information provided in support of the Gogo ESAA License has not changed.[3]

I. ADDITIONAL SATELLITES

Gogo requests modification of its license to add the Eutelsat 172A, Intelsat 904, Satmex 5, and SES-6 satellites as points of communication for the Gogo ESAA network pursuant to the provisions of Section 25.227(a)(2) and (b)(2). All of these satellites are either U.S.-licensed or have already been authorized to serve U.S. earth stations. Updated tables listing the satellites to be used and the associated ground stations are provided in Annex 2 hereto.

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band, the Commission revised the Table of Allocations to authorize ESAAs to operate on an unprotected basis in the 10.95-11.2 GHz and 11.45-11.7 GHz bands for domestic and international service and authorized ESAAs on a secondary basis in the 14-14.5 GHz band. *See id.* at ¶¶ 20-21, ¶ 24, and new footnote NG52 to the Table of Allocations.

In addition, in the Notice of Proposed Rulemaking portion of the ESAA proceeding, the Commission is considering elevating ESAAs to primary status in the 14-14.5 GHz band. *See id.* at ¶ 142. If the Commission implements such a change in allocation of the 14-14.5 GHz band while this modification application is pending, Gogo requests that the Commission reflect the allocation change when it acts on the modification.

[3] For the Commission's convenience, Gogo has attached as Annex 1 hereto a table listing the information required pursuant to Section 25.227 of the Commission's rules and providing a cross-reference to the necessary information.

Eutelsat 172A: Eutelsat 172A is a U.S.-licensed satellite positioned at the 172° E.L. orbital location.[4] Gogo seeks authority to use Eutelsat 172A capacity for ESAA operations on a secondary basis in the 14-14.5 GHz uplink spectrum and on a primary basis in the 11.7-12.2 GHz downlink spectrum, consistent with the *ESAA Order* and the terms of the satellite license. Eutelsat 172A will provide coverage of the Pacific Ocean Region.

Intelsat 904: Intelsat 904 is a U.S.-licensed satellite positioned at the 60° E.L. orbital location.[5] Gogo seeks authority to use Intelsat 904 capacity for ESAA operations on a secondary basis in the 14-14.5 GHz uplink spectrum and on an unprotected basis in the 10.95-11.2 GHz and 11.45-11.7 GHz downlink spectrum, consistent with the *ESAA Order* and the terms of the satellite license. Intelsat 904 will provide coverage of Russia.

Satmex 5: Satmex 5 is a Mexican-licensed satellite positioned at the 114.9° W.L. orbital location. The Commission placed Satmex 5 on the Permitted Space Station List for operations at this location in the conventional Ku-band.[6] Gogo seeks authority to use Satmex 5 capacity for ESAA operations on a secondary basis in the 14-14.5 GHz uplink spectrum and on a primary basis in the 11.7-12.2 GHz downlink spectrum, consistent with the *ESAA Order* and the

[4] The satellite was originally licensed as AMC-23 in 2004. *See SES Americom, Inc.,* Call Sign S2610, File No. SAT-LOA-20031218-00358, grant-stamped July 13, 2004. The Commission granted consent to assignment of the license to Eutelsat in 2012. *See* File No. SAT-ASG-20120626-00105, granted Aug. 23, 2012.

[5] *See Intelsat License LLC*, Call Sign S2408, File No. SAT-MOD-20011221-00140, granted Mar. 22, 2002.

[6] *See Satélites Mexicanos, S.A. de C.V.,* Call Sign S2589, File Nos. SAT-PPL-20121218-00217 & SAT-APL-20130308-00028, grant-stamped May 31, 2013. The Commission considered the orbital debris mitigation information submitted for Satmex 5 and granted associated waivers as part of this ruling. *See id.* at ¶ 5 (granting partial waivers of Sections 25.114(d)(14)(ii) and 25.283(c)).

terms of the satellite's U.S. market access. Satmex 5 will provide coverage of North and South America.

SES-6: SES-6 is a Netherlands-licensed satellite positioned at the 40.5° W.L. orbital location. The Commission placed SES-6 on the Permitted Space Station List for operations in the conventional Ku-band and has granted U.S. market access for SES-6 in the extended Ku-band.[7] Gogo seeks authority to use SES-6 capacity for ESAA operations on a secondary basis in the 14-14.5 GHz uplink spectrum and on an unprotected basis in the 10.95-11.2 GHz downlink spectrum, consistent with the *ESAA Order* and the terms of the satellite's U.S. market access. SES-6 will provide coverage of the Atlantic Ocean Region.

Coordination Letters: Attached as Annex 3 pursuant to Section 25.227(b)(2) of the Commission's rules are copies of letters confirming that Gogo's proposed operations with the Eutelsat 172A, Intelsat 904, Satmex 5, and SES-6 satellites have been coordinated with operators of adjacent satellites. In addition, Gogo is providing as Annex 4 a demonstration that the ESAA system is capable of detecting and automatically ceasing emissions within 100 milliseconds when the transmitter exceeds the off-axis EIRP spectral-densities supplied to the target satellite operator, as required in Section 25.227(b)(2)(iv). Gogo's operations with these satellites will conform to the terms of its agreements with the National Science Foundation ("NSF") and the National Aeronautics and Space Administration ("NASA"), as required by the Gogo ESAA License.[8]

[7] *See New Skies Satellites, B.V.*, Call Sign S2870, File No. SAT-PPL-20120717-00117, grant-stamped in part July 12, 2013 and in part August 1, 2013.

[8] Gogo ESAA License, Special and General Provisions, Condition 90057.

II. NSS-703 AND SES-1 POWER LEVELS

This modification application also includes updated information regarding operation of Gogo's terminals with the NSS-703 and SES-1 satellites that were authorized as part of the Gogo ESAA License. Specifically, Gogo proposes to operate with higher input power density when communicating with these satellites. Letters confirming that these higher levels have been coordinated with operators of adjacent satellites are included in Annex 3. In addition, an updated link budget for operations with SES-1 is provided as Annex 5. Gogo's operations with these satellites pursuant to the higher coordinated power levels will conform to the terms of the Gogo agreements with NSF and NASA.

