## ASTEROID DEFLECTION NEGATIVE

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## SOLVENCY FRONTLINE

**FIRST, THE STATUS QUO IS SOLVING NOW – NASA FUNDING FOR ASTEROID DETECTION WAS RECENTLY DOUBLED**

**Morrison 11 (David, NASA official at NASA Ames research center, “Asteroid and Comet Impact Hazards”,** From the Strategic Plan for the NASA Space Science Enterprise, 7/11/2011, <http://impact.arc.nasa.gov/news_detail.cfm?ID=61>) rory

Asteroids and comets will get increased attention at NASA as a new program office is formed to coordinate data from spacecraft and ground-based observations of celestial bodies. This office will help avoid a repeat of the media frenzy surrounding the early March announcement that Earth might be on the receiving end of an asteroid in 2028, a possibility later retracted. The new office will increase financial support for the detection and characterization of Near Earth Objects (NEOs). It will work with other groups in the United States and abroad to create an inventory of NEOs. One of its goals will be to identify asteroids at sizes down to 1 km in diameter. Scientists estimate that 2000 Earth-crossing asteroids at least a kilometer in size have yet to be identified. The yet-to-be-named program office will be located at a NASA field center within the next few weeks, though some responsibilities will be maintained at NASA Headquarters in Washington, said Tom Morgan, discipline scientist for planetary astronomy. Morgan is shaping the duties of the new office. "The first job is to understand what is out there, increase the numbers of detections and get good orbits for them," Morgan told Space News March 27. He said the new office will strengthen NASA?s ground-based program and study data from spacecraft missions to asteroids and comets. Some $3 million is now being earmarked for the new program, a doubling of current NASA funding NEO work, he said. . . . "Part of our ongoing plan is to understand the composition, the mineralogy, the physical condition of increasing numbers of NEOs," Morgan said.

**AND, THE STATUS QUO FUNCTIONS AS A DELAY COUNTERPLAN – WE ARE NOT IN AN IMMEDIATE THREAT OF AN ASTEROID COLLISION – WE SHOULD LET THE DETECTION TECHNOLOGY DEVELOP ALONGSIDE RELEVANT PREVENTION TECHNOLOGY SLOWLY**

**Sagan and Ostro 94** (Carl, Editor “Issues in Science and Technology”, and Steven, Editor, “Issues in Science and Technology” “Long-range consequences of interplanetary collisions.” 6/22/94http://elibrary.bigchalk.com/elibweb/elib/do) Canova

However, arranging in advance to destroy or deflect a hazardous ECA in anticipation that such an object might, against 5,000-to-1 odds, be discovered during the 21st century is quite another matter--because of the time scales involved, the cost, and the possible dangers of developing the relevant technology. Since the interval between such impacts is comparable to the age of the human species and since ECAs are likely to be identified in a Spaceguard-like survey many decades, or even centuries, before impact, there can be no urgency about taking measures to prevent or mitigate collisions. We lose almost nothing in terms of the safety of humanity during the next few decades (or centuries) if we delay the costly development of means of prevention until a threatening object is found. Indeed, it seems likely that technological progress in the next few decades (or centuries) will provide much cheaper, as well as much safer, means of prevention than any we can conceive of today.

**AND, DETECTION IS IRRELEVANT – OUR DEFELCTION METHODS WILL FAIL – LACK OF ACCURACY**

Borchers, 09 (Brent W. Borchers, USAF Major, “Should the US be involved in Planetary Defense?” http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA539693&Location=U2&doc=GetTRDoc.pdf, 7/17/11)

Another problem with any solution that intercepts the object is accuracy. It’s hard enough to get two objects to intercept each other when they’re both moving at 17,500 mph in low earth orbit or in the case of intercepting a missile with an anti ballistic missile battery or something similar. We’ve tackled both of the problems listed above with our anti-ballistic missile system and testing of anti-satellite weapons in the past. However, the problem with intercepting a NEO in bound for the earth is that the object you’re trying to intercept is moving at a speed between twelve to seventy two kilometers per second. This is much faster than any incoming ICBM or a satellite that is moving in low earth orbit. Add to this that the object is not coming in on a straight line and your missile or interceptor is not moving towards that target on a straight line either**.44** Both objects are on a slight parabolic arc (when viewed from the macro level**)** because of the gravitational pull of the sun, earth and any other bodies that are nearby in our solar system**.** Even though gravity may seem to work against you in some of these situations, in the following deflection operations gravity is the basic force that makes them work.

