TMI COMMUNICATIONS™

January 14, 2003

Marlene H. Dortch
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, D.C. 20554

Re: TMI Communications and Company, Limited Partnership
2 GHz LOI MSS Authorization, File No. SAT-LOI-19970926-00161
Supplemental Narrative- Orbital Debris Mitigation

Dear Ms. Dortch,

TMI Communications and Company, Limited Partnership ("TMI"), hereby submits this supplemental narrative regarding mitigation of orbital debris, pursuant to the requirement set out by the Federal Communications Commission's ("FCC" or "the Commission") in its grant of authorization for operation of a 2 GHz mobile satellite service.[1] In developing this response, TMI has consulted with its affiliate TerreStar Networks Inc.[2], the entity responsible for procuring the satellite, Space Systems Loral Inc. ("SS/L"), the satellite manufacturer, and Telesat Canada, an affiliate of TMI and a potential supplier of satellite control services for the spacecraft.

TMI has structured the format of this response to be consistent with the specific concerns raised by the Commission in its *Order*. In the *Order*, the Commission notes four objectives in its review of orbital debris information: (1) controlling debris released during normal operations, (2) minimizing debris generated by accidental explosions, (3) selecting safe flight profiles and operational configurations, and (4) providing for post-mission disposal of space structures.[3] The Commission requested a further response regarding the latter three categories[4], and this information is provided below.

Minimizing debris generated by accidental explosions

SS/L advises that no structural failures of pressurized volumes have occurred on SS/L spacecraft. These items are procured from vendors with strict quality control procedures

[1] TMI Communications and Company, Limited Partnership, Letter of Intent to Provide Mobile Satellite Services in the 2 GHz Bands, Order, DA-01-1638, released July 17, 2001, at ¶18 ("the *Order*").

[2] On December 11, 2002, TMI filed an application to assign the LOI authorization to Terrestar. See SAT-ASG-20021211-00238.

[3] *Order*, ¶13.

[4] ibid, ¶¶17-18.

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and the pressure vessels are designed to survive the rigors of the launch environment. Burst tests are performed on all pressure vessels during qualification testing to demonstrate factors of safety against burst. In some cases, the tested burst level is about twice the maximum expected operating pressure (MEOP). Bipropellant mixing is prevented by the use of valves that prevent backwards flow in propellant lines and pressurization lines. Therefore, the chances of battery overpressurization are alleviated. While batteries retain fluids in a pressure vessel, pressure at end-of-life is maintained at a low level, and procedures are recommended to customers to assure that the battery is not retaining a charge at the end of the mission. Pyrotechnics are only used early in the mission as part of the deployment process. Redundant pyrotechnics are not fired during mission, but at end of life, there is no power/control to switch relays to fire them. For the last satellite decommission, SS/L recommends that all pyros have been fired.

Selection of safe flight profile; avoidance of collision with controlled objects

The launch contractor is responsible for collision avoidance maneuvers and launch analysis in flight profile planning. Plans will be made to select one of the established launch agencies with a proven record of safe flight planning taking care to minimize the possibilities of any collision.

Collisions with the background environment including meteoroids are considered as part of the satellite design. These effects are considered on a statistical basis to determine collision risk. SS/L includes meteoroid environments as part of all satellite Environmental Requirement Specifications. Literature is reviewed for large size space objects, particularly technical papers that present collision probability estimates for orbital conditions of interest. These papers include data obtained from the USSPACECOM Catalog, Haystack radar, etc. If deemed necessary, SS/L will request assessment from outside consultants to review the design and flight profile.

Regarding avoidance of collisions with controlled objects, Telesat advises that, 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.

As an operator of satellites, Telesat has a contract with an external laboratory which is monitoring encounters between satellites under Telesat's control and some 500 active and inactive drifting objects. Any close encounters (separation of less than 5 km.) are flagged and investigated in more detail. If required, avoidance maneuvers are performed to eliminate the possibility of collisions.

If collocation of satellites is required, Telesat would use the well-documented eccentricity and inclination collocation strategy for orbit control. With this procedure, two spacecraft can be controlled with the same stationkeeping limits of ± 0.05 degrees in both latitude and longitude and still maintain a minimum close approach of greater than 5 km.

If relocation of a spacecraft is required, as a minimum 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 external laboratory's assistance 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.

Post-mission disposal of space structures

The upper stage engine remains part of the satellite and there is no re-entry phase for either component.

Post-mission disposal of the satellite from operational orbit will be accomplished by carrying out maneuvers to a higher orbit. SS/L advises that the fuel budget for this operation is included in the satellite design, and the decommissioned spacecraft will be raised 300 km. above the operational altitude. At that point, all the fuel tanks will be very close to empty, and all propellants will be vented. SS/L further advises that the accuracy of the fuel measurement of SS/L satellites is high.

TMI trusts that this information is adequate and resolves the outstanding issues raised by the Commission. Should further information be required, please feel free to contact the undersigned or our attorney Mr. Greg Staple of the firm Vinson & Elkins LLP.

Yours truly,

Ted H. Ignacy
Vice-President, Finance
TMI Communications Inc.

cc. Mr. Wharton Rivers, TerreStar Networks Inc.
Mr. Eric Butte, Space Systems Loral Inc.