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Beating Swords, Shields and Plowshares into Planetary Defense

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In the years following the massive impacts of fragments from Comet Shoemaker-Levy 9 into Jupiter in 1994 scientists around the world have been increasing optical detection of asteroids and comets that are on Earth Crossing Orbits (ECOs). Slight changes in the speeds of these objects in space can result in potentially catastrophic collisions with Earth, or the avoidance of such collisions.

Of growing concern are the estimated one million (near Earth objects) NEOs that are 50 meters across or larger. NASA does not currently have the facilities to search for these smaller but still significant threats. An example of this was the discovery of 2002 MN by the Lincoln Near Earth Asteroid Research (LINEAR) program on 17 June 2002, estimated to be between 50 and 120 meters across. LINEAR is an MIT program funded by NASA and the USAF. 2002 MN passed within 120,000 kilometers of the Earth on 14 June, three days before its discovery. Had it struck Earth in the right place, it could have destroyed a large city. While NASA is currently focused on finding one kilometer or larger NEOs, because of their potential for global devastation, NASA is also initiating a feasibility study for conducting searches for these smaller objects.

In addition to ensuring the preservation of the human species, it can be argued that planetary defense will also build prestige, confidence and relations among powers, great and small alike. These secondary effects, while seemingly separate, serve as the keystones to an architectural analogy of the cathedral of refuge against fire and brimstone. The smaller the units of polities (grains of powder versus pebbles), the greater the density and impermeability the eventual "mortar" will be when cured – in terms of watchfulness in the overall dome or arch of planetary defense. This conceptualization therefore supports a regional or continental approach to planetary defense, rather than a great power or even a state-based approach through the United Nations. Especially in regard to detection, there is much that even sub-state polities can contribute to a planetary defense regime (PDR).

An argument can be made against planetary defense or at least the public disclosure of it, because it may cause panic. This assertion can be argued the other way around. If done through effective global political leadership, citizen knowledge of and involvement in PDR could bring about initial solidarity of purpose among citizens worldwide. This might be carried over into other areas of peacemaking and the maintenance of human civilization.

For this to occur, the United States cannot be perceived as “running the show,” as if PDR is a Hollywood script. America would do better to “request” and “invite” technological assistance from the rest of the world. The United States can use PDR to rebuild the depleted prestige of large nations in Europe and Asia in a positive way. These include but are not limited to France, China and North Korea, each of which has ballistic missile capability. The problem of depleted prestige has been the result of obvious U.S. dominance; economically, socially, politically and militarily. From the perspective of the depleted, it does not matter whether this dominance has been benign or not. Furthermore, the prospect of average people worldwide, feeling empowered and connected – either vicariously through regional space programs or through smaller contributions to PDR will create bonds that will be harder to break, though never impossible.

Planetary defense captures the imagination. It promises to make *full use* of available global human capital and technology as a means to achieve human security and solidarity. Global solidarity has always been an objective of the American experiment in republican democracy. *E Pluribus Unum, From Many One*: “The cause of America is, in a great measure, the cause of all mankind.” Thomas Paine, *Common Sense*, 14 February 1776.

The North American Aerospace Defense Command (NORAD) is an appealing template for PDR. NORAD is an international organization comprised of the United States and Canada. It is dedicated to preserving human life by determining the velocities and trajectories of threatening objects that are outside of Earth’s atmosphere. Still, when preparing to defend Earth from asteroids and comets, Earth bound defense policymakers must take into account counterintuitive facts concerning out-of-plane dynamics.

The obvious terrestrial-oriented response to an approaching NEO is to “deflect” it sideways so that it will miss Earth. This countermeasure would only cause the object to wobble in its orbit before it would still arrive at future points close to the original predictions. Instead, force (preferably non-explosive) should be directed along the flight path of an NEO, to slow it down from in front of its direction or to actually speed it up from behind. Both of these countermeasures would alter the energy of the orbit and cause the NEO to pass by the predicted intersection point before Earth would have arrived at that point in space. PDR should use re-directable space probes to rendezvous with NEOs as far away from Earth as is practicable. This factor depends on the number, optical capability, data analysis and information dissemination capabilities of the eventual constellation of NEO detection/redirection micro-satellites.

In a truly identifiable emergency that occurs before these countermeasures can be developed and tested, a United Nations resolution authorizing the use of nuclear force against an inanimate object in outer space might be quickly negotiated. However this alternative, likely to only cause fragmentation of the NEO, cannot be relied upon as a substitute for effective planetary defense planning.

Whatever form PDR ends up being, the international community should always remember the sentiment and vision of the late Representative George Brown of California:

“If some day in the future we discover well in advance that an asteroid that is big enough to cause a mass extinction is going to hit the Earth, and then we alter the course of that asteroid so that it does not hit us, it will be one of the most important accomplishments in all of human history.”