AsteroidFinder: Unveiling the Population of Inner Earth Objects

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Inner Earth Objects (IEOs) are a special group of NEOs (Near-Earth Objects) with orbits completely contained within the Earth orbit. Because of their low solar elongation they are only observable from the ground shortly after sunset or just before sunrise - analog to the planets Mercury and Venus - which makes them difficult to discover. As of writing, only 8 IEOs have been positively detected by ground-based surveys, out of an estimated population of about 1000 down to a size of 100m.

An Earth-orbiting search telescope capable of observing at small angular distances from the Sun is an efficient and cost-effective tool for discovering these objects and measuring their orbits. For this reason DLR, the German Aerospace Center, has selected AsteroidFinder as the first payload to be flown on its SSB satellite platform, in the frame of the German national compact satellite Program.

The primary scientific goals of AsteroidFinder are to contribute to the understanding of the dynamical evolution of the innermost region of the Solar System and of the cratering history of the inner planets. This is achieved by estimating the IEO population, their size-frequency distribution and their orbital properties. In addition to these primary goals, AsteroidFinder will contribute to the assessment of the impact hazard of NEOs and provide a test platform for the space-based detection of space debris and artificial satellites.

The mission concept consists of a 25cm wide-field telescope installed on the DLR compact satellite bus orbiting in LEO. The telescope continuously scans the region of the sky in the range of 30° to 60° solar elongation. Asteroids in the field are identified through their apparent motion across subsequent images. The telescope is body-mounted to the platform, and the necessary pointing is achieved through rotation of the spacecraft. The minimum mission lifetime is one year, with payload and satellite components designed for at least two years. Currently the mission is in its phase A, with a target launch date around the end of 2011.

This mission will contribute to the newly defined NASA goal for the Spaceguard II initiative, i.e. the extension to find 90% of all Earth-threatening objects down to a size of about 150m in diameter. Furthermore, this experiment complements the ongoing ESA activities concerning the definition of a mission within the Cosmic Vision Program employing novel technologies to study the physical nature of NEOs.