MSV
Mobile Satellite Ventures LP

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January 14, 2005

Via Hand Delivery
Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: *Ex Parte* Presentation of Mobile Satellite Ventures Subsidiary LLC
IB Docket No. 01-185
File No. SAT-MOD-20031118-00333 (ATC application)
File No. SAT-AMD-20031118-00332 (ATC application)
File No. SES-MOD-20031118-01879 (ATC application)

Dear Ms. Dortch:

Mobile Satellite Ventures Subsidiary LLC ("MSV") hereby submits the attached analysis further demonstrating how its L-band Ancillary Terrestrial Component ("ATC") base stations will not cause harmful interference to Inmarsat aeronautical terminals.

Please direct any questions regarding this matter to the undersigned.

Very truly yours,

Lon C. Levin

cc: Donald Abelson
Jim Ball
William Bell
Richard Engelman
Chip Fleming
Howard Griboff
Karl Kensinger
Paul Locke
Kathyrn Medley
Robert Nelson
Sean O'More
Roderick Porter
Steve Spaeth
David Strickland
Cassandra Thomas
Thomas Tycz
John Janka, Counsel for Inmarsat

Technical Response to Inmarsat's January 5, 2005 Filing

Downlink Interference Potential. Inmarsat's recent filing (January 5, 2005) continues to show significant errors in the interference analysis of the aeronautical case, specifically in failing to account for shielding by the body of the aircraft. When shielding is accounted for, it is apparent that Inmarsat receivers will be protected from MSV base stations operating at the permitted power levels even at very low altitudes.

MSV has asserted that an AMS(R)S receiver that is only 35 meters above an ATC base station (65 meters above ground) can maintain positive margin against overload. MSV states: "*With one ATC base station emitting 32 dBW EIRP per sector and using the relaxed base station antenna characteristic, an airborne AMS(R)S receiver can be as low as 65 meters above ground (only 35 meters above the base station) and still maintain positive margin against overload. As the horizontal distance between the AMS(R)S receiver and the base station tower increases, the available margin increases rapidly as shown in the Table below.*"[1] The Table referred to in the above excerpt, illustrates the aircraft trajectory over the base station and specifies the available margin against overload at different points along the trajectory at horizontal distance increments of 600 meters. The referenced Table is reproduced below.[2]

AMS(R)S Receiver Trajectory over one ATC Base Station Emitting 32 dBW EIRP per Sector and using the Relaxed Overhead Gain Suppression Pattern (AMS(R)S Receiver at 65 Meters Altitude; Base Station Located at X, Y = 0, 0 km)

X	-4	-3.4	-2.8	-2.2	-1.5	-0.9	-0.3	0.3	0.9	1.5	2.2	2.8	3.4	4.0
Y	-4	-3.4	-2.8	-2.2	-1.5	-0.9	-0.3	0.3	0.9	1.5	2.2	2.8	3.4	4.0
Over. Thrsh. (dBm)	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50
Agg. Rec. Sig. (dBm)	-68.5	-67.2	-65.7	-63.9	-61.6	-58.7	-56.9	-56.9	-58.7	-61.6	-63.9	-65.7	-67.2	-68.5
Margin (dB)	18.51	17.22	15.71	13.89	11.63	8.73	6.87	6.87	8.73	11.63	13.89	15.71	17.22	18.51

Inmarsat's January 5 filing repeats the assumptions that MSV associates with the above Table and uses them to extrapolate the overload margin at the zenith of the base station, at which point Inmarsat derives a negative margin. Then, Inmarsat concludes: "This shows there is a problem."[3] However, there's no problem. The assumptions stated by MSV (and used by Inmarsat) are valid only for the points of the aircraft's trajectory

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[1] Mobile Satellite Ventures Subsidiary LLC, Opposition, File No. SAT-MOD-20031118-00333, File No. SAT-AMD-20031118-00332, File No. SES-MOD-20031118-01879 (December 23, 2004) ("*MSV Opposition*"), Technical Appendix at 2.

[2] MSV also stated that "*it should be emphasized that critical air-to-ground communications during take-offs and landings rarely, if ever, are based on the use of Inmarsat's system.*" *See MSV Opposition*, Technical Appendix at 3. To which Inmarsat remains silent.

