

SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FAR FUTURE (D4)  
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VACUUM-ARC ASTEROID THRUSTERS (VAST) – A DESIGN CONCEPT FOR AN ASTEROID  
SPACE TRANSPORTATION SYSTEM

**Abstract**

The mining of asteroids for valuable raw materials has been recognised as one of the most important space endeavours that must be undertaken towards establishing a mature space-faring civilization. However, a number of major practical and technical challenges need to be overcome. One such challenge is the task of transporting asteroid material to earth or near-earth space for eventual processing and utilization. As a result of concept studies performed since the 1970's, it has been recognized that in-situ use of asteroid material as propellant is the most feasible method of transporting such large masses. To date, one of the leading propulsion technologies proposed to accomplish this has been Mass Drivers. However, this paper presents an alternative design concept to the Mass Driver based on Vacuum-arc Plasma Thrusters. Whilst these devices are currently being considered for use as micro-thrusters on small satellites, they have the potential to be massively scaled up to a size suitable for propelling large bodies such as asteroids. This paper demonstrates that the Vacuum-arc Asteroid Thruster (VAST) concept can recover a significantly higher fraction of asteroid material compared to the Mass Driver; is highly scalable to body size and shape; and is potentially safer to operate when in the near-earth space environment. Limitations with present technological capabilities and guidelines for addressing them will also be discussed.