NASA's Planetary Defense Coordination Office

- NASA Infrared Telescope Facility
- Near-Earth Asteroid Eros
- Pan-STARRS Observatory
- Comet ISON
- Goldstone Radar
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What are near-Earth objects and why do we need to study them?

Near-Earth objects (NEOs) are asteroids and comets that have been nudged by the gravitational attraction of nearby planets into orbits that allow them to enter Earth’s neighborhood. Like the planets, all asteroids and comets orbit the Sun. They are remnants of the formation of planetary bodies in our solar system.

Our solar system contains far more asteroids than comets, and thus far more near-Earth asteroids than near-Earth comets. Most asteroids orbit the Sun in a region called “the main belt” between Mars and Jupiter. The vast majority of near-Earth asteroids come from the inner part of the main belt, where their orbits were altered, some by mutual collisions but most by the gravitational influence of Jupiter and Mars.

Most asteroids are the size of grains of sand, and they bombard the Earth at the rate of more than 100 tons a day. Although the vast majority of larger near-Earth asteroids that enter Earth’s atmosphere explode and disintegrate there, fragments of larger asteroids that explode in the atmosphere could hit Earth’s surface and cause damage in and around their impact sites. The hazard posed by possible impacts of asteroids with Earth’s atmosphere or surface is the reason why we need to study near-Earth objects.

What is NASA doing to protect Earth from asteroid impacts?

NASA’s Near-Earth Object (NEO) Observations Program sponsors projects dedicated to finding, tracking, and characterizing near-Earth objects. All projects supported by this program are required to make their data available in a timely manner to the global scientific community. The global public archive for these data is the Minor Planet Center, which is sanctioned by the International Astronomical Union and supported by the NEO Observations Program.

NASA-funded surveys have found 98 percent of the known catalog of over 20,000 near-Earth objects (only a little more than 100 of these objects are comets). These surveys are currently finding NEOs at a rate of about 1,800 per year. The current objective of the NEO Observations Program is to find, track, and catalog at least 90 percent of the estimated population of NEOs that are equal to or greater than 140 meters in size in coming years and to characterize a subset of those objects that is representative of the entire population. Not quite half of the known catalog of NEOs – almost 8,000 – are objects larger than 140 meters in size. The estimated population of NEOs of this size is about 25,000. Current surveys are finding NEOs of this size at a rate of about 500 per year.

How can we defend Earth from asteroid impacts?

We can defend Earth from asteroid impacts by planning for planetary defense which entails:

- Finding and tracking near-Earth objects;
- Characterizing NEOs to determine their orbit trajectories, size, shape, mass, composition, rotational dynamics and other parameters, so that experts can determine the severity of a potential impact event, warn of its timing and potential effects, and determine ways to mitigate the impact; and
- Designing and testing measures to deflect a NEO that is on an impact course with Earth, or to mitigate the effects of an impact that cannot be prevented. Mitigation measures can also include evacuation of the impact area and movement of critical infrastructure such as public utilities, food and water supplies, medical facilities, transportation systems, and power generation and distribution.

What is NASA doing to prepare for planetary defense?

NASA has a Planetary Defense Coordination Office (PDCO) located at NASA Headquarters in Washington, D.C. Its responsibilities include:

- Ensuring the early detection of potentially hazardous objects (PHOs) – asteroids and comets whose orbits are predicted to bring them within 5 million miles (8 million kilometers) of Earth; and of a size large enough to reach Earth’s surface – that is, greater than around 30 to 50 meters;
- Tracking and characterizing PHOs and issuing warnings about potential impacts;
- Providing timely and accurate communications about PHOs; and
- Performing a lead coordination role in U.S. Government planning for response to an actual impact threat.

The PDCO relies on data from projects sponsored by NASA’s Near-Earth Object (NEO) Observations Program.

For more information, visit:

www.nasa.gov/planetarydefense/overview
https://cneos.jpl.nasa.gov
www.minorplanetcenter.net

Cover Images:
Left: NEA 234061 (1999 HE1), detected by NEOWISE during the prime mission’s fully cryogenic phase.
Right: Meteor fireball Chelyabinsk