III. *ESAA ORDER* CHANGES

As discussed above, the *ESAA Order* revised the Table of Allocations to specify that ESAA operations in the 11.7-12.2 GHz band are an application of the fixed-satellite service and can be authorized on a primary basis.[9] In addition, the Commission deleted footnote NG104 to the Table of Allocations and replaced it with new footnote NG52. The decision also adopted Section 25.227 to govern ESAA operations. Gogo requests that the Commission modify its license to reflect these changes.

First, the Commission should revise condition 90056 in the Special and General Provisions portion of the Gogo ESAA License, which specifies that reception of downlink transmissions is on a non-interference, non-protected basis. That provision should be altered to remove references to operations in the 11.7-12.2 GHz band that are now entitled to primary status. A suggested restatement of this condition that also incorporates the new satellites requested in the instant modification is as follows:

[9] *See ESAA Order* at ¶¶ 16-17.

90056 --- Reception of downlink transmissions is on a non-interference, non-protected basis from the following geostationary-orbit space stations: SES-4 (Call Sign S2828) at 22° W.L. in the 12.5-12.75 GHz frequency band; SES-6 (Call Sign S2870) at 40.5° W.L. in the 10.95-11.2 GHz frequency band; ~~Intelsat 14 (Call Sign S2785) at 45° W.L. in the 11.7-11.95 GHz frequency band;~~ NSS-703 (Call Sign S2818) at 47.05° W.L. in the 10.95-11.2 GHz, 11.45-11.7 GHz, ~~11.7-11.95 GHz,~~ and 12.5-12.75 GHz frequency bands; Intelsat 21 (Call Sign S2863) at 58° W.L. in the 11.45-11.7 GHz ~~and 11.7-12.2 GHz~~ frequency band~~s~~; ~~SES-1 (Call Sign S2807) at 101° W.L. in the 11.7-12.2 GHz frequency band;~~ Intelsat 19 (Call Sign S2850) at 166° E.L. in the 12.25-12.75 GHz frequency band; ~~and~~ Intelsat 22 (Call Sign S2846) at 72.1° E.L. in the 12.25-12.5 GHz frequency band; and Intelsat 904 (Call Sign S2408) at 60° E.L. in the 10.95-11.2 GHz and 11.45-11.7 GHz frequency bands. When communicating with these satellites in these frequency bands, ~~T~~the aircraft earth station operations authorized herein must accept interference from any radio station operating in conformance with the U.S. Table of Frequency Allocations.[10]

[10] Alternatively, in order to distinguish between portions of the extended Ku-band that are covered by the *ESAA Order* and those which are permitted for ESAA on an *ad hoc* basis pursuant to waiver of the Table of Allocations, the Commission may want to divide this condition into two separate provisions. A suggested formulation for this alternative is as follows:

90056 --- Reception of downlink transmissions is on a non-interference, non-protected basis from the following geostationary-orbit space stations: SES-6 (Call Sign S2870) at 40.5° W.L. in the 10.95-11.2 GHz frequency band; NSS-703 (Call Sign S2818) at 47.05° W.L. in the 10.95-11.2 GHz and 11.45-11.7 GHz frequency bands; Intelsat 21 (Call Sign S2863) at 58° W.L. in the 11.45-11.7 GHz frequency band; and Intelsat 904 (Call Sign S2408) at 60° E.L. in the 10.95-11.2 GHz and 11.45-11.7 GHz frequency bands. When communicating with these satellites in these frequency bands, the aircraft earth station operations authorized herein must accept interference from any radio station operating in conformance with the U.S. Table of Frequency Allocations.

90056A --- Reception of downlink transmissions is on a non-interference, non-protected basis from the following geostationary-orbit space stations: SES-4 (Call Sign S2828) at 22° W.L. in the 12.5-12.75 GHz frequency band; NSS-703 (Call Sign S2818) at 47.05° W.L. in the 12.5-12.75 GHz frequency band; Intelsat 19 (Call Sign S2850) at 166° E.L. in the 12.25-12.75 GHz frequency band; and Intelsat 22 (Call Sign S2846) at 72.1° E.L. in the 12.25-12.5 GHz frequency band. When communicating with these satellites in these frequency bands, the aircraft earth station operations authorized herein must accept interference from any radio station operating in conformance with the U.S. Table of Frequency Allocations.

Second, condition 90071 of the license should be deleted in its entirety. That provision granted waivers of the Table of Allocations for ESAA operations in the 11.7-12.2 GHz, 10.95-11.2 GHz, and 11.45-11.7 GHz frequency bands and a waiver of footnote NG104 in the 10.95-11.2 GHz and 11.45-11.7 GHz bands, pending action on a conforming modification pursuant to the *ESAA Order*. Because ESAA operations in the 11.7-12.2 GHz, 10.95-11.2 GHz, and 11.45-11.7 GHz frequency bands are consistent with the Table of Allocations as revised in the *ESAA Order* and footnote NG104 was deleted in that decision, condition 90071 is no longer needed.

Third, Gogo requests that the Commission modify condition 90068 of the Gogo ESAA License, which describes the data logging requirements applicable to the Gogo ESAA network, to conform to the specifications of Section 25.227(a)(6). The current license condition has a longer standard recording interval than does Section 25.227(a)(6) but also requires collection of data that was not included when the Commission adopted the ESAA rules. In order to clarify the specifics of the data logging applicable to Gogo and conform them to the obligation that will be imposed on future ESAA licensees, Gogo requests that the Commission delete condition 90068 and instead apply the terms of 25.227(a)(6) to the Gogo ESAA network.

IV. CONCLUSION

Gogo requests that the Commission modify the Gogo ESAA License to reflect the changes described herein.

