How not to save the planet

Making plans to deflect an asteroid on collision course for Earth is a sensible precaution – but not the way NASA wants to do it, says **Clark Chapman**

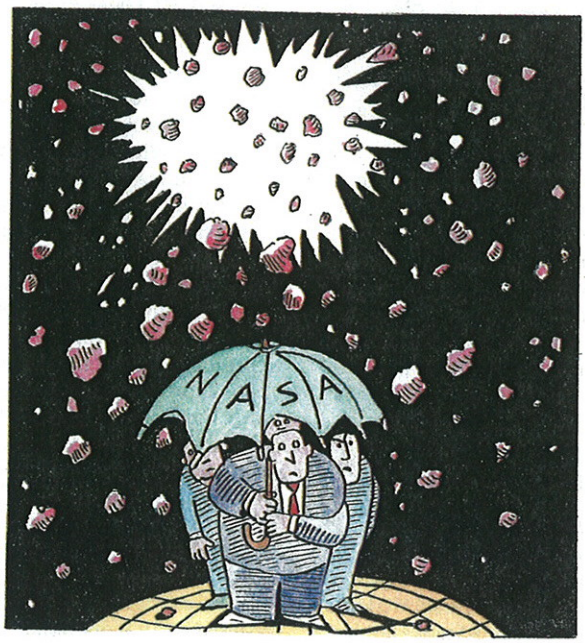
HOW should we protect ourselves from asteroid strikes? Not in the way NASA suggests. In its recent report on this question, the agency is evasive about how it might search for incoming asteroids and has plumped for the most dangerous method of deflecting them.

We know that so-called near-Earth asteroids (NEAs) pose a real threat. An asteroid strike rendered most species extinct 65 million years ago, and there are plenty more still out there. NASA's Spaceguard search, mandated by Congress in 1998, found most of the 1000 NEAs larger than a kilometre across, and thankfully, none of these will hit Earth this century. But there are around half a million NEAs larger than the 50-metre object that caused a multi-megaton explosion above Tunguska, Siberia, in 1908. A hit by one of these could wipe out a city or cause a devastating tsunami. Of those half a million, we know in detail about just 4000.

One of the NEAs we know about is the 250-metre Apophis, which was once estimated to have a 1 in 37 chance of striking Earth on 13 April 2029. Further observations by the Arecibo radar in Puerto Rico (now threatened with closure) and optical telescopes improved our knowledge of Apophis's orbit, and we now know it will miss Earth in 2029 – though, scarily, it will pass closer to us than communications satellites. Apophis still has a 1 in 45,000 chance of penetrating a small "keyhole" region in space that would set it up for a collision with Earth exactly seven years later.

In 2005, Congress ordered NASA to mount a new search to find 90 per cent of NEAs larger than 140 metres across, within 15 years. NASA had until December 2006 to recommend an option for a survey, as well as methods to characterise threatening NEAs and mitigate the threat if a possible collision course were found.

Unfortunately NASA's report, which it submitted to Congress in March, is flawed. For a start, NASA refused to formally recommend a programme and budget for a new survey; perhaps it feared Congress might fail to provide it with the necessary funds. The report also implicitly suggests an unrealistically expensive option: for $1 billion it says it would build a new telescope; for even more, it would fly an observatory near Venus. What it failed to say was that if the survey deadline shifted a few years, then the existing Pan-STARRS and LSST telescope projects could do this for just $10 million a year, from 2008 to 2023.



"NASA's biggest error relates to the suggestion that a nuclear device would be the most effective"

But its biggest error relates to the suggestion that a nuclear device would be the most effective way of deflecting an NEA from a collision course. It arrived at this conclusion on the basis of the most difficult and unlikely deflection scenarios, all involving bodies between 200 metres and 1 kilometre across. Yet more than 95 per cent of dangerous NEAs likely to be discovered by a new search will be smaller than 200 metres, and in such cases we have better options.

Many NEAs are fragile, and the gravity holding them together is tiny. So attempting to move one using a sudden impulse risks fragmenting it – leaving a number of pieces, any one of which might still hit us. NASA also seems to have grossly underestimated the chance that a clumsy deflection might push the NEA into a keyhole, so it would still strike Earth. Between 10 and 50 per cent of NEA impacts on Earth are thought to follow a recent passage through a keyhole.

The safest way to move an NEA is with controlled, gentle pushes from something like a "gravity tractor" – a massive, thrusting spacecraft that would hover near the NEA, gradually pulling it off its original track, without touching it. If the slow-pull technique isn't powerful enough, then a spacecraft could be crashed into the asteroid, as the European Space Agency's Don Quijote mission is designed to demonstrate. A series of impacts could accelerate the NEA incrementally, and if the NEA – or a fragment of it – moved towards a keyhole, a waiting gravity tractor could trim the deflection.

Only in the rare cases in which the asteroid was very large or the warning time very short would the world's nations have to decide whether a device detonated next to the asteroid – the gentlest nuclear alternative – was warranted. Shock waves would still shake the NEA, but in such a situation it could be our only hope.

NASA's proposal to use a nuclear blast in every situation is dangerous and unrealistic. When I questioned it at NASA headquarters last month, I was told that the nuclear options are top secret and not for public discussion. This misses the point. The technical problem lies not in the nuclear technology, but in NASA's understanding of keyholes and the fragility of NEAs.

NASA must study the problem of deflecting NEAs soberly, and embrace a new survey which will surely find many threatening NEAs. We must learn to do what the dinosaurs couldn't: assess the threat rationally and use the most cost-effective techniques available to discover and deflect threatening asteroids. ●

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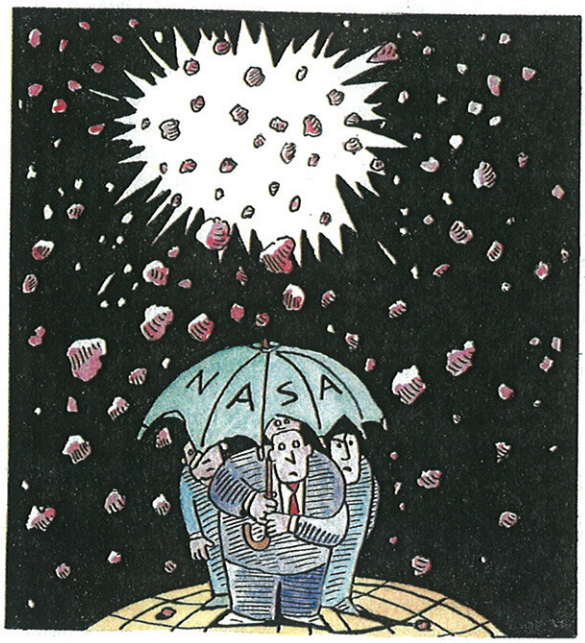

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