[3] *See* Inmarsat Ventures Ltd., Reply, File No. SAT-MOD-20031118-00333, File No. SAT-AMD-20031118-00332, File No. SES-MOD-20031118-01879 (January 5, 2005) ("*Inmarsat Reply*"), Appendix A at 3 & 4.

that MSV addressed in the above Table. Not all of the stated assumptions remain valid, however, when the elevation angle from the AMS(R)S antenna to the base station antenna becomes negative and is in the region between -30° and -90°. For that range of negative elevation angles, the body of the aircraft significantly limits the AMS(R)S antenna gain. The effect of shielding of airborne antennas by the aircraft is well recognized by the RTCA specifications and was first described by MSV in its ATC Application, Appendix L, at 4 & 5.[4] The rationale is as follows.

RTCA Document DO-235A (*Assessment of Radio Frequency Interference Relevant to the GNSS*) provides GNSS antenna patterns at angles below the aircraft (negative elevation angles). The RTCA assessment is based on results from simulations, pattern measurements made with GPS antennas mounted on a full-scale fuselage section, and pattern measurements made on a scale-model aircraft. Based on these studies, the RTCA has concluded that an average back lobe antenna gain below the aircraft of -10 dBic is representative of the elevation angle range from -30 to -90 degrees below the horizon. This gain value applies to en-route, non-precision approach, and Category I precision approach aircraft types. *See* RTCA/DO-235A, Appendix G.

With regard to aeronautical antennas used for AMS(R)S service, RTCA document DO-210C (*Minimum Operational Performance Standards for Aeronautical Mobile Satellite Services (AMSS)*), defines two types of antennas; a high gain antenna and a low-gain omni-directional antenna. Performance and coverage specifications for the low-gain version are similar to those defined by the RTCA for GNSS antennas. The high gain AMSS antenna is specified to be significantly more directive than the low gain version in terms of discrimination against adjacent satellites. It is reasonable, therefore, to expect that its average back lobe (below the aircraft) is at least as good as that of the broader-beam low-gain antenna. Both AMS(R)S and GNSS antennas are installed on top of the aircraft and use right-hand circular polarization.

While RTCA/DO-210C does not provide specifications for AMS(R)S antenna gain below the aircraft, it is reasonable to believe that this gain may be modeled using the value given by RTCA/DO-235 for GNSS antennas; that is, -10 dBic for elevation angles from -30° to -90°. NTIA, in its *Ex Parte* interference analysis dated November 12, 2002, used a similar rationale to conclude that an AMS(R)S receive antenna gain of -10 dBic below the aircraft may be used to derive a conservative estimate of the received interference power level.

Figure 1 below illustrates the geometry between an aircraft and a base station. As the approaching aircraft reaches point A, representing -30° look-angle toward the base station, the base station enters the shielded region, below the aircraft, where the

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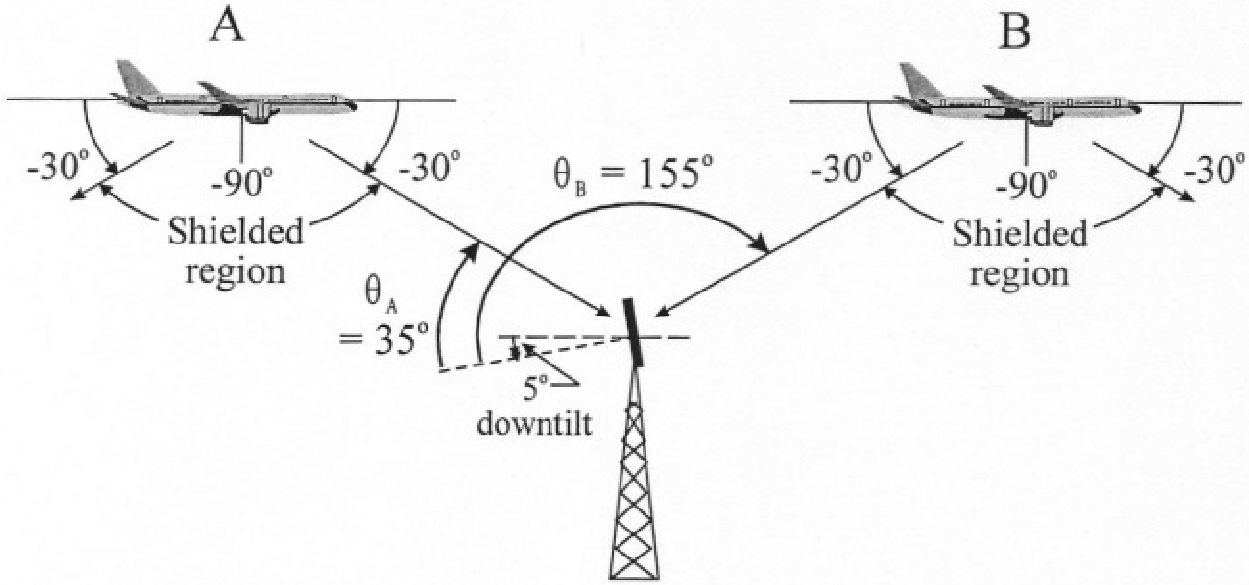
[4] *See* Application of Mobile Satellite Ventures Subsidiary LLC, File No. SAT-MOD-20031118-00333, File No. SAT-AMD-20031118-00332, File No. SES-MOD-20031118-01879 (filed November 18, 2003) (collectively, "*MSV ATC Application*"), Appendix L at 4-5.