Respectfully submitted,

GOGO LLC

By: */s/ William J. Gordon*

William J Gordon
VP, Regulatory Affairs
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Dated: November 14, 2013

ANNEX 1:

Table of Information Required by Section 25.227

Section 25.227 Requirement	Citation to Information Provided
25.227(a)(4) & 25.227(b)(5)	N/A: Gogo does not propose to use a contention protocol.
25.227(a)(5) & 25.227(b)(6)	24/7 point of contact is Gogo Network Operations Center, 1250 North Arlington Heights Road, Itasca, IL, +1 866-943-4662, as specified in Form 312 Schedule B, Items E2-E9.
25.227(a)(15)	Gogo certifications are in Annex 6 attached.
25.227(b)(2)(i), (ii) & (iii)	Target satellite operator certifications are in Annex 3 attached.
25.227(b)(2)(iv)	Demonstration regarding compliance with coordination agreements and ceasing emissions is in Annex 4 attached.
25.227(b)(4)	Gogo's ESAA network will operate in U.S. airspace, foreign airspace, and in the airspace over international waters. Coverage areas for the specific satellites to be used in the Gogo network are described in the table found in Annex 2 attached, and detailed contours for all the satellites are on file with the Commission.
25.227(b)(7)	Gogo certifications are in Annex 6 attached.
25.227(b)(8)	An updated Radiation Hazard Analysis is in Annex 7 attached. The new analysis reflects a slightly higher maximum EIRP for the carriers proposed in this modification than was used in the prior analysis (44.63 dBW instead of 44.44 dBW).
25.227(c)	Gogo's coordination agreement with NASA was filed February 1, 2013 in File Nos. SES-LIC-20120619-00574 *et al*.
25.227(d)	Gogo's coordination agreement with NSF was included as Amendment Exhibit B in File No. SES-AMD-20120731-00709.

ANNEX 2:

Updated Spacecraft and Teleport Tables

Satellite	Location	Beam Coverage Area	Tx (GHz)	Rx (GHz)	Use in US airspace?	Satellite Operator
SES-1	101W	North America	14-14.5	11.7 – 12.2	Yes	SES
SES-4	22W	Europe	14-14.5	12.5-12.75	No	
SES-6	40.5W	East Atlantic Ocean	14-14.5	10.95-11.2	No	
		West Atlantic Ocean	14-14.5	10.95-11.2	Yes	
NSS-703	47.05W	S2 - Northwestern Atlantic Ocean	14-14.5	11.7 – 11.95	Yes	
		S1 – North-central Atlantic Ocean	14-14.5	10.95 – 11.2; 11.45-11.7	No	
		S3 - Northwestern Atlantic Ocean	14-14.5	12.5-12.75	No	
IS-14	45W	North and South America excludes Brazil	14-14.5	11.7 – 12.2	Yes	Intelsat
IS-21	58W	Brazil	14-14.5	11.7 – 12.2	No	
		South Atlantic Ocean	14-14.5	11.45 – 11.7	No	
IS-22	72.1E	Mobility from Mideast to Japan and to Australia	14-14.5	12.25 – 12.5	No	
IS-19	166E	Northeast Pacific Ocean	14-14.5	12.25-12.75	Yes	
		Northwest Pacific Ocean	14-14.5	12.25-12.75	No	
		Australia	14-14.5	12.25-12.75	No	
		Southwest Pacific Ocean	14-14.5	12.25-12.75	No	
IS-904	60E	Spot 1 - Western Russia	14-14.5	10.95 – 11.2; 11.45-11.7	No	
Satmex 5	114.9W	North America	14-14.5	11.7-12.2	Yes	Satmex
		Central and South America	14-14.5	11.7-12.2	Yes	
E172A	172E	North Pacific Ocean and Northeastern Russia	14-14.5	11.7-12.2	No	Eutelsat

Satellite	Teleport Location	FCC Call Sign
SES-1	Woodbine, MD	E920698
SES-4	Bristow, VA	E020071
	Bristow, VA	E000696
SES-6	Betzdorf, Luxembourg	N/A
NSS-703	Woodbine, MD	E070181
IS-14	ATL teleport ATL-C06	E940333
	ATL teleport ATL-K15	E090093
IS-21	Rio de Janeiro, Brazil	N/A
	Mobility: MTN teleport MTN-K02	E030051
IS-22	Kumsan, Korea	N/A
IS-19	Perth, Australia	N/A
	Napa teleport NAP-K31	E980460
	Napa teleport NAP-C30	E980467
IS-904	Moscow, Russia	N/A
Satmex 5	Napa teleport NAP-K31	KA450
E172a	Khabarovsk, Russia	N/A

ANNEX 3:

Satellite Company Letters

eutelsat
communications via satellite

November 12, 2013

Federal Communications Commission
International Bureau
445 12th Street, S.W.
Washington, D.C. 20554

Re: Engineering Certification of Eutelsat

To Whom It May Concern:

This letter confirms that Eutelsat is aware that Gogo LLC ("Gogo") is planning to seek a modification to its blanket authorization (the "Modification Application") from the Federal Communications Commission ("FCC"), to operate technically identical Ku-band transmit/receive earth stations aboard aircraft ("ESAAs"), Call Sign E120106. Gogo seeks additional authorization for these aeronautical Ku-band earth stations in order also to utilize E172a at 172° E.L. under the current ESAA rules, including Section 25.227.

Based upon the representations made to Eutelsat by Gogo concerning the contents of its Modification Application:

- Eutelsat certifies that the proposed use of the ESAA transmit/receive terminals at the power density levels that Gogo provided to Eutelsat is consistent with existing coordination agreements to which Eutelsat is a party with all adjacent satellite operators within +/- 6 degrees of orbital separation from E172a.
- Eutelsat also acknowledges that the proposed operation of the Gogo ESAA terminal has the potential to receive harmful interference from adjacent satellite networks that may be unacceptable.
- If the FCC authorizes the operations proposed by Gogo, Eutelsat will include the power density levels specified by Gogo in all future satellite network coordination with other adjacent satellite operators.