## SOLVENCY EXTS – #1 – STATUS QUO SOLVES

**STATUS QUO SOLVING – NASA’S BUDGET FOR NEO DETECTION HAS BEEN QUADRUPLED**

**Lawler and Reardon 11** (Andrew is a senior writer with Science Magazine as well as writer for Smithsonian, Nat Geo, Columbia Journalism Review and others, and Sara is a writer for Science Magazine and has masters in biology and physiology, “Climate Science, Asteroid Detection Big Winners in NASA Budget”, Science Insider Magazine, Feb 14, 2011, <http://news.sciencemag.org/scienceinsider/2011/02/climate-science-asteroid-detection.html>) rory

NASA will have to live with a stagnant budget—again. The $18.7 billion proposed by the Administration is the same amount as 2010 and 2011, and science funding would continue to hover at about $5 billion. But in the details are significant winners and losers. Earth science would grow from $1.439 billion to $1.797 billion in 2012, though House of Representatives Republicans are sure to attack a program focused on understanding global change. Meanwhile, Mars exploration—which this year stands at $438 million—would spike at $602 million next year, but plummet to less than half that amount by 2016. Funds for near-Earth object observations would quadruple to $20.4 million. And NASA Chief Financial Officer Elizabeth Robinson said the agency will kill a dark-energy mission in the hope that it can collaborate more cheaply with the European Space Agency. She added that details on how the agency will fund a massive cost overrun in the James Webb Space Telescope won't be ready until this summer.

**LAWMAKERS HAVE ALREADY INCREASED ASTEROID DETECTION BY FOUR-FOLD – STATUS QUO SOLVING**

**Hopkins et. al, 10** [ Josh Hopkins, Adam Dissel, Mark Jones, James Russell, and Razvan Gaza Lockheed Martin “ Plymouth Rock An Early Human Mission to Near Earth Asteroids Using Orion Spacecraft,” June 2010, [http://www.lockheedmartin.com/data/assets/ssc/Orion/Toolkit/OrionAsteroidMissionWhitePaperAug2010.pdf][Max](http://www.lockheedmartin.com/data/assets/ssc/Orion/Toolkit/OrionAsteroidMissionWhitePaperAug2010.pdf%5D%5BMax) Waxman]

Some of these resources have *outstanding* value. Space agencies intent on addressingfundamental economic needs should focuson these materials. Platinum, for example,has sold at over $1,700/oz since January.25Platinum group metals (PGMs) are greatcatalysts. Used in automotive catalyticconverters, which are required by national governments worldwide,26 PGM supplies are quite limited. Some models point to **terrestrial depletion within decades.**27 Platinum group metals are also critical as catalysts in hydrogen fuel cells, which are key to a possible post-carbon, “hydrogen economy.”28 In 2008, The National Research Council identified PGMs as the “most critical” metals for U.S. industrial development.29 Platinum group metals are abundant in certain types of near-Earth asteroids (NEAs). NEAs that are mineralogically similar to one of the most common types of “observed fall” meteorites (H-type, ordinary chondrites) offer PGM concentrations (4.5 ppm)30 that are comparable to those found in profitable terrestrial mines (3-6 ppm).31 Other meteorites suggest that some asteroids may contain much more valuable metal.32The PGM value of a 200 m asteroid can exceed **$1 billion,** or possibly **$25 billion.**33 Over 7,500 NEAs have been detected.34 Close to a fifth of these are easier to reach than the moon; more than a fifth of those are ≥200 m in diameter: 200+ targets.35 President Obama requested, and Congress has authorized, a four-fold increase in detection funding ($5.8 m to $20.4 m/year).36 This could lead to ~10,000 known 200 m NEAs in a decade.37 But detection is just a start. The costs to locate, extract, and process asteroid ore are not well understood.38 Before significant private capital is put at risk, we need to learn more. In cooperation with other forward looking nations,39 the U.S. should *purchase an option* to develop asteroid resources by investing in the knowledge required to mine asteroids. We can then choose to *exercise this option* if terrestrial PGM supplies do in fact collapse. Asteroids may also be able to supply other metals that are increasingly at risk.40 There are several candidates: In 2009, the U.S. imported 100% of 19 key industrial metals.41

