

SYMPOSIUM ON STEPPING STONES TO THE FUTURE: STRATEGIES, ARCHITECTURES,
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DESIGN AND LOCATION OF AN ASTEROID MINING SPACE STATION

Abstract

Exploration and utilization of asteroids has been one of the most ambitious and yet appealing future commercial applications of space. While many have focused on the technical and financial feasibility of asteroid mining, the support systems and technologies for such an endeavor have been overlooked. This paper provides conceptual research on certain parameters of a space station orbiting a Near Earth Asteroid (NEA) in support of its mining operations. The space station is designed for a crew of 20 inhabitants and is expected to support extraction of materials such as water, Nickel-Iron and Platinum group metals (PGMs). The paper discusses possible structural designs and orbital location for the space station. The space station is proposed to supplement industrial and mining activities on the asteroid. The station rotates about its principle axis in order to provide artificial gravity to the crew. The station provides habitation for 20 people in two habitats connected to their center of rotation by trusses. The center of rotation contains a non rotating cylindrical module that incorporates a control unit that communicates to the asteroid based mining systems, LOX and LH2 storage units and a mined material processing unit. The solar arrays and docking facilities are contained on the axis perpendicular to the axis of rotation. Radiation and micro-meteorite shielding is proposed through the use of Whipple shields. Many possible asteroid target locations have been discussed for reasons of accessibility, ease of return, and probable ease of extraction of both metals and volatiles. These include asteroids 1950DA, 1986DA, 1996FG3 and 1999JU3.