

From Earth Missions to Deep Space Exploration (05)  
Cis-Lunar Outposts and other Exploration Missions (5)

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A SUSTAINABLE LOGISTICS ARCHITECTURE FOR EXPLORATION OF THE MOON,  
ASTEROIDS, AND MARS

**Abstract**

Aerojet has identified an affordable architecture for human exploration of deep space. Following the key tenets of launch and in-space commonality, efficient in-space transportation, and phased capability development drives the overall cost of missions to the Moon, NEOs, Phobos, and the surface of Mars to within NASA's existing Exploration budget while ensuring that risks to the crew and mission are minimized. Using high power solar electric tugs to preposition all non-time critical cargo and using conventional LOX/H<sub>2</sub> or nuclear thermal high thrust systems for crew transportation enables the use of smaller launch vehicles with great commonality across NASA, DoD, and commercial missions, distributing fixed launch costs across a broad customer base and dramatically exploration costs. Both 300kW and 600kW SEP Tugs are used for pre-placement of habitats, exploration equipment, and return vehicles at the destinations, allowing complete systems verification prior to crew Earth departure, significantly reducing the risks from the crewed portion of the mission.