Exploration of Near Earth Asteroids (06)
Precursor Missions to NEAs (2)

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THE MOBILE ASTEROID SURFACE SCOUT (MASCOT) – SYSTEM & MISSION ENGINEERING AND SURFACE OPERATIONS CONCEPT

Abstract

The Mobile Asteroid Surface Scout (MASCOT) is currently under development as a DLR contribution to the Japanese Hayabusa 2 mission, a sample return mission to the C-type near-Earth asteroid 1999JU3. MASCOT is a small – about the size of a shoe box – deployable package with a total mass of 10kg. It enhances the missions scientific return by providing ground truth information from different surface sites by relocating itself with an hopping mechanism. It is thus complementing the sample return mission. It will also accomplish stand-alone science only a surface asset can perform and will serve as reconnaissance and scouting vehicle. Challenges to the design of a small-body landing package are the geo-technical properties of these bodies, which are apriori basically unknown. The shape and rotational state can be irregular resulting in a complex gravity field, whereas the surface properties will even differ largely across the surface of one asteroid. The marginal knowledge of the environmental conditions affects mainly the mobility capabilities and guidance control performance. To fulfill its mission objectives while satisfying the tight mass and volume budget constraints in view of a highly uncertain environment, MASCOT is designed as a highly integrated small landing package with some degree of autonomous robotic operations capability on the asteroid surface. This paper introduces the system design as well as the payload suite

of MASCOT and then focuses on mission design aspects and the surface operational concept. Hereby, the interaction of the mobility subsystem, the attitude motion determination sensors and the payload – coordinated by MASCOT's onboard decision making entity – is discussed in detail. An outlook to functional end-to-end simulation and testing is given.