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Ms. Marlene Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Re: Application of Northrop Grumman Space & Mission Systems Corporation, File No. SAT-AMD-20040312-00030, Call Sign S2254

Dear Ms. Dortch:

Northrop Grumman Space & Mission Systems Corporation ("NGST"), by its attorneys, hereby responds to the April 27, 2005 letter from Robert Nelson, Chief of the Engineering Branch of the Satellite Division of the Commission's International Bureau, to Peter Hadinger of NGST ("April 27 Letter"). In the April 27 Letter, the Bureau observes that the orbital parameters of the highly-elliptical orbit ("HEO") satellites in the non-geostationary satellite orbit ("non-GSO") component of NGST's proposed hybrid Ka-band/V-band non-GSO and geostationary satellite orbit system, as contained in NGST's March 12, 2004 amendment (referenced above) are identical to the orbital parameters proposed ten days later in the amendment of contactMEO Communications, LLC ("contactMEO") in the latter's amendment to its own Ka-band non-GSO satellite system application. April 27 Letter, at 1 & n.1. The Bureau requests NGST to explain the measures it intends to take to avoid in-orbit collisions with respect to the HEO satellites in the non-GSO component of the two proposed systems. It specifically requests that NGST indicate what steps have been taken to contact contactMEO and to ascertain the likelihood of successful coordination of physical operations in the event that NGST is relying on physical coordination of the two systems. *Id.* at 1.

NGST hereby states that is does indeed intend to rely on physical coordination of the HEO satellites in the NGST and contactMEO systems' non-GSO components at Ka-band. Prior to the filing of NGST's own above-referenced amendment in March of 2004, NGST and representatives of contactMEO had a number of discussions that led to the two companies' respective decisions to amend their Ka-band non-GSO applications to specify, *inter alia*, the use of HEO spacecraft with

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identical orbital parameters in the system designs. The ultimate objective was to maximize the companies' use of the Ka-band non-GSO fixed-satellite service spectrum by ensuring that the separation angle between any two satellites of the two systems as viewed by any earth station of these two systems meets or exceeds the minimum angle required to permit full-time operation by both systems.

In the event that both companies are eventually licensed to operate their proposed systems, NGST expects to continue to engage in coordination discussions with contactMEO to ensure that the two systems' operations are physically compatible. The commonality of design, and the considerations described below, will contribute greatly to the ultimate success of this endeavor.

In a nutshell, the fact that the two systems will have identical orbital parameters is not an impediment to successful coordination of physical operations so long as the two systems' satellites are launched on different dates. In both the NGST and contactMeo HEO non-GSO filings, the systems' Right Ascension of the Ascending Node ("RAAN") and Mean Anomaly ("MA") are 0/0 (Satellite #1, RAAN=0 deg./ MA= 0 deg.), 120/120 (Satellite #2, RAAN=120 deg./MA= 120 deg.) and 240/240 (Satellite #3, RAAN=240 deg./ MA= 240 deg.).[1] These RAAN/MA parameters indicate the plane separations of 120 degrees. Even though they will be launched into different initial orbits, in time, when the RAAN of the first satellite drifts around to 0, the others will then be at 120 and 240 RAAN.

For each system, once launched, the orbit nodes are going to drift westward at a rate of approximately 0.13 degrees per day. This means that if there is a one-year difference between the launch dates of the NGST HEO satellites and the contactMEO satellites, there would be orbit Right Ascension of the Ascending Node ("RAAN") separations of some 48 degrees just from the drift of the RAANs. After injection, the orbit RAANs do not stay constant, and there is no orbit maintenance of the RAANs. The 120 degree orbital separation between each system's satellites, however, does remain constant.

What this means is that despite the fact that the filed orbital parameters of NGST's and contactMEO's HEO non-GSO satellites are identical, operational conditions and coordination between the operators will eliminate the potential for in-orbit collisions between the systems' satellites. Specifically:

- The NGST RAAN/MA values at the time of launch will be set to provide orbit planes that do not interfere with contactMEO's satellites if the latter's satellites have already been launched.[2]

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1 The RAAN/MA values (0/0, 120/120, 240/240) are the initial values for each satellite if they were to be launched on one-month centers. The one-month centers are just an example since satellite build rate, launcher availability and range availability would probably make the time between launches something else.