Sincerely,

Ethan Lavan
Director of Orbital Resources
Eutelsat S.A.

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15 October, 2013

Federal Communication Commission
International Bureau
445 12th Street SW
Washington, D.D. 20554

INTELSAT

Re: Engineering Certification of Intelsat

To Whom It May Concern:

This letter certifies that Intelsat is aware that Gogo LLC ("Gogo") is planning to seek a modification to its blanket authorization, from the Federal Communications Commission ("FCC"), to operate technically identical Ku-band transmit/receive earth stations for the provision of Aeronautical Mobile Satellite Service (Call Sign E120106). Gogo seeks additional authorization for these aeronautical Ku-band earth stations to also utilize IS-904 at 60E, under the current rules for Earth Stations Aboard Aircraft (ESAA), including Section 25.227.

In its initial FCC application, Gogo stated that their AMSS aircraft remote terminals use the AeroSat HR6400 which supports reception and transmission, in the 10.7-12.75 GHz and 14.0-14.5 GHz bands respectively, to and from a geostationary satellite in space with a linear polarized array antenna. The HR6400 antenna has an array of two rows of 32 elements each, with each lensed-horn element being 3.4 X .75 inches. The antenna operates under gimbaled motor control to orient the antenna in azimuth, elevation and polarization and achieves better than a ± 0.2 degree rms pointing accuracy during active tracking of the intended satellite. All emissions automatically cease within 100 ms if the pointing error exceeds 0.5^0, and transmission is not resumed until the angle is verified to be less than 0.2°. In its initial application, Gogo indicated that the AMSS terminal complies with the off-axis EIRP density level requirements specified in Sections 25.222 and 25.226 of the Commission's Rules, at all off-axis angles up to and including 6 degrees separation in geostationary orbit. The terminal will also comply with the off-axis EIRP density level requirements of Section 25.227 for ESAA terminals in the revised rules.

When communicating with IS-904, Gogo will operate its antenna within the 14.0-14.5 GHz FSS uplink band and the 10.95 – 11.2 or 11.45-11.7 GHz FSS downlink band. Within the service area defined by Gogo, over angles up to and including 6 degrees separation in the geostationary orbit, the maximum uplink power density emitted in the plane of the geostationary arc will be less than those defined in Section 25.227(a)(1). The maximum forward downlink EIRP density will be 12.93 dBW/4kHz.

Intelsat certifies that the use of the above referenced ESAA transmit/receive terminal by Gogo, installed and operated in accordance with the Gogo application

Intelsat Corporation
3400 International Drive NW, Washington DC 20008-3006 USA **www.intelsat.com** T +1 202-944-6800 F +1 202-944-7898

and the above conditions, is consistent with existing coordination agreements with all adjacent satellite operators within +/- 6 degrees of orbital separation from IS-904. Intelsat also acknowledges that the use of the above referenced terminal by Gogo has the potential to receive harmful interference from adjacent satellite networks that may be unacceptable. If the FCC authorizes the operations proposed by Gogo in its application, Intelsat will include the power density levels, as described above, in all future satellite network coordinations with other adjacent satellite operators. Gogo shall comply with all such coordination agreements reached by the satellite operators

In order to prevent unacceptable interference into adjacent satellites, Intelsat has been informed, and Gogo acknowledges, that the ESAA antennas will be installed and operated in accordance with the above conditions and/or any other operational requirements specified in the FCC license ultimately granted to Gogo. If the use of this antenna should cause unacceptable interference into other systems, Gogo has agreed it will terminate transmissions immediately upon notice from the affected parties.

Sincerely,

15 October 2013

Alan Yates
Senior Technical Advisor, Spectrum Strategy
Intelsat, LLC

Date

Acceptance by Gogo, LLC:

Gogo affirms that the information provided reflected in this coordination letter is true and accurate to the best of Gogo's knowledge, information and belief, and that it shall comply with all relevant Intelsat coordination agreements, as provided herein.

29 Oct 2013

Timothy Joyce
VP of RF Engineering
Gogo LLC

Date

SATMEX
REACHING HIGHER

Federal Communications Commission
International Bureau
445 12th Street, S.W.
Washington, D.C. 20554

October 25, 2013

Re: Engineering Certification of Satélites Mexicanos S.A. de CV

To Whom It May Concern:

This letter certifies that Satélites Mexicanos S.A. de CV ("SATMEX") is aware that Gogo LLC ("Gogo") is planning to seek a modification to its blanket authorization from the Federal Communications Commission ("FCC"), to operate technically identical Ku-band transmit/receive earth stations aboard aircraft ("ESAAs"), Call Sign E120106. Gogo seeks additional authorization for these aeronautical Ku-band earth stations to also utilize Satmex-5 at 114.9° W.L. under the current ESAA rules including Section 25.227.

Satmex recognizes that the proposed use of the ESAA transmit/receive terminals at the power density levels provided by Satmex is consistent with existing coordination agreements with all adjacent satellite operators within +/- 6 degrees of orbital separation from Satmex-5. Satmex also acknowledges that the proposed operation of the Gogo ESAA terminal has the potential to receive harmful interference from adjacent satellite networks that may be unacceptable. If the FCC authorizes the operations proposed by Gogo, Satmex will take into consideration the power density levels associated with the operation of Gogo in all future satellite network coordinations with other adjacent satellite operators, in accordance with the established international regulations.

Sincerely,

10/25/2013
Date

Hector Fortis
SATMEX
International and Regulatory Affairs

SES

Federal Communications Commission
International Bureau
445 12th Street, S.W.
Washington, D.C. 20554

November 7, 2013

Re: Engineering Certification of New Skies Satellites B.V.

