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MORE THAN ONE FOR ALL – THE SYNERGY OF MODULARITY AND RE-USE IN NANOLANDER DEVELOPMENT IN THE CONTINUATION OF THE DESIGN OF MOBILE ASTEROID SURFACE SCOUTS (MASCOT)

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ABSTRACT

MASCOT, the Mobile Asteroid Surface Scout nanolander successfully landed and operated on C-type Near-Earth and Potentially Hazardous Asteroid (162173) Ryugu on October 3rd, 2018. It was carried there by the JAXA spacecraft HAYABUSA2 which continues to explore this asteroid and will eventally return samples of it to Earth. MASCOT is not the first, but certainly one of the more complex nanolander systems designed to be carried along by a larger interplanetary spacecraft. Other concepts and current missions have shown the attractiveness of nanospacecraft in an application range from Earth-orbiting cubesats to interplanetary scientific exploration

endeavors ranging from fast fly-by to landing missions. We investigate nanolander options based on the MASCOT lander concept for a range of target bodies of interest. Their respective environmental properties as well as their influence on the nanolander design are analyzed. Landing systems, surface mobility, power subsystem design and communication architecture are affected by changes of the target object. With the specific interest in every new target body, an expansion of the scientific objectives of the current MASCOT lander from geological surface scout to other scientific objectives opens a range of new possibilities. We provide an overview of possible alternative payloads to those flown on MASCOT and analyze their influence on the system design. The experience that has been gained with MASCOT provides us with a head start for future missions, if it is properly exploited. With this paper we intend to recommend MASCOT type of nanolanders for a range of possible future applications, including all characteristic missions of planetary defense.

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