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MAGIC
(Mobile Autonomous Generic Instrument Carrier): Environment Specification & Requirements Assessment

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Abstract

This paper presents first results of the DLR MAGIC (Mobile Autonomous Generic Instrument Carrier) study. MAGIC, a small robotic landing system that can autonomously relocate and upright, shall allow carrying variable suites of innovative instrumentation (up to a limit of ca. 3kg) for *in-situ* exploration to a broad, but defined, range of small bodies (such as asteroids, Near Earth Objects (NEO) and small moons). The instrumentation delivered shall allow studying the body's physical properties, internal, surface and subsurface structure and its chemical composition, thus being a complement to any rendezvous or sample return missions to small bodies.

The MAGIC study is based on the common DLR and CNES asteroid lander development MASCOT (Phase B) – which is to fly on the JAXA sample return mission Hayabusa-2 in mid 2014. The objective of the study is to transfer the dedicated MASCOT design, into a generic modular lander design applicable to varying mission scenarios.

Relevant asteroid research objectives, according to the international community, for utilisation of a MAGIC like lander are (i) preparation of human missions with robotic precursor that assess the surface in order to maximise the efficiency of future human missions and identify potential hazards, (ii) investigation of the mysteries of the formation of the Solar System, and the detection of indices for the origin of life on Earth, (iii) research on the internal structure of NEOs in order to develop impact mitigation strategies.

During this talk we will briefly present the MASCOT baseline design, but focus more on assessment of design implementations coming from the objective of a lander design applicable to a broader range of missions. Thus, we will present a range of possible mission scenarios minimally compliant with above listed research objectives.

The study focus at this stage lies on specification of the environmental characteristics of potential target asteroids. The lander design driving requirements coming from both, the asteroid environment as well as operational constraints will be presented. A range of potential target environments in terms of asteroid properties, i.e. orbit, inclination, rotation period, gravity, physical and thermal surface properties, radiation, etc., will be defined. Presenting these we strongly desire to trigger a discussion on the assumptions made and get some feedback from the science community.

Besides the asteroid environment and the operational scenario, the payload itself normally is another major design driver. However, to ensure the lander platform to be as generic as possible it is of major importance to standardize as much of the payload interfaces (mechanical, electrical and software), as possible, hence, limiting the dependence of lander platform design from payload selection. Therefore we will additionally present a preliminary specification of a standardized payload interface