This letter certifies that New Skies Satellites B.V. ("SES") is aware that Gogo LLC ("Gogo") is planning to seek a modification to its blanket authorization from the Federal Communications Commission ("FCC"), to operate technically identical Ku-band transmit/receive earth stations aboard aircraft ("ESAAs"), Call Sign E120106. Gogo seeks additional authorization for these aeronautical Ku-band earth stations to also utilize SES-6 at 319.5° E.L. under the current ESAA rules including Section 25.227.

SES certifies that the proposed use of the ESAA transmit/receive terminals at the power density levels that Gogo provided to SES (and captured in a letter executed by Tim Joyce of Gogo on October 22, 2013) is consistent with existing operator-to-operator coordination agreements with all adjacent satellite operators within +/- 6 degrees of orbital separation from SES-6. SES also acknowledges that the proposed operation of the Gogo ESAA terminal has the potential to receive harmful interference from adjacent satellite networks that may be unacceptable. If the FCC authorizes the operations proposed by Gogo, SES will include the power density levels specified by Gogo in all future satellite network coordinations with other adjacent satellite operators.

Sincerely,

for Kimberly M. Baum
VP, Spectrum Management & Development, Americas
SES

SES

Federal Communications Commission
International Bureau
445 12th Street, S.W.
Washington, D.C. 20554

October 31, 2013

Re: Engineering Certification of SES Satellites (Gibraltar) Limited

To Whom It May Concern:

This letter certifies that SES Satellites (Gibraltar) Limited ("SES") is aware that Gogo LLC ("Gogo") is planning to seek a modification to its blanket authorization from the Federal Communications Commission ("FCC"), to operate technically identical Ku-band transmit/receive earth stations aboard aircraft ("ESAAs"), Call Sign E120106. SES understands that Gogo will be filing the modification pursuant to the current ESAA rules including Section 25.227 and will seek to revise the input power density levels at which these aeronautical Ku-band earth stations will communicate with NSS-703 at 47.05° W.L.

SES certifies that the proposed use of the ESAA transmit/receive terminals at the revised power density levels that Gogo provided to SES (and captured in a letter executed by the undersigned on October 17, 2013 and by Tim Joyce of Gogo on October 22, 2013) is consistent with existing operator-to-operator coordination agreements with all adjacent satellite operators within +/- 6 degrees of orbital separation from NSS-703. SES also acknowledges that the proposed operation of the Gogo ESAA terminal has the potential to receive harmful interference from adjacent satellite networks that may be unacceptable. If the FCC authorizes the operations proposed by Gogo, SES will include the power density levels specified by Gogo in all future satellite network coordinations with other adjacent satellite operators.

Sincerely,

Kimberly M. Baum
VP, Spectrum Management & Development, Americas
SES

Federal Communications Commission
International Bureau
445 12th Street, S.W.
Washington, D.C. 20554

October 31, 2013

Re: Engineering Certification of SES Americom, Inc.

To Whom It May Concern:

This letter certifies that SES Americom, Inc. ("SES") is aware that Gogo LLC ("Gogo") is planning to seek a modification to its blanket authorization from the Federal Communications Commission ("FCC"), to operate technically identical Ku-band transmit/receive earth stations aboard aircraft ("ESAAs"), Call Sign E120106. SES understands that Gogo will be filing the modification pursuant to the current ESAA rules including Section 25.227 and will seek to revise the input power density levels at which these aeronautical Ku-band earth stations will communicate with SES-1 at 101° W.L.

SES certifies that the proposed use of the ESAA transmit/receive terminals at the revised power density levels that Gogo provided to SES (and captured in a letter executed by the undersigned on July 26, 2013 and by Tim Joyce of Gogo on August 15, 2013) is consistent with existing operator-to-operator coordination agreements with all adjacent satellite operators within +/- 6 degrees of orbital separation from SES-1. SES also acknowledges that the proposed operation of the Gogo ESAA terminal has the potential to receive harmful interference from adjacent satellite networks that may be unacceptable. If the FCC authorizes the operations proposed by Gogo, SES will include the power density levels specified by Gogo in all future satellite network coordinations with other adjacent satellite operators.

Sincerely,

Kimberly M. Baum
VP, Spectrum Management & Development, Americas
SES

ANNEX 4:

Section 25.227(b)(2)(iv) Compliance Showing

The Gogo ESAA system will comply with all coordination agreements with satellite operators, and is capable of detecting and automatically ceasing emissions within 100 milliseconds if the off-axis EIRP spectral density (OESD) levels are not confirmed to be within the limits supplied to satellite operators.

The Aeronautical Earth Stations (AESs) operating on the Gogo ESAA system consist of the AeroSat Ku antenna system, which incorporates the iDirect satellite modem. This system interfaces with the various satellites which comprise the Space Segment (via the Ku band). The satellites in turn communicate with the Ground Segment, which consists of the Gateway Earth Stations and Network Operations Centers (NOCs) that are associated with the satellites and the overall Gogo ESAA network. Utilizing input from the aircraft's navigation system ARINC 429 interface, the antenna is steered by the antenna control system and satellite modem as the aircraft maneuvers and travels in the air. Gogo's on-board data network interfaces with the satellite modem to provide users with access to online connectivity, as well as to in-flight entertainment content.

An AES will not initiate communications with a specific satellite unless its operational characteristics have been confirmed to be within defined limits. With iDirect's satellite modem, Gogo is able to use Automatic Beam Selection (ABS) to switch between satellite beams as an aircraft travels between different served areas. This also allows Gogo to control the terminal's access to a geographically defined service area. The modem's satellite maps contain the information regarding which satellite and beam is preferred based on the terminal's geographic location. For each service area, operational parameters are defined to ensure that applicable OESD levels are not exceeded within the service area. For example, the maximum skew is set on a service area basis. This parameter will limit the maximum angle of skew that the antenna can tolerate before it mutes its transmission for the given area. The ABS system ensures that terminals only operate within the defined service areas, allows the terminal to select the appropriate adjoining service area when the boundary is approached, and manages the process of switching to the selected service area (permitting continuity of service as service area boundaries are crossed).