**Squo solves – we have the tech and its improving now**

Spotts, 10. (Pete Spotts is a staff writer for the Christian Science Monitor, September 8, 2010, “2010 RF12 and its pal show improvements in asteroid detection; 2010 RF12 and another small asteroid that passed close to earth Wednesday were detected three days before their fly-by, illustrating the improving capability of asteroid-spotting telescopes.” Lexis, CALLAHAN)

Earth is entertaining two transient visitors on Wednesday - a pair of small asteroids, 2010 RX30 and 2010 RF12, whose track takes them inside the moon's orbit around Earth. Such close passes have appeared with increased frequency as telescopes and detectors dedicated to asteroid hunting have improved. That capability holds the promise of improved warnings for potential collisions with relatively small objects that might otherwise seem to come out of the blue. By the time they come close enough to brighten sufficiently to spot, they've almost arrived. The effects of these small objects on populated areas might be local - they would be too small to be "civilization busters" but too large to ignore, some researchers say - but even a few days' warning can allow evacuations to take place. Wednesday's objects were much smaller than even those asteroids, and yet they were picked up three days before their fly-by. Although the telescopes and detectors were built to spot much larger objects, they also are proving adept at picking out smaller asteroids. These survey telescopes "are likely to catch a much larger fraction of objects that could hit Earth than people originally thought," says Clark Chapman, an asteroid specialist at the Southwest Research Institute in Boulder, Colo. Wednesday's objects posed no threat of impact. 2010 RX30 zipped past Earth some 154,000 miles away shortly before 6:00 Eastern Daylight Time this morning. 2010 RF12 is slated to hurtle past at a distance of about 50,000 miles at 5:12 p.m. Both were first detected Sept. 5 by the Catalina Sky Survey. The survey is run by The University of Arizona using telescopes in Australia and on Mt. Lemmon in the Santa Catalina Mountains that border Tucson. The asteroids' arrival comes as the US government is weighing fresh approaches to detecting and tracking near-Earth objects that cross Earth's orbit. Earlier this year, the National Research Council (NRC) noted in a major report on planetary-defense efforts that the National Aeronautics and Space Administration (NASA) was likely to meet within the next few years a goal of finding 90 percent of near-Earth objects (NEOs) whose diameters are larger than about 2,000 feet across. Scientists have estimated that an impact from one of these objects would trigger a global disaster. But the goal was set in 1998, even as researchers were developing an increasing respect for the damage much smaller objects can inflict. The shockwave from an airburst over Siberia in 1908, for instance, flattened 830 square miles of forest. The incoming object, by one estimate as small as 130 feet across, exploded some three to six miles overhead. In 2005, NASA was charged with finding 90 percent of all NEOs 500 feet across or larger by 2020. The space agency will not be able to meet that goal unless Congress and the White House provide more money for the effort, the NRC concluded. The White House is seeking $16 million per year for NEO detection and data-analysis efforts in its FY 2011 budget. But Congress has yet to act on the proposal, which is part of a larger, controversial overhaul of NASA the administration has planned. NASA is currently spending about $4 million on these efforts. In the meantime, a NASA task force is in the final stages of preparing recommendations regarding the future of the agency's NEO efforts. Dr. Chapman notes that groups of astronomers have proposed setting up networks of small telescopes designed to quickly and repeatedly image large patches of the night sky to pick up small NEOs. In addition, the NRC recently placed a top priority on a new ground-based telescope, the Large Synoptic Survey Telescope, designed to image the entire night sky once every three days. This instrument, Chapman explains, could dramatically improve the detection rate of even smaller objects on final approach. In the end, however, improvements in technology aren't the only drivers behind hoped-for improvements in detection and warning, he says. With increased observations, asteroid hunters have become more aware "that when something actually is going to hit the Earth, it gets a whole lot brighter than things that pass by at the distance of the moon." That increasing brightness can turn even small telescopes into useful early-war.

