



## **Deployed Nano-Satellites to Determine Gravity as Secondary Mission**

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The mass properties of a planetary body can be estimated by using visiting spacecraft, although this currently requires the use of specialised equipment for precise ranging and attitude control. An alternate method without this requirement would allow the reallocation of mass, power and bandwidth budgets to other important scientific tasks. One such method may deploy groups of nano-satellites in the vicinity of a planetary body to make gravity estimates. The estimates are made by measuring the changes in velocity and position of the nano-satellites relative to one another as they move through the gravity field near the body. This technique only requires the use of low-power communications equipment and an ad-hoc positioning network. Computationally simple techniques have been derived which are able to produce in-situ gravity estimates. These have been tested using simulation of vehicles travelling near modelled planetary bodies. As the effectiveness of this technique may depend on the manner in which the vehicles are deployed, two such strategies were simulated as a point for comparison and discussion.. It has been found that the technique becomes increasingly inaccurate for smaller asteroids. By relying on non-directional hardware, each nano-satellite may pursue alternate primary mission goals concurrently with mass determination.