



An Ion-Propelled Cubesat for Planetary Defense and Planetary Science

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Small satellites can reduce the cost of launch by riding along with other payloads on a large rocket or being launched on a small rocket, but are perceived as having limited capabilities. This perception can be at least partially overcome by innovative design, including ample in-flight propulsion. This allows achieving multiple targets and adaptive exploration. Ion propulsion has been pioneered on Deep Space 1 and honed on the long-duration, multiple-planetary body mission Dawn. Most importantly, the operation of such a mission is now well-understood, including navigation, communication, and science operations for remote sensing. We examined different mission concepts that can be used for both planetary defense and planetary science near 1 AU. Such a spacecraft would travel in the region between Venus and Mars, allowing a complete inventory of material above, including objects down to about 10m diameter to be inventoried. The ion engines could be used to approach these bodies slowly and carefully and allow the spacecraft to map debris and follow its collisional evolution throughout its orbit around the Sun, if so desired. The heritage of Dawn operations experience enables the mission to be operated inexpensively, and the engineering heritage will allow it to be operated for many trips around the Sun.