additional 10 dB of isolation is present. The base station remains in the shielded region until the aircraft reaches point B.

Figure 1: Aircraft Shielded Region



Based on the above, the Table below presents the overload profile associated with the aircraft's trajectory, in increments of approximately 45 meters of horizontal distance, as the aircraft travels from (X, Y) = (-0.3, -0.3) km to (X, Y) = (0.3, 0.3) km (the base station is at (X, Y) = (0, 0) km). It is seen that over a horizontal distance of approximately 200 meters centered about the base station zenith the overload margin is approximately zero dB; not -6 dB as Inmarsat asserts.[5] For a horizontal distance that is greater than approximately 100 meters from the base station zenith, the overload margin increases to over 4 dB.[6]

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[5] *See Inmarsat Reply*, Appendix A at 4.

[6] When the elevation angle from the AMS(R)S antenna to the base station antenna is in the region between -30° and -90°, the antenna gain of the AMS(R)S receiver is assumed to be -10 dBic. Over this (near-zenith) region all three sectors of the ATC base station are assumed to impact the AMS(R)R receiver equally. Outside of the stated near-zenith region the antenna gain of the AMS(R)S receiver is assumed to be 0 dBic and only one sector of the ATC base station (the one radiating in the direction of the AMS(R)S receiver) is assumed to impact the AMS(R)S receiver.

AMS(R)S Receiver Trajectory over one ATC Base Station Emitting 32 dBW EIRP per Sector <u>and</u> using the Relaxed Overhead Gain Suppression Pattern (AMS(R)S Receiver at 65 Meters Altitude; Base Station Located at X, Y = 0, 0 km)

X	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.3
Y	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.3
Over. Thrsh. (dBm)	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50
Agg. Rec. Sig. (dBm)	-56.9	-57.6	-59.0	-57.7	-54.9	-50.7	-49.2	-49.2	-50.7	-54.9	-57.7	-59.0	-57.6	-56.9
Margin (dB)	6.94	7.64	8.98	7.68	4.86	0.75	-0.77	-0.77	0.75	4.86	7.68	8.98	7.64	6.94

Finally, as the aircraft travels from (X, Y) = (0.3, 0.3) km to (X, Y) = (1, 1) km significant positive margin is maintained, contrary to Inmarsat's assertion, as seen from the Table below. Over this region, the aircraft's body shielding is 0 dB, and only one sector of the base station (the one facing towards the aircraft) is assumed to influence the AMS(R)S receiver.

AMS(R)S Receiver Trajectory over one ATC Base Station Emitting 32 dBW EIRP per Sector <u>and</u> using the Relaxed Overhead Gain Suppression Pattern (AMS(R)S Receiver at 65 Meters Altitude; Base Station Located at X, Y = 0, 0 km)

X	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0
Y	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0
Over. Thrsh. (dBm)	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50
Agg. Rec. Sig. (dBm)	-56.9	-56.6	-56.5	-56.6	-56.7	-56.9	-57.2	-57.4	-57.7	-58.0	-58.3	-58.6	-58.9	-59.1
Margin (dB)	6.94	6.58	6.49	6.55	6.71	6.92	7.17	7.43	7.71	8.00	8.28	8.57	8.85	9.13

CERTIFICATION

I, Dr. Peter D. Karabinis, Vice President & Chief Technical Officer of Mobile Satellite Ventures Subsidiary LLC ("MSV"), certify under penalty of perjury that:

I am the technically qualified person with overall responsibility for preparation of the information contained in the foregoing. I am familiar with the requirements of the Commission's rules, and the information contained in the foregoing is true and correct.

Executed on January 14, 2005

Dr. Peter D. Karabinis
Vice President & Chief Technical Officer