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☐ **Planetary Defense – Recent Progress & Plans**
☐ **NEO Discovery**
☐ **NEO Characterization**
☒ **Mitigation Techniques & Missions**
☐ **Impact Effects that Inform Warning, Mitigation & Costs**
☐ **Consequence Management & Education**

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NASA'S ASTEROID REDIRECT MISSION LEVERAGES ENHANCED PHA DETECTION AND DEMONSTRATES POTENTIAL MITIGATION OPTIONS

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ABSTRACT

NASA is developing a first-ever robotic mission to visit a large near-Earth asteroid, collect a multi-ton boulder from its surface, and use it in an enhanced gravity tractor asteroid deflection demonstration. The spacecraft will then redirect the up to 4-meter mean diameter boulder into a stable orbit around the moon, where astronauts will explore it and return with samples in the mid-2020s.

This Asteroid Redirect Mission (ARM) is part of NASA's plan to advance the new technologies and spaceflight experience needed for the journey to Mars in the 2030s, and for other compelling future destinations farther into the solar system. ARM comprises three primary components: identify an asteroid candidate; robotically collect and redirect a boulder from the asteroid's surface to a lunar distant retrograde orbit; and send humans to visit it once it's been placed in the stable orbit around the moon. To identify a valid candidate asteroid, the agency is relying on its Near Earth Object Observation (NEOO) Program, the most robust and productive survey and detection program for discovering near-Earth objects (NEOs). In 2013, as part of the Asteroid Grand Challenge, NASA's NEOO Program amplified its coordinated efforts across the agency and global asteroid observation community to detect, track and

characterize potentially hazardous asteroids and identify ways to mitigate impact threats to humanity. Through this enhanced effort, the NEOO Program has found a number of asteroids that come very close to the Earth-moon system that might be suitable for the ARM. In March 2015, NASA approved a baseline mission concept for the robotic mission. NASA has already identified four candidate asteroids that have the right physical characteristics suitable for the mission. During the robotic segment of the ARM, the spacecraft will demonstrate “slow push” planetary defense techniques on the target asteroid. The enhanced gravity tractor technique involves using the mass of the both robotic spacecraft and the captured boulder to impart a gravitational force on the large asteroid, slowly altering its trajectory. This paper will describe the baselined ARM robotic mission concept and the forward plan resulting from the mission concept review in March 2015.