Once communication between the AES and a satellite has begun, there are multiple modes of fault detection within the ESAA system that will cause transmissions to be terminated. All emissions automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the antenna exceeds 0.5 degrees, and transmission is not resumed until the angle is less than 0.2 degrees. In addition, if the Antenna Control Modem Unit (ACMU) loses communication with the aircraft inertial reference system,

or if there is a failure of the ACMU itself, it will cause the transmitter to immediately mute. If the reference oscillator fails, the antenna system will cease transmission. If the maximum skew is exceeded within the defined service area, the antenna's transmitter will be muted. Finally, the Antenna System will not transmit unless it sees the appropriate out-route signal from the satellite; if the signal is not received, the Antenna System will not transmit.

Thus, the Gogo ESAA system will not commence operations, or will cease operations within 100 milliseconds, if the OESD levels supplied to the target satellite operator are exceeded, as required in Section 25.227(b)(2)(iv).

ANNEX 5:

Updated SES-1 Link Budget

Forward Link Budget

Hub	Woodbine, MD	
Required Eb/No	1.2	dB
Modulation	QPSK	
Info Rate	18,465	Kbps
FEC Rate	1/3	
Carrier Rolloff	1.2	
Satellite SFD @ 0 dB/K	-94.9	dBW/m^2
Transponder Atten	9.0	dB
Transponder ID	US Coverage	

Hub Transmit

Frequency	14.4	GHz
Satellite G/T	6.3	$dB/^oK$
Antenna Diameter	9.2	M
Carrier EIRP	71.5	dBW
Ant. Input PFD	-28.1	dBW/4kHz
Path Loss	207.3	dB
Atm/Point/Pol Loss	0.7	dB

Aircraft Receive Terminal

Frequency	12.1	GHz
Satellite EIRP	44.0	dBW
Downlink PFD@ Beam Center	12.8	dBW/4kHz
Receive Gain	30.8	dB
Terminal G/T	11.0	$dB/^oK$
Path Loss	205.6	dB
Other Losses	0.6	dB

Transponder

Total OPBO	0.0	dB
Carrier OPBO	0.0	dB
C/No Thermal Up	98.4	dB-Hz
C/No Thermal Dn	77.4	dB-Hz
C/Io Total	76.7	dB-Hz
C/No+Io	74.0	dB-Hz
Add'l Link Margin	0.14	dB
% BW per cxr	99.9	%
% Power per cxr	99.0	%
Xpdr BW Alloc	36.0	MHz

Return Link Budget

Terminal	Gogo AES-1	
Required Eb/No	3.6	dB
Modulation	BPSK	
Info Rate	1000	Kbps
FEC Rate	2/3	
Carrier Spacing	1.30	
Carrier Spreading	2.0	
Satellite SFD @ 0 dB/K	-95.1	dBW/m^2
Transponder Atten	9.0	dB
Transponder ID	US Coverage	

Aircraft Transmit Terminal

Frequency	14.2	GHz
Satellite G/T	1.0	$dB/^oK$
Antenna Diameter	0.4	M
Carrier EIRP	44.5	dBW
Ant Input PFD	-13.3	dBW/4kHz
Path Loss	206.9	dB
Atm/Point/Pol Loss	0.6	dB

Hub Receive

Frequency	11.9	GHz
Satellite EIRP	50.3	dBW
Downlink PFD@ Beam Center	-4.9	dBW/4kHz
Hub G/T	37.3	$dB/^oK$
Path Loss	205.5	dB
Other Losses	0.6	dB

Transponder

Total OPBO	3.0	dB
Carrier OPBO	28.5	dB
C/No Thermal Up	66.7	dB-Hz
C/No Thermal Dn	81.7	dB-Hz
C/Io Total	67.0	dB-Hz
C/No+Io	63.7	dB-Hz
Add"l Link Margin	0.12	dB
% BW per cxr	10.8	%
% Power per cxr	0.28	%
Xpdr BW Alloc	3.9	MHz

ANNEX 6:

Gogo Certifications

Gogo LLC ("Gogo"), in support of the foregoing application to modify the Gogo ESAA License, hereby certifies as follows:

1. Gogo's target space station operators have confirmed that Gogo's proposed ESAA operations over international waters are within coordinated parameters for adjacent satellites up to 6 degrees away on the geostationary arc.
2. Gogo will comply with the requirements contained in paragraphs (a)(6), (a)(9), (a)(10), and (a)(11) of Section 25.227 of the Commission's rules, 47 C.F.R. § 25.227.

By: */s/ Timothy Joyce*
Timothy Joyce
VP of RF Engineering
Gogo LLC

November 14, 2013

ANNEX 7:

Updated Radiation Hazard Analysis

This analysis predicts the radiation levels around a proposed earth station terminal, comprised of one array type antenna. This report is developed in accordance with the prediction methods contained in OET Bulletin No. 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, Edition 97-01, pp 26-30. The maximum level of non-ionizing radiation to which employees may be exposed is limited to a power density level of 5 milliwatts per square centimeter (5 mW/cm^2) averaged over any 6 minute period in a controlled environment, and the maximum level of non-ionizing radiation to which the general public is exposed is limited to a power density level of 1 milliwatt per square centimeter (1 mW/cm^2) averaged over any 30 minute period in an uncontrolled environment. Note that the worst-case radiation hazards exist along the beam axis. Under normal circumstances, it is highly unlikely that the antenna axis will be aligned with any occupied area since that would represent a blockage to the desired signals, thus rendering the link unusable.