2 The RAAN/MA and date/time-of-day combination for each satellite will be used to set the apogee longitude of the satellites in each HEO system.

- Though specified as beginning initial service at approximately the same time, it is extremely unlikely that the NGST and contact MEO system satellites would be launched on the same date due at a minimum to such considerations as booster and range constraints. If the launches occurred on one-month centers (30 days), it would take 5 months to launch a series of six satellites for both systems.

- During a sequence of launches, the orbit RAANs of each satellite that has been launched would naturally drift at approximately 4 degrees per month (~0.13 deg per day) westward. As a satellite is launched for each system, the orbit RAAN and Mean Anomaly would be adjusted to match up with the previous launches to provide the proper constellation plane separation.

In summary, if the satellites were to be launched at approximately the same time of year, the actual launches would be separated in time due to launcher and range constraints. If the launches were to occur on one-month centers, the actual launch RAAN/MAs of each satellite would need to be adjusted to account for RAAN drift since the launch of the first satellite. The resulting orbit planes and orbit positions between the two systems would provide sufficient satellite separation to preclude collisions.[3]

At this time, NGST maintains that it would be premature to specify different RAANs for its satellites to differentiate them from the satellites of contactMEO's system, as it is unknown which

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[3] An example sequence of launches for both systems, with launches on 30-day intervals, would produce the following initial orbit RAAN's:

* Month #1 (day 0) System 1, satellite #1, RAAN: 0 deg. Mean anomaly: 0 deg.
* Month #2 (day 30) System 1, satellite #2, RAAN: 116 degrees (120 deg - 1*4 deg) and Mean anomaly: 128 deg (120 deg + 1*8 deg) (RAAN adjusted to provide proper plane separation from the orbit plane of the previously launched satellite, MA adjusted to place the satellite on the specified system ground track)
* Month #3 (day 60) System 1, satellite #3, RAAN: 232 degrees (240 deg - 2*4 deg), Mean anomaly: 256 degrees (240 + 2*8 deg)

The following launches of System 2 satellites, with the same initial RAANs as the System 1 RAANs, produces an actual plane separation from the System 1 satellites due to the natural RAAN drifts of the System 1 orbit planes during the sequence of launches. The initial planes, of each system, are now separated by 12 degrees (due to natural RAAN drift of System 1), the MA puts the satellite on the same ground track as System 1 satellites at a different location in the orbit to account for the different RAANs.

* Month #4 (day 90) System 2, satellite #1, RAAN: 0 degrees and Mean anomaly: 24 degrees (MA adjusted to provide the same ground track as system 1)
* Month #5 (day 120) System 2, satellite #2, RAAN: 116 degrees (120 - 1*4 deg) and Mean anomaly: 152 deg (120 + 24 + 1*8 deg)
* Month #6 (day 150) System 2, satellite #3, RAAN: 232 degrees (240-1*8 deg) and Mean anomaly: 280 degrees (240 + 24 + 2*8 deg)

system will launch first. Even so, on the assumption that both systems will not be launched simultaneously (as explained above), there would be no potential for in-orbit collisions even if the same RAAN/MA combinations are nominally specified in the application. Nevertheless, NGST is prepared, should the Commission so desire, to amend its application to specify alternative nominal RAANs for its HEO non-GSO satellites. Please inform NGST if additional information on this matter is desired or needed in light of the foregoing discussion.

NGST trusts that the foregoing explanations satisfy the requests the Bureau made in the April 27 Letter. If there are any questions or if any additional explanation is desired or required, please do not hesitate to contact the undersigned.

Respectfully submitted,

Stephen D. Baruch
Attorney for Northrop Grumman Space & Mission Systems Corporation

cc: Mr. Robert Nelson
Mr. Kal Krautkramer