

SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FAR FUTURE (D4)  
Contribution of Space Activities to Solving Global Societal Challenges (4)

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STUDY ON CRITICAL TECHNOLOGIES AND MISSION ROADMAP FOR ASTEROID MINING

**Abstract**

Thousands of asteroids in solar system are not only the threat to our exclusive planet, but also the valuable resources for humankind in the future. Global countries should be unite to actualize asteroids mining engineering that will solve the problems about our expanding consumption, asteroid collision avoidance, Large-scale manned deep space exploration, even migrate outer space problems. This article presents a series of mission modes based on the perspective of aerospace engineering like different types of asteroids model, manned or unmanned mining model, in-situ coarse or exact mining model, asteroid overall or resource return model, asteroid in-orbit or orbit change control model. And proposes to solve the critical techniques including asteroid detection and cataloging, long-distance detection of material, asteroid landing, the asteroid orbit control, large-scale space transportation, crew to and from the long-term presence. Finally, it presents 6 kinds of mining mission architectures for small asteroids and 5 for large asteroids. As a result of scheme comparison and optimization, an original and feasible roadmap for asteroids mining in short-term (2013-2020), medium-term (2021-2030) and long-term (2031-2045) are proposed in this paper.