Current NASA Discovery and Characterization Efforts

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The search and tracking of near-Earth objects (NEOs) are, by far, the most important elements in any NEO program. Characterization and mitigation efforts are possible only if NEOs are found early enough to allow these efforts to be carried out. NASA's current near-Earth object (NEO) program is driven by the 1998 NASA agreement to discovery 90% of the NEOs larger than one km by the end of 2008. To date, the half dozen NASA-supported NEO discovery surveys have discovered more than 700 objects of this size, more than 70% of the estimated total number. The majority of these discoveries have been carried out by LINEAR, a MIT Lincoln Lab effort that uses two 1-meter aperture telescopes near Socorro, NM and the Catalina Sky Survey that uses two northern hemisphere telescopes (0.7 and 1.5 meter apertures) near Tucson AZ and a third 0.5 meter telescope near Siding Spring, Australia. NASA also supports the NEO Program Office at JPL and partially supports the Minor Planet Center in Cambridge, MA.

In a NASA Science Definition Team (SDT) report published in August 2003, the recommendations included extending the current NEO search down to the 140 meter-sized objects that could approach the Earth's orbit to within 4.7 million miles. By finding 90% of theses so-called potentially hazardous objects (PHOs), 90% of the impact risk to Earth is also retired, as well as all of the risk from the objects larger than one kilometer. Depending upon the search time interval allowed and the resources allocated, this next generation NEO search effort could be carried out in as short as 7 years using both ground and space-based optical telescopes or, using the lowest cost option, in 20 years using two dedicated 4 meter aperture, ground-based telescopes.

In an effort to understand the NEO population, NASA also supports ground-based and space-based efforts to understand their physical and orbital natures. As a result of these efforts, it is becoming clear there is an enormous diversity of NEO types. Active comets can be characterized as relatively weak, porous, black, icy dust balls and asteroids run the gamut from ex-cometary fluff balls, to rubble piles (e.g., Itokawa), shattered rock (Eros), solid rock and slabs of solid nickel-iron. Should a future NEO be found on an Earth threatening trajectory, this diversity would offer challenges for deflection attempts since the appropriate mitigation response may well depend upon the object's mass, shape, rotation characteristics, density, and porosity. On the other hand, this diversity and accessibility makes some NEOs logical sources for the raw materials necessary for future space structures and water supplies.