2024

IAF COMMITTEE ON PLANETARY DEFENSE AND NEAR-EARTH OBJECTS (NEOs)

Introduction

Planetary defense is the term used to encompass all the capabilities needed to detect and warn of potential asteroid or comet impacts with Earth, and to prevent and mitigate their possible effects. A Near-Earth object (NEO) is an asteroid or comet whose orbit brings it within about 50 million kilometres of Earth's orbit. The primary objective of the Technical Committee (TC) on Planetary Defense and Near-Earth Objects (NEOs) is to raise awareness among the global space community, particularly the IAC audience, about the ongoing work within the planetary defense community and to get more people, especially students and young professionals, interested and actively participating in the field.

Summary

Planetary Defense remains a hot topic with several missions in flight, in preparation, being planned, or being repurposed after the main mission has been successfully accomplished. Workshops, conferences, and scientific meetings are being held and outreach activities such as Asteroid Day on 30 June are taking place. The Double Asteroid Redirection Test (DART) team continues to analyze the data from the first flight demonstration of one technology to prevent an asteroid impact. NASA's DART spacecraft intentionally slammed into Dimorphos the small moon of the binary asteroid Didymos, on 26 September 2022. A series of papers were published in summer 2024 (including some in the Nature and Science Groups) that exposed the current understanding of the outcome of the DART impact and made predictions for what the ESA Hera mission will discover when reaching the Didymos system in fall 2026.

The United States held its fifth interagency tabletop exercise about planetary defense, which included—for the first time—international participants. The exercise emphasized international collaboration and coordination on planetary defense space missions, near-Earth object impact disaster preparedness, and public messaging.

Highlights

2024 marked the tenth anniversary of the first meeting of the International Asteroid Warning Network (IAWN), which is a worldwide collaboration that supports asteroid detection, tracking, characterization, and modeling in support of planetary defense.

This year also saw the conclusion of the NEOWISE (Near-Earth Object Wide-field Infrared Survey Explorer) mission. NEOWISE was a repurposed space-based infrared telescope that for more than ten years provided critical discoveries of and information about near-Earth objects.

Figure 1- The Hera team in ESA's cleanroom before transport of Hera to Florida for launch

In October 2024 (one week before the IAC in Milan), ESA's Hera mission launched and began its journey to the same binary asteroid system that saw the DART impact in September 2022. After the Hera spacecraft's rendezvous with the binary system at the end of

December 2026, Hera will measure in detail the effect of DART's impact on Dimorphos, as well as the physical and compositional properties of the asteroid, including for the first time the asteroid's internal structure, which has great influence on the impact outcome. With DART, it will offer the first fully documented impact deflection test at the scale of an asteroid and improve greatly our understanding of the geophysics of near-Earth asteroids.

Future Outlook

The RAMSES mission is under study at ESA to perform a rendezvous with the asteroid Apophis before its close passage to the Earth on April 13, 2029, in order to characterize the properties of Apophis before and during the passage and observe possible surface change due to Earth tidal forces. The data can then be compared with those of NASA's OSIRIS-APEX mission taken shortly after the close passage, making it possible to observe long-term effects. RAMSES relies on the platform developed for Hera and, if funded, would help to demonstrate that we can rapidly implement a space mission. RAMSES launch needs to occur in April 2027 for a rendezvous, and such a development timeline is very short in current standards. Discussions are taking place with ESA delegations to get it funded so that we do not miss the unique chance to have a mission around Apophis while more than 2 billion people can observe it from the Earth in Western Europe and North Africa with naked eyes, something that only occurs once in a millennium.

NASA's next planetary defense mission, the Near-Earth Object (NEO) Surveyor telescope, continued to make progress toward a launch later this decade. NEO Surveyor is a dedicated, space-based telescope designed specifically to find NEOs that may be potentially hazardous to Earth.

A group is also proposing to the UN that 2029 officially becomes the international year of planetary defense. The proposal is under finalization and the decision should take place in 2024.

Committee activities

During the Special Session organized by the committee at IAC 2023 in Baku, Apollo 9 astronaut Rusty Schweickart announced the Schweickart prize, open to students globally who contribute to planetary defense. The committee is supporting this initiative.

https://www.schweickartprize.org/

Most Committee members are active in the Organizing Committee of the 2025 Planetary Defense Conference (PDC) which will be held May 5-9 in Stellenbosch, South Africa.

https://iaaspace.org/pdc