

Defending Planet Earth from Asteroid and Comet Strikes (w/ Video)

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University of Maryland Astronomy Professor Michael A'Hearn, leader of NASA's Deep Impact and EPOXI comet missions is vice-chair of a new report from the National Academy of Sciences on detecting and protecting Earth from collisions with comets and asteroids. In the report, "Defending Planet Earth: Near-Earth Object Surveys and Hazard Mitigation Strategies," the panel says NASA cannot meet a Congressional requirement to find 90 percent of Earth-threatening asteroids 155 yards in diameter or larger, unless money is appropriated for the task.

The report committee calls on NASA to monitor for even smaller sized space rocks (down to 100 ft), because these also could pose significant hazards. In addition to serving on the full committee, A'Hearn also headed a subpanel that looked at how to deflect or otherwise avoid or "mitigate" damage from an asteroid, comet or smaller [meteoroid](#) on a collision course with Earth.

Q: How big a threat is there from objects striking our planet?

A'Hearn: We need to keep in mind that really small [impact] events happen all the time, including the meteorite that landed in a doctor's office this week in the Washington suburbs. Big events like Tunguska in 1908, an event that could easily wipe out a whole city or a 50 mile area, those probably happen once every few hundred years. So in any human lifetime, there is perhaps a 20 - 30 percent chance that one of these events will happen.

Global devastations, because they would wipe out humanity, we really need to worry about them, but they really are very infrequent. [The report notes that research has clearly demonstrated that major impact events caused by large asteroids or comets have occurred throughout Earth's 4.5 billion year history, often with catastrophic consequences. It was just such an event 65 million years ago, caused by an estimated 10 kilometer [comet](#) or asteroid striking the Yucatan peninsula, that probably wiped out the dinosaurs.]

Q: What prompted this new report from the National Research Council, the operating arm of the [National Academy of Sciences](#)?

A'Hearn: In the 1980s we first started surveying these objects to try and catch them before they hit the Earth. In 1998, congress gave NASA [a year of funding] specifically to conduct searches. NASA started the searches and has kept them up. That's been called the Space Guard survey and has had a goal of finding all the objects larger than 1 kilometer. We think we've found roughly 90 percent of those objects and none of the objects that we've found are going to hit the Earth in this century.

In 2005 congress directed NASA to initiate the George E. Brown survey for objects down to 140 meters [about 460 feet]. One hundred and forty meters is still a pretty large object that would easily wipe out any large city and much more. No money ever came [to NASA] to start the survey. In 2008 Congress mandated that NASA fund a study by the National Research Council to recommend a way forward [with the Brown survey].

The report was required to not only address finding the objects, but also once you find them how you mitigate against a collision, typically by diverting the object so it misses the Earth.

Q: Can you tell us more about what the committee says about how to respond to such threats?

A'Hearn: There are four general approaches. We don't talk about specific missions, we talk about general approaches. For a small [object], you might just evacuate the area where it is going to hit. For a somewhat larger [object] -- not much larger, but with decades of warning -- you apply a very small push for a few decades. This is most easily done with what is called a gravity tractor - just applying the gravity of a large mass near the object to change its course. For larger objects or less warning you do what we call a kinetic impact. You slam into the object with a large mass, like Deep Impact, but on a much larger scale. For the largest objects and the shortest warnings the only option remaining is a nuclear device.

Q: What does the committee say are the next steps in "Defending planet Earth"?

A'Hearn: Clearly what we think is needed is an enhanced program that has a couple of aspects:

One is really conducting the survey for 140 meter objects that Congress mandated [but has not funded]. We have recommendations that you can do it [search for the objects] from either the ground or from space, depending on which is more important speed or cost. It's cheaper on the ground, but it takes longer. It is no longer physically possible to do the survey in the time [by 2020] originally planned by Congress. It's also clear that it cannot be done without a substantial increase in funding.

Other steps that are urgent are some fundamental research into things such as: how airbursts [a meteoroid exploding in the air] of objects in the 50 to 100 meter size range, work; and exactly what size object does have a big effect on the ground. We don't actually know that very well. Research on how you mitigate against these objects is also important.

Deep Impact proved you could target and hit comets or other objects in space. However, it had a different purpose and was too small in scale to provide deflection.

Deep Impact was a proof of concept -- that you could target and hit comets or other objects in space -- but it was done at far too small a scale to be useful at mitigation. You need to improve targeting, and figure out how to get a much bigger mass out there. Some peer reviewed research needs to be done on how nuclear weapons can be used. There has been some classified work, but we aren't allowed to know about that as part of our report.

We even need to think very carefully about the response framework, who's in charge [of responding], that's not defined. Congress said OSTP [White House Office of Science and Technology Policy] should make a recommendation on who's in charge, that hasn't been done yet. We think that OSTP is waiting for our report.

More information: Report: [www8.nationalacademies.org/onp...
.aspx?RecordID=12842](http://www8.nationalacademies.org/onp...aspx?RecordID=12842)

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