Earth Station Technical Parameter Table

Antenna Aperture Width	0.62 meters
Antenna Aperture Height	0.17 meters
Antenna Surface Area	.1069 sq. meters
Antenna Isotropic Gain	29.0 dBi
Number of Identical Adjacent Antennas	1
Nominal Frequency	14.25 GHz
Nominal Wavelength (λ)	0.0211 meters
Maximum Transmit Power / Carrier	36.55 Watts
Number of Carriers	1
Total Transmit Power	36.55 Watts
W/G Loss from Transmitter to Feed	0.0 dB
Total Feed Input Power	36.55 Watts
Near Field Limit	$R_{nf} = D^2/4\lambda$ =4.55 meters
Far Field Limit	$R_{ff} = 0.6\ D^2/\lambda$ = 10.92 meters
Transition Region	R_{nf} to R_{ff}

In the following sections, the power density in the above regions, as well as other critically important areas will be calculated and evaluated. The calculations are done in the order discussed in OET Bulletin 65.

1.0 At the Antenna Surface

The power density at the antenna radiating surface can be calculated from the expression:

$PD_{refl} = 4P/A =$ **132.372** mW/cm^2 (1)

Where: P = total power at feed, milliwatts
A = Total area of reflector, sq. cm

In the normal range of transmit powers for satellite antennas, the power densities at or around the reflector surface are expected to exceed safe levels. This area will not be accessible to the general public. Operators and technicians should receive training specifying this area as a high exposure area. Procedures

must be established that will assure that all transmitters are rerouted or turned off before access by maintenance personnel to this area is possible.

2.0 On-Axis Near Field Region

The geometrical limits of the radiated power in the near field approximate a cylindrical volume with a diameter equal to that of the antenna. In the near field, the power density is neither uniform nor does its value vary uniformly with distance from the antenna. For the purpose of considering radiation hazard it is assumed that the on-axis flux density is at its maximum value throughout the length of this region. The length of this region, i.e., the distance from the antenna to the end of the near field, is computed as Rnf above.

The maximum power density in the near field is given by:

$PD_{nf} = (16\varepsilon P)/(\pi D^2) =$ **34.417** mW/cm² (2)
from 0 to 4.55 meters

Evaluation
Uncontrolled Environment: **Does Not Meet Uncontrolled Limits**
Controlled Environment: **Does not Meet Controlled Limits**

3.0 On-Axis Transition Region

The transition region is located between the near and far field regions. As stated in Bulletin 65, the power density begins to vary inversely with distance in the transition region. The maximum power density in the transition region will not exceed that calculated for the near field region, and the transition region begins at that value. The maximum value for a given distance within the transition region may be computed for the point of interest according to:

$PD_t = (PD_{nf})(R_{nf})/R$ = dependent on R (3)
where: PD_{nf} = near field power density
R_{nf} = near field distance
R = distance to point of interest
For: $4.55 < R < 10.9$ meters

We use Eq (3) to determine the safe on-axis distances required for the two occupancy conditions:

Evaluation

Uncontrolled Environment Safe Operating Distance,(meters), R_{safeu}: 156.7
Controlled Environment Safe Operating Distance,(meters), R_{safec}: 31.3

4.0 On-Axis Far-Field Region

The on- axis power density in the far field region (PD_{ff}) varies inversely with the square of the distance as follows:

$PD_{ff} = PG/(4\pi R^2)$ = dependent on R (4)
where: P = total power at feed
G = Numeric Antenna gain in the direction of interest relative to isotropic radiator

R = distance to the point of interest
For: $R > R_{ff} = 10.9$ meters
PD_{ff} = **1.921** mW/cm² at R_{ff}

We use Eq (4) to determine the safe on-axis distances required for the two occupancy conditions:

Evaluation

Uncontrolled Environment Safe Operating Distance,(meters), R_{safeu} :	See Section 3
Controlled Environment Safe Operating Distance,(meters), R_{safec} :	See Section 3

5.0 Off-Axis Levels at the Far Field Limit and Beyond

In the far field region, the power is distributed in a pattern of maxima and minima (sidelobes) as a function of the off-axis angle between the antenna center line and the point of interest. Off-axis power density in the far field can be estimated using the antenna radiation patterns prescribed for the antenna in use. This will correspond to the antenna gain pattern for an off-axis angle. For example, for the Gogo AES antenna at 1.5 degrees off axis the antenna gain is:

G_{off} = 25.7 dBi at 1.5 degree

Considering that satellite antenna beams are aimed skyward, power density in the far field will usually not be a problem except at low look angles. In these cases, the off axis gain reduction may be used to further reduce the power density levels.

For example: At 1.5 degrees off axis at the far-field limit, we can calculate the power density as:

G_{off} = 25.7 dBi = 371.5 numeric

$PD_{1\ deg\ off\text{-}axis} = PD_{ff} \times 371.5/G = 0.8986$ mW/cm² (5)

6.0 Off-Axis power density in the Near Field and Transitional Regions

According to Bulletin 65, off-axis calculations in the near field may be performed as follows: assuming that the point of interest is at least one antenna diameter removed from the center of the main beam, the power density at that point is at least a factor of 100 (20 dB) less than the value calculated for the equivalent on-axis power density in the main beam. Therefore, for regions at least Deff meters away from the center line of the antenna, in any direction, the power density exposure is at least 20 dB below the main beam level as follows:

$PD_{nf(off\text{-}axis)} = PD_{nf}/100$ = **0.34417** mW/cm² at D off axis (6)

See Section 7 for the calculation of the distance vs. elevation angle required to achieve this rule for a given object height.

7.0 Evaluation of Safe Occupancy Area in Front of Antenna

The distance (S) from a vertical axis passing through the antenna center to a safe off axis location in front of the antenna can be determined based on the effective antenna diameter rule (Item 6.0). Assuming a flat area in front of the antenna, the relationship is:

$S = (Deff/ \sin \alpha) + (2(h\text{-}GDeff) - Deff - 2)/(2 \tan \alpha)$ (7)

Where: α = minimum elevation angle of antenna
D = effective antenna diameter in meters
h = maximum height of object to be cleared, meters

For distances equal or greater than determined by equation (7), the radiation hazard will be below safe levels for all but the most powerful stations (> 4 kilowatts RF at the feed).

