

NASA Advisory Council Recommendation

Demonstrate and Articulate the Justification and Strategy for NASA's New Asteroid Initiative 2013-01-01 (HEOC-01)

Recommendation:

NASA should clearly demonstrate and articulate a strategy for the Agency's new Asteroid Initiative that highlights the benefits that will be gained, making progress toward NASA goals while furthering science and technology and benefiting humankind. The Agency should clearly demonstrate how the Initiative will serve as a stepping stone to NASA's ultimate goal of a human mission to Mars. Potential benefits include involving operations that could apply to future missions, including life support and deep space habitability, advanced propulsion, complex ground and space operations, rendezvous in new gravitational environments, and sampling of small objects.

The Agency should also demonstrate and articulate other potential benefits:

- Benefit the United States by forging new industrial capabilities and international partnerships.
- Benefit humankind by advancing technologies and operations that might someday assist in the development of a defense strategy for Earth-bound asteroids.

Major Reasons for Proposing the Recommendation:

Current budget constraints result in Federal agencies having to justify and fight for annual budgets. It is in NASA's best interests to demonstrate and clearly articulate the benefits of the Asteroid Initiative to the public and Congress in a way that accurately represents its merits. Asteroid impact is in the public mind after the recent event in Chelyabinsk, Russia. As part of the new Initiative, NASA can take action to identify asteroids that might impact the Earth.

Consequences of No Action on the Proposed Recommendation:

In the absence of a clearly demonstrated and accurately articulated justification, the new Asteroid Initiative might miss external interest, leading to loss of public and Congressional support.

NASA Response:

NASA concurs with the recommendation of the NASA Advisory Council.

NASA's FY 2014 budget proposes an innovative asteroid initiative which leverages on-going investments in space technology, science and space exploration in order to make simultaneous progress toward a range of goals, including:

- Advancing technologies and capabilities applicable to future exploration, as well as science, commercial and other U.S. Government space activities;
- Integrating these efforts to lead to the first-ever human mission to an asteroid; and
- Accelerating efforts to improve detection, characterization, and mitigation of potentially hazardous asteroids to help plan for the defense of our planet against the threat of catastrophic collisions.

Enclosure

Each of the leveraged activities individually provides technology advancements or new capabilities for human exploration, science and commercial applications, and include:

- Asteroid identification and characterization efforts for potential hazardous asteroids;
- Advanced high power solar electric propulsion for future robotic missions, human space exploration, and commercial applications;
- Autonomous guidance and control for deep space proximity operations and capture;
- Exercising Space Launch System and Orion crew vehicle initial capabilities; and
- Technologies for deep space astronaut extra vehicular activity (EVA).

The initiative enables both the Grand Challenge, to “find all asteroid threats to human populations and know what to do about them” and an integrated asteroid mission, composed of three separate and independently compelling elements: the detection and characterization of candidate near-Earth asteroids; the robotic rendezvous and redirection of a target asteroid to the Earth-Moon system; and crewed exploration and sampling of the captured asteroid using the Space Launch System (SLS) and the Orion crew vehicle. This mission represents an unprecedented technological challenge — raising the bar for human exploration and discovery, while helping protect our home planet and bringing us closer to a human mission to Mars in the 2030’s.

The necessary search for a suitable target asteroid will provide a significant increase in the discovery rate of NEOs along with an associated increase in the characterization of this population. Our greater understanding of small bodies in Earth’s vicinity would benefit planetary defense activities; which aligns perfectly with the goals of the Grand Challenge. Those near Earth objects that are most easily reached by spacecraft are the same objects that represent the greatest likelihood of striking Earth. A better understanding of this population would benefit both planetary science and planetary defense.

Through the Grand Challenge, NASA will expand upon current efforts to enhance capabilities to detect, track and characterize hazardous near Earth asteroids and plan mitigation responses. Central to the Grand Challenge is the use of innovative methods like crowd sourcing, prizes and challenges, citizen science, and public/private partnerships to leverage NASA’s planned investments and meaningfully engage the public.

The asteroid redirect mission utilizes human space flight capabilities currently under development in important ways during early operations in the early 2020’s. Astrodynamically stable regions in the lunar vicinity offer locales for early operations in deep space environments. Interactions with an asteroid in this region will allow NASA to test and gain operational experience in proximity operations and rendezvous with a non-cooperative target, astronaut experience in complex EVA, and sample collection, handling and return.

In addition, these locales offer an ideal venue for initial crewed operations in regions in which returns to Earth are impossible for many days. This will stretch our human space flight capabilities in a safer approach than very long journeys of many months to a year. This allows NASA to gain experience in practicing aborts and contingency procedures, and handling maintenance and repair, including with EVA.

These activities will keep the U.S. in the forefront of peaceful uses of outer space, complement scientific investigations and technology demonstrations on the International Space Station, and provide valuable experience in mission planning and operations to prepare and reduce risk for future crewed deep-space missions, such as a future human mission to Mars. We are currently working on an analysis of the technologies and capabilities planned for and operational experience gained in this mission, albeit in early planning stages, and how they would be a stepping stone to NASA's goal of a human mission to Mars.

Continued progress on the mission is conditional upon identification of a technically and programmatically feasible concept. NASA anticipates completing this summer (2013) an internal review of the asteroid redirect mission to assess technical and programmatic aspects of the mission. Budgetary findings of this review will be integrated into budget planning for FY 2015 with other priorities. Based on the results of this summer's review and the further maturation of this mission concept, NASA will continue to evolve the story of this asteroid mission, the broader asteroid strategy, and how these build toward our future in deep space exploration.

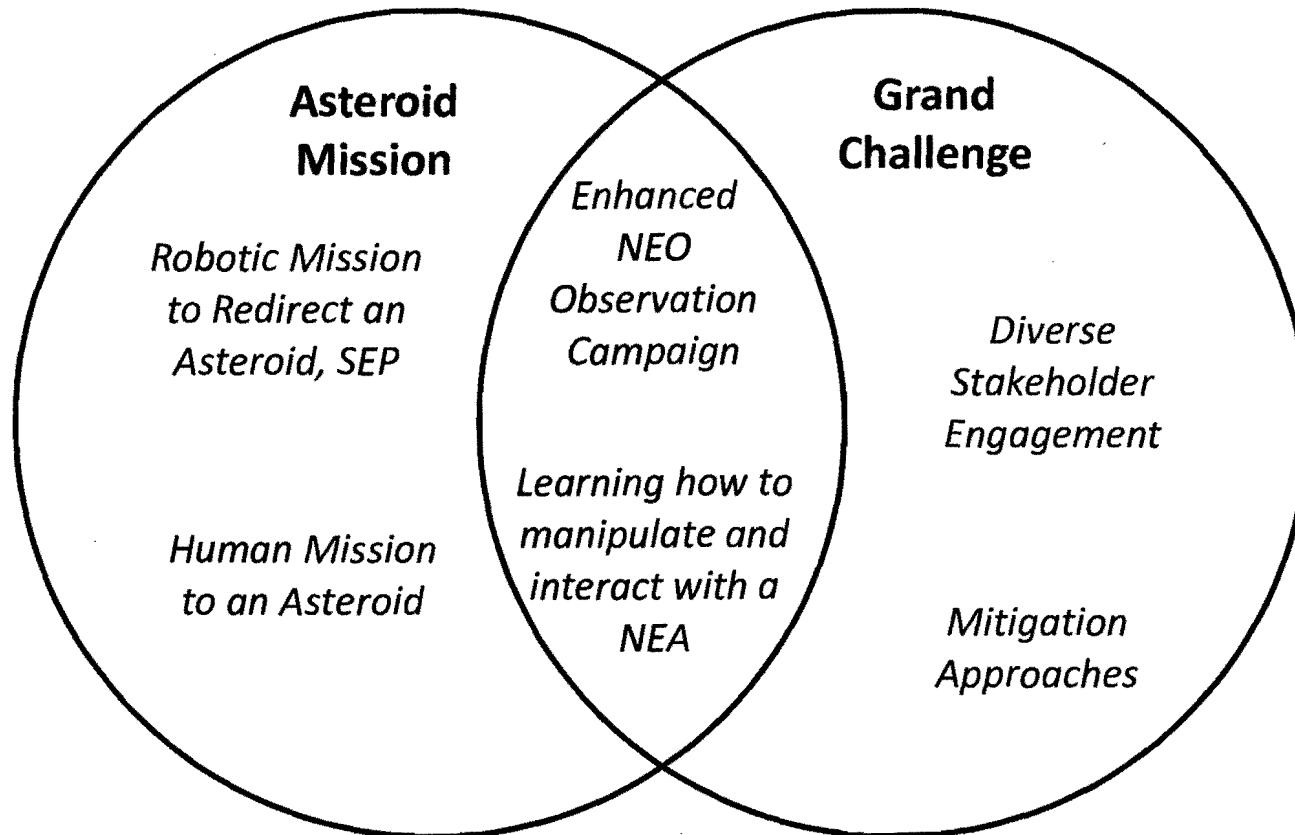
Announcement of the Grand Challenge has already engaged members of the public looking to participate in the exciting work of NASA. A fall workshop will bring together those with great ideas to assist in the development of an implementation plan for the Grand Challenge. Nominally, a Grand Challenge has a 10-15 year time horizon, so in the near-term the planning budget will be baselined at FY 2014 levels.

We would like to offer a briefing on the Asteroid Initiative to the NASA Advisory Council at its next meeting.

FY14 Asteroid Initiative

- **NASA has a broad asteroid strategy which aligns relevant portions of NASA's science, space technology, and human exploration capabilities for a human mission, advanced technology development, efforts to protect the planet, and engages new industrial capability and partnerships**
- **The FY14 Asteroid Initiative consists of two mutually supporting activities, both leveraging on-going activities to:**
 - **Redirect a small asteroid to a stable orbit in trans-lunar space, followed by sampling by astronauts in early operations of Orion and SLS.**
 - **Lead an effort to find all asteroid threats to human populations and know what to about them.**
- **This initiative includes a parallel, forward-looking mission development approach, partnership opportunities (nationally and internationally), open innovation, and participatory engagement.**

FY14 Asteroid Initiative: What and How



Both sets of activities leverage existing NASA work while amplifying participatory engagement to accomplish their individual objectives and synergize for a greater collective purpose.