

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Future Space Transportation Systems Technologies (5)

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## NON-PROPELLANT ORBIT TRANSFER FOR IMPROVED TRANSPORTATION

**Abstract**

This paper will look at a combination of ideas to enable a change in orbits without using propellant. To start off with one part would be to have a reverse space elevator concept. This would include a mass on the end of a tether to be spooled in an out to change the center of gravity of the orbiting craft. Since the velocity acts at the center of gravity, the orbital radius will have changed. But since the velocity did not change the craft would not keep the same orbiting path. The next key is to use technology from the GRAIL mission to map the magnetic field that the spacecraft sees from its perspective. The spacecraft would then emit a magnetic pulse to pull it closer to the planet as well as in to slow down in the tangential direction. Putting these two concepts together would lead to change in orbit without using propellant of any kind. The mass being tethered out could have instruments on it to enable better efficiency. A theoretical concept study will be done with a chemical and SEP cruise to Mercury to show how much more mass could be delivered. Mercury was picked because it does not have an concentrated atmosphere to enable air braking, as well as MESSENGER and BEPI-COLUMBO have already calculated trajectories for cruise. The more mass delivered to an objective allows more science to be done for longer periods of time. Eventually this would lead to humans colonizing planetary bodies.