For	D =	0.62 meters
	h =	2.0 meters
	GD =	1.0 meters - elevated height of earth station above ground (min)

Then:

α	S
10	7.5 meters
15	5.0meters
20	3.7 meters
25	2.9 meters
30	2.4 meters

This is a fuselage mounted antenna, and all persons working on or near the antenna will be properly trained regarding radiation hazard. The antenna transmitter will be disabled any time work inside the radome is in progress.

Summary

The earth station site will be on top of the fuselage and will be protected from uncontrolled access. There will also be proper emission warning signs placed, and all operating personnel will be aware of the human exposure levels at and around the earth station. The applicant agrees to abide by the conditions specified in Condition 5208 provided below:

> *Condition 5208 - The licensee shall take all necessary measures to ensure that the antenna does not create potential exposure of humans to radiofrequency radiation in excess of the FCC exposure limits defined in 47 CFR 1.1307(b) and 1.1310 wherever such exposures might occur. Measures must be taken to ensure compliance with limits for both occupational/controlled exposure and for general population/uncontrolled exposure, as defined in these rule sections. Compliance can be accomplished in most cases by appropriate restrictions such as fencing. Requirements for restrictions can be determined by predictions based on calculations, modeling or by field measurements. The FCC's OET Bulletin 65 (available on-line at www.fcc.gov/oet/rfsafety) provides information on predicting exposure levels and on methods for ensuring compliance, including the use of warning and alerting signs and protective equipment for worker.*

The following table summarizes all of the above calculations:

Table - Summary of All RadHaz Parameters				**AES**
Parameter	Abbr.		Units	Formula
Dish #		Hub		
Antenna Dimenstions	Dma	0.62	meters	major axis (azimuth)
Effective Aperture Diameter	Deff	0.375	meters	
Antenna Centerline	h	0.5	meters	
Antenna Surface Area	Sa	0.1069	$meters^2$	$(\pi * Deff^2)/ 4$
Frequency of Operation	f	14.25	GHz	
Wavelength	λ	0.0211	meters	c / f
HPA Output Power	P_{HPA}	36.55	watts	
HPA to Antenna Loss	L_{tx}	0.0	dB	
Transmit Power at Flange	P	15.6	dBW	$10 * Log(P_{HPA}) - L_{tx}$
		36.55		
Antenna Gain	G_{es}	29.0	dBi	
		788.3	n/a	
PI	π	3.1415927	n/a	
Antenna Aperture Efficiency	η	26.00%	n/a	$G_{es} / (PI * Df /λ)^2$
1. Reflector Surface Region Calculations				
Reflector Surface Power Density	PDas	1323.72	W/m^2	$(16 * P)/(\pi * Deff^2)$
		132.372	mW/cm^2	**Does Not Meet Uncontrolled Limits**
				Does not Meet Controlled Limits
2. On-Axis Near Field Calculations				
Extent of Near Field	Rn	4.55	meters	$Dma^2 / (4 *λ)$
		14.93	feet	
Near Field Power Density	PDnf	344.17	W/m^2	$(16 * η * P)/ (\pi *Deff^2)$
		34.417	mW/cm^2	**Does Not Meet Uncontrolled Limits**
				Does not Meet Controlled Limits
3. On-Axis Transition Region Calculations				
Extent of Transition Region (min)	Rtr	4.55	meters	$Dma^2 / (4 *λ)$
Extent of Transition Region (min)		14.93	feet	
Extent of Transition Region (max)	Rtr	10.92	meters	$(0.6 * Dma^2) /λ$
Extent of Transition Region (max)		35.83	feet	
Worst Case Transition Region Power Density	PDtr	344.17	W/m^2	$(16 *η * P)/ (\pi * Deff^2)$
		34.417	mW/cm^2	**Does Not Meet Uncontrolled Limits**
				Does not Meet Controlled Limits
Uncontrolled Environment Safe Operating Distar	Rsu	156.7	m	=(PDnf)*(Rnf)/Rsu
Controlled Environment Safe Operating Distance	Rsc	31.3	m	=(PDnf)*(Rnf)/Rsc
4. On-Axis Far Field Calculations				
Distance to the Far Field Region	Rf	10.9	meters	$(0.6 * Dma^2) /λ$
		35.83	feet	
On-Axis Power Density in the Far Field	PDff	19.21	W/m^2	$(G_{es} * P) / (4 * \pi * Rf^2)$
		1.921	mW/cm^2	**Does Not Meet Uncontrolled Limits**
				Meets Controlled Limits
5. Off-Axis Levels at the Far Field Limit and Beyond				
Reflector Surface Power Density	PDs	8.986	W/m^2	$(G_{es} * P) / (4 * \pi * Rf^2)*(Goa/Ges)$
Goa/Ges at example angle θ 1.5 degree		0.468		25.7 at 1.5 deg
		0.8986	mW/cm^2	**Meets Controlled Limits**
6. Off-axis Power Density in the Near Field and Transitional Regions Calculations				
Power density 1/100 of Wn for one diameter removed	PDs	3.4417	W/m^2	$((16 * η * P)/ (\pi *Deff^2))/100$
		0.34417	mW/cm^2	**Meets Uncontrolled Limits**
7. Off-Axis Safe Distances from Earth Station				$S = (Dma/ \sin α) + (2h - Dma - 2)/(2 \tan α)$
α = minimum elevation angle of antenna		10	deg	
h = maximum height of object to be cleared, meters		2.0	m	
GD = Ground Elevation Delta antenna-obstacle		0.0	m	
elevation angle	10	7.5	m	
	15	5.0	m	
	20	3.7	m	
	25	2.9	m	
	30	2.4	m	
Note: Maximum FCC power density limits for 14 GHz is 1 mW/cm^2 for general population/uncontrolled exposure as per				
FCC OE&T Bulletin No. 65, Edition 97-01 August 1997, Appendix A page 67.				