## SOLVENCY EXTS - #1 – STATUS QUO SOLVING NOW

**NASA INCREASING RESOURCES AND FOCUS NOW TO NEO DETECTION**

**Reich 10 (**Eugenie, Knight Science Journalims Fellow at MIT, writer on science policy, “NASA panel weighs Asteroid Danger”, Nature News, Sept 8, 2010 <http://www.nature.com/news/2010/100908/full/467140a.html>) rory

Owing to a 2008 law passed by Congress, the White House Office of Science and Technology Policy has until 15 October to decide which agency will be responsible for protecting the planet from an asteroid strike. Members of the task force say NASA expects to be given part or all of that responsibility. To meet it, the panel discussed the creation of a Planetary Protection Coordination Office (PPCO) within NASA, with an annual budget of $250 million–$300 million. It would detect and track asteroids — and develop a capability to deflect them. "You want to use a proven capability when you're talking about an actual threat," says Rusty Schweickart, a former astronaut and the other panel co-chair.

## SOLVENCY EXTS – GROUND-BASED FAILS

**GROUND-BASED TELESCOPES FAIL – SEVERAL REASONS**

**Shaffer et al., 1996** (William Shaffer, Martin McHugh, Dexter Wang, “Space-Based Asteroid Detection and Monitoring System,” Report to Secretary of Navy, 7/11/11) Hou

Currently, ground-based telescopes are used for detecting and monitoring NEAs and other near earth objects. However, ground-based monitoring and detection schemes suffer from several limitations. For example, small objects such as NEAs with diameters of 50 meteres cannot be reliably detected using ground-based telescopes. The performace of ground-based systems is affected by factors such as the sun, atmospheric turbulence, and cloud cover which limit the size and distance of the NEAs detected. Additionally, there are only enough ground-based systems to monitor a small fraction of the celestial sphere every day. Because the earth turns on its axis with a twenty-four hour period, any ground based system can examine only one latitudinal section of the celestial sphere per day. Thus ground based systems are either inherently slow, or require a unacceptably large number of telescopes. The high cost of building the many needed observatories, the great number of persons needed to operate the systems, and the limiting factors of the sun, clouds and atmosphere This iturbulence limit the use of ground-based telescopes.

## COLLISION ADVANTAGE FRONTLINE

**FIRST, YOUR TIMEFRAME IS THE YEAR 2182 FOR A LARGE ASTEROID COLLISION AND THAT IS EVEN ONLY ONE-IN-A-THOUSAND CHANCE**

**Sutherland, 10.** (Paul is a correspondent for the Christian Science Monitor who cites NASA reports. July 28, 2010, “Huge asteroid on possible collision course with Earth (172 years from now),” http://www.csmonitor.com/Science/Cool-Astronomy/2010/0728/Huge-asteroid-on-possible-collision-course-with-Earth-172-years-from-now, CALLAHAN)

A rather large asteroid is on a possible collision course with the Earth, space scientists have revealed. But there is no need to panic – even if an impact date is confirmed, it is not likely to be for 172 years. An international team, including NASA experts, say in new research that the space rock has a one-in-a-thousand chance of an impact. They may sound like high odds, but they are enough to mean the threat from the 560-meter (612-yard) wide asteroid will have to be taken seriously. If such a cosmic missile hit land, it would blast a crater several miles wide – enough to devastate a city and wreak destruction for hundreds of miles around. The good news is the evidence suggests that if there is an impact then it is most likely to happen in 2182. That is clearly a long way of and provides time to work out strategies to deal with the threat. The asteroid was discovered in 1999 and is dubbed 1999 RQ36. The scientists had labelled it a “potentially hazardous asteroid” of the Apollo group because its orbit brings it close to Earth. But it was then considered a much lower risk. Now scientists from Spain, Italy and NASA’s Jet Propulsion Laboratory in California have used computer models to produce a more accurate forecast of its path. Their results are published in the science journal Icarus. The asteroid’s orbit has been fairly well known thanks to 290 visual observations and 13 measurements using radar, say the scientists. It takes around 14 months to go round the Sun. However, a disturbance called the Yarkovsky effect, caused by the force of sunlight on smaller bodies, introduces a significant “orbital uncertainty”. Maria Eugenia Sansaturio, of Valladolid University, Spain, said: “The total impact probability of asteroid 1999 RQ36 can be estimated at 0.00092 – approximately one-in-a-thousand chance – but what is most surprising is that over half of this chance (0.00054) corresponds to 2182.” Scientists had previously suggested sending a space mission called OSIRIS-REx (corr) to collect samples of the cosmic missile. Bill Cutlip of NASA’s Goddard Space Flight Centre in Greenbelt, Maryland, said: “This asteroid is a time capsule from before the birth of our solar system. You can’t underestimate the value of a pristine sample.” Scientists have reduced the threat from another 300-meter wide space rock called Apophis which is due to make two close approaches to Earth within the next 30 years. The first, on Friday the 13th of April, 2029, is virtually certain to miss us though it will come closer than TV and other geostationary satellites, at a distance of only 18,300 miles. But uncertainty over the effect of that close encounter meant that astronomers could not rule out the chance of an impact seven years later in 2036. Now, however, the chance of a catastrophic collision on 13 April of that year have dropped from one-in-45,000 to an even more reassuring one-in-250,000. • Discover space for yourself and do fun science with a telescope. Here is Skymania’s advice on [how to choose a telescope](http://skymania.com/wp/2007/04/how-to-choose-telescope.html). We also have a guide to the different types of telescope available. Check out our monthly sky guide too!

