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Future and current space missions: including and expanding all aspects of human life on-board and in other worlds (1)

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ASTEROID MINING - AN INTERDISCIPLINARY STUDY

Abstract

There are around nine hundred asteroids with diameters of two-kilometers in near-Earth orbits. There are approximately one billion of such near-Earth objects (NEOs) with diameters of approximately ten meters and much larger number of even smaller objects. Undisturbed, approximately one-third of these will impact Earth eventually, the larger ones with devastating effects. While major impacts will, for the most part, be far in the future, in due course a solution to the dangers posed by large NEOs will need to be found. One potential solution would be to dismantle them and make use of the resulting minerals and volatiles either for construction in space or for return to Earth.

This paper will present the results of an interdisciplinary project conducted by an independent team of graduate students and young professionals from a wide variety of professional backgrounds at the 2010 Space Studies Program of the International Space University in Strasbourg, France. The aims of the project are to define, document and critically assess previous research into asteroid mining, identify suitable candidate asteroids for exploitation/mining, define systems to deliver asteroidal metals for use on Earth or in near-Earth space and perform a trade study to determine which offers the most beneficial outcomes. In addition, the team will examine the potential role of humans in asteroid mining and the related ethical, social and medical aspects and legal status of asteroid mining, identify any potential obstacles and determine possible solutions, before assessing the economic viability of the mission options and describing a business plan to deliver asteroidal metals in such a way as to preserve their market value.