

Technology Roadmaps for Space Exploration (09)  
Advancing Propulsion Technologies (4)

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NUCLEAR THERMAL PROPULSION FOR CREW TRANSPORT 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 Nuclear Thermal Propulsion (NTP) for time-critical crew transport along with high power solar electric tugs for non-time critical cargo 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 reducing exploration costs. Using modern technologies, Isp's greater than 900 seconds can be obtained at thrust levels ranging from of 5 klbf to 75 klbf and higher. This allows for sets of NTR engines to be used together to provide efficient high thrust burns to reduce the transit time between Low Earth Orbit and the desired destination while also reducing the propellant required round-trip missions to a destination. Thus providing a redundant system that lowers the mission impact on the crew and reduces the cost of launch and staging of the mission in LOE prior to departure.