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IAF SPACE EXPLORATION SYMPOSIUM (A3)
Small Bodies Missions and Technologies (Part 2) (4B)

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CHARACTERISATION OF A POTENTIALLY THREATENING NEO

Abstract

The "Space Missions Planning Advisory Group" (SMPAG) has been established by the Working Group on Near-Earth Objects (NEOs) of the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space in 2013. Its primary purpose is to prepare for an international response to a NEO threat through the exchange of information, development of options for collaborative research and mission opportunities, and to conduct NEO threat mitigation planning activities. The SMPAG members have devised a Work Plan consisting in eleven activities aiming at defining and implementing appropriate mitigation strategies. This paper will focus on the present status of one of these activities, called NEO Tool Kit, which is dedicated to the definition of a "straw man payload" which should be available on a reasonably short notice for a characterization mission. The goal of this space mission would be to determine the physical and dynamical information required to design an effective mitigation mission, soon after a hazardous asteroid has been discovered.

We will first describe the various mitigations methods which could be applied to either destroy a threatening NEO, or deviate it slightly from its catastrophic trajectory. The main physical parameters required by each of these methods will then be presented. The assessment of the true impact probability for the hazardous asteroid is actually the first important aspect in this regard, since it can render an expensive mitigation mission obsolete. We will then elaborate the type of reconnaissance missions that could be envisioned (essentially fly-by missions, and under favourable circumstances Rendez-Vous orbiter missions). The objectives that could be fulfilled by each type of mission will be discussed, and the instruments that should be associated to meet these objectives will be elaborated in details. A particular attention will be paid to possibilities offered by the recent progresses in miniaturisation, which make possible a combined investigation by a set of probes, generally under the form of a mothership in conjunction with a few cubesats. The benefice of this approach which be illustrated, in particular in the context of reconnaissance fly-by missions.