From: Brian Gunter

To: Doug Young
Date: September 02, 2016

Subject: Request for Info - File #0311-EX-PL-2016

Message:

Q: Please provide a description of the concept of operations for formation flying (including target range between the satellites) and provide information concerning the risk of collision between the two satellites, and any steps taken to mitigate this risk.

A: Because the satellites have no active propulsion system, the formation flying will be managed through differential drag. By changing the orientation of one of the satellites, a change in drag area occurs, inducing a relative velocity between the spacecraft. This allows the relative distance between the spacecraft to be controlled. Initially, the RANGE satellites will remain within a few km from each other, but the intention is to extend this distance later in the mission to test the limits of the intersatellite ranging techniques (e.g., out to hundreds of km). The risk of collision is extremely low. First, the differential drag technique is not nearly precise enough to bring the satellites back to within centimeters of each other, especially after extended operations. Second, the two spacecraft will be physically attached upon deployment, and will only separate upon command. This will allow for a very controlled separation, further reducing the chance for an accidental collision. Lastly, the relative velocities between the spacecraft will only reach the cm/s level, so even in the unlikely event of a collision, the velocities are not high enough to damage the spacecraft.

Q: Please provide “who” will be operating the ground based laser.

A: The ground-based satellite laser ranging (SLR) will be handled by the Naval Research Laboratory (NRL), who operate a ranging station in Stafford, VA. In addition, the mission will apply to be tracked by the International Laser Ranging Service (ILRS), which operates a global network of SLR stations that currently track approved spacecraft at no cost to the mission (pending station scheduling and priorities). The NRL site is part of the ILRS network.

Q: On the ODAR document it showed the summary of analysis of zeros Joules (KE) for re-entering debris. However, on the second to last page of the ODAR it clearly shows debris surviving with a KE of 125.910988 Joules which is inconsistent with the summary analysis of debris re-entry. Perhaps, the applicant can undertake a higher fidelity analysis that may establish the material component demise on reentry.

A: Thank you for spotting this. Upon further investigation, it was discovered that the entire battery pack in the original ODAR report was modeled as a solid block of nickel, instead of modeling individual battery cells. This was corrected, and an updated ODAR report (Rev B) has been created and submitted. The updated ODAR now shows that no individual components survive re-entry.

Q: Review of Form 442 and SpaceCap documents (multiple items)

A: The SpaceCap file is being revised and will be sent directly to D. Young when ready.