

HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)  
Human Exploration of the Moon and Cislunar Space (1)

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THE ASTEROID REDIRECT MISSION AND SUSTAINABLE HUMAN EXPLORATION

**Abstract**

The Asteroid Redirect Mission is an affordable, near-term, compelling utilization of critical exploration capabilities currently under NASA development that enable many future human exploration missions. The crewed mission in the mid-2020's will include the Space Launch System (SLS) heavy-lift crew launch vehicle; Orion multi-purpose crew vehicle; advanced technologies and systems for rendezvous and extra vehicular activities (EVA); the International Docking System; and crewed/robotic vehicle integrated stack operations. The preceding robotic mission will demonstrate high power, long life solar electric propulsion (SEP) for future cargo delivery and interaction with low gravity, non-cooperative targets.

One approach under consideration for the robotic mission is to rendezvous with a small 4 – 10 meter mean diameter Near Earth Asteroid (NEA) and redirect it to a stable, crew-accessible lunar distant retrograde orbit. NASA has also pursued the study of another concept to rendezvous with a larger NEA (100+ meter diameter), collect a 1-5 meter diameter boulder, and return the boulder to the same orbit. The potential demonstration of multiple planetary defense aspects and deflection techniques is also being examined.

Once the asteroidal mass is returned to the proper orbit in cis-lunar space, the crewed mission will be launched. The Orion spacecraft will serve as the crewed transportation vehicle, habitat, and airlock for this mission. Orion will be launched into cis-lunar space on the SLS, allowing it to rendezvous and dock with the robotic spacecraft to demonstrate early human exploration capabilities including longer duration operations in deep space, rendezvous and proximity operations, life support and EVA capabilities. Two EVAs, each four hours in duration, are envisioned to explore, select, and obtain samples via a variety of sample collection options being examined. Using the SLS/Orion systems, the ARM is the next significant step in human exploration beyond low earth orbit. The systems proven on this mission will provide for a sustainable path to longer duration missions in deep space; developing the capabilities needed ultimately for mission to Mars.

NASA will present the status of mission formulation, including evolution of concept development based on external inputs received. The applicability and timing of this mission in the early 2020's for future human exploration will be also described.