**AND, YOUR EXTINCTION CLAIMS ARE ALL HYPE – SMALL NEOs WILL EXPLODE IN THE AIR BEFORE LAND CONTACT AND LARGER ASTEROIDS WILL NOT HAVE AN EXTINCTION IMPACT – THE RISK OF YOUR IMPACT IS INSIGNIFICANT AND UNLIKELY**

**Harris 06** (Allan W, Earth and Space Sciences Division of the Jet Propulsion Laboratory, California Institute of Technology, “Chicken Little Was Right!,” Phi Kappa Phi Forum, http://elibrary.bigchalk.com/elibweb/elib/do/document?

set=search&dictionaryClick=&secondaryNav=&groupid=1&requestid=lib\_standard&resultid=2&edition=&ts=5FE4E122D9D27930CBA198F29069D5FD\_1310431068999&start=1&publicationId=&urn=urn%3Abigchalk%3AUS%3BBCLib%3Bdocument%3B121599853) [Iuliano]

“What are the consequences of impacts of various W sizes? Table 1 is a short summary. As I have already noted, small asteroids up to about 50 m in diameter, with impact energy up to a megaton equivalent, explode high enough in the atmosphere to cause no significant ground damage, other than perhaps a few broken windows and such from the sonic boom. Because most enter over the ocean or remote areas, they may go completely unnoticed by the general population. In the size range of the Tunguska event, 60 to 100 m in diameter, the asteroid still explodes in the air rather than reaching the ground, but the blast wave is capable of causing ground damage, just as if a nuclear bomb of the same size exploded in the atmosphere. The energy of such explosions is comparable to large thermonuclear weapons, so the consequences are well studied, both theoretically and experimentally. We can easily calculate the "mean fatalities per event," which turns out to be around 25,000, but in fact only a small fraction of events kill even a single individual because most occur over the ocean. Those that do occur over land are mostly in remote areas, as was the Tunguska event. Thus, we do not expect any fatalities at all most of the time; only one in about five events (once in five-thousand years) kills anyone, and even fewer would lead to major catastrophes. Such findings are therefore entirely consistent with the historical record of no such events in the last several thousand years.
Moving up to the next larger event size, beginning at around 150 to 200 m in diameter, an entering asteroid will make it to the surface, creating an impact crater such as the one in Arizona. That particular crater was formed by a considerably smaller iron meteoroid, but such iron bodies are only a small fraction of the asteroid population. If an asteroid of this size struck the sea, it would generate a tsunami that might be even more destructive than a ground hit, depending on location. Impacts of this size carry more energy than the largest nuclear bombs, around 1,000 MT. Such a large blast would actually blow a hole in the atmosphere and send debris flying out into space and falling back on the atmosphere hundreds or even thousands of kilometers away. For a land blast, we can estimate fairly well the range of damage and the resultant mean fatality rate. For an ocean impact that creates a tsunami, there is far more uncertainty. It has been claimed for some time, going back to the time of above-ground nuclear testing, that explosion-generated waves will break, like a giant surf, when they encounter a continental shelf, still far from shore. If this is the case, then impact-generated tsunamis may be close to harmless. Furthermore, tsunami waves take some time to reach the shore. So with proper warnings the actual death count might be kept quite low. Thus the "expected deaths" in the table might lie more representative of numbers of displaced (wet and angry) individuals, rather than actual fatalities.
At