

Findings from the 11th Meeting of the NASA Small Bodies Assessment Group (SBAG)

The Need for a Near-Earth Object Survey

The NASA Authorization Act of 2005, Section 321, cited as the “George E. Brown, Jr. Near-Earth Object Survey Act” directs that “the Administrator shall plan, develop, and implement a Near-Earth Object Survey program to detect, track, catalogue, and characterize the physical characteristics of near-Earth objects equal to or greater than 140 meters in diameter in order to assess the threat of such near-Earth objects to the Earth. It shall be the goal of the Survey program to achieve 90 percent completion of its near-Earth object catalogue (based on statistically predicted populations of near-Earth objects) within 15 years after the date of enactment of this Act.” The stated goal of NASA’s Asteroid Grand Challenge is “to find all asteroid threats to human populations and know what to do about them,” which is well aligned with the congressional direction to identify potentially hazardous objects. However, no plan has been defined or resourced to achieve the congressional goal by 2020. A dedicated space-based survey telescope would achieve this goal in the shortest period of time. SBAG reiterates that a space-based NEO survey telescope would be a foundational asset, significantly advancing NASA’s human exploration, science, and planetary defense objectives.

The Asteroid Redirect Mission

SBAG is composed of members with knowledge and expertise in small bodies throughout the Solar System, including asteroids. As such, the group has pertinent expertise to assess the Asteroid Redirect Mission (ARM) concept in its ability to address strategic objectives identified in the planetary Decadal Survey, in the context of small bodies exploration priorities, and in determining the outstanding risk factors for the execution of the concept based on current knowledge of the NEO population and their characteristics. SBAG supports the following findings as related to the ARM concept:

The portion of the ARM concept that involves a robotic mission to capture and redirect an asteroid sample to cis-lunar space is not an effective way to advance the knowledge of asteroids or further planetary defense strategies.

Limits in the current knowledge and large uncertainties in the properties of near-Earth asteroids contribute significantly to schedule and cost risk and ultimately to the likelihood of success of either Option A (redirect an entire small asteroid) or Option B (capture and return a large boulder from a larger asteroid) of the robotic ARM concept. Current surveys, observing programs, and other projects are not positioned to sufficiently bridge this knowledge gap or significantly mitigate these risks. There does not appear to be sufficient time in the schedule for a precursor mission that could address many of these gaps and mitigate risk.

After the SBAG 10 meeting in January 2014, at the request of NASA, the SBAG Asteroid Redirect Mission Special Action Team (SBAG ARM SAT) was formed and tasked by NASA with providing specific input on the likely physical composition of

small (<10 meter diameter) near-Earth asteroids, the likelihood and nature of boulders on asteroids, relevant information gained from meteorites, the properties of asteroid regolith, and the potential for science, planetary defense, and resource utilization. The SBAG ARM SAT responses to these tasks are summarized in the following documents available on the “Documents” section of the SBAG website and provide more detailed scientific and technical information about the current knowledge of properties of near-Earth asteroids, the limits of that knowledge, and the significant associated uncertainties:

http://www.lpi.usra.edu/sbag/documents/SBAG_ARM_summary_021914.pdf

http://www.lpi.usra.edu/sbag/documents/SBAG_ARM_SAT_07_30_14.pdf

http://www.lpi.usra.edu/sbag/documents/SBAG_ARM_SAT_07_30_2014_slides.pdf

The Discovery Program

SBAG strongly supports the planetary science Decadal Survey and finds that having a Discovery AO in 2014 is a major step to achieving the strategy outlined in the Decadal Survey. The Discovery Program has been highly successful and is of crucial importance to the future scientific exploration of the Solar System. SBAG supports maintaining a regular cadence of Discovery AOs and further urges achieving mission selections at the Decadal Survey recommended ≤ 24 month cadence.

The New Frontiers Program

The planetary Decadal Survey states the importance of having two New Frontiers class missions in the decade to achieve a balanced exploration portfolio of the Solar System. OSIRIS-REx was selected in May 2011 as the third mission in the New Frontiers Program, and SBAG encourages an AO for the fourth mission selection in the near future as OSIRIS-REx development work is completed.

The Value of Planetary Radar

Radar is a powerful technique for constraining asteroid orbits, shapes, sizes, and spin states, as well as the potential presence of small orbiting companions and boulders on an object's surface. The capability of radar for revealing the character of small near-Earth asteroids is exemplified by the recent bistatic observation of 2014 HQ₁₂₄. A chirped X-band transmission from Goldstone was received by Arecibo using a new digital receiver. To enable the ability to characterize potential targets for robotic or crewed exploration and for assessing risks associated with potentially hazardous objects, it is essential to maintain the facilities able to do this work. SBAG reiterates its concern about the future stability of funding for key planetary radar facilities, especially in light of the December 2013 "Dear Colleague" letter from the National Science Foundation.

The Establishment of a Planetary Defense Coordination Office

SBAG reiterates the importance of establishing a Planetary Defense Coordination Office, as recommended by the 2010 NASA Advisory Council Planetary Defense Task Force, following the NASA Authorization Acts of 2005 and 2008 that affirmed the need for the

establishment of policy and responsibilities with respect to a response for threats posed by near-Earth objects. While the efforts through the NEO Observation program are laudable, an office that would coordinate planetary defense activities across NASA, other U.S. federal agencies, foreign space agencies, and international partners is still needed.

The B612 Sentinel Project

The B612 Foundation has been unable to meet scheduled milestones under its Space Act Agreement with NASA for the Sentinel mission. SBAG is concerned that reliance on this initiative has delayed NASA's ability to move forward on a NEO survey telescope that is competed and optimally designed to address NASA strategic objectives across planetary defense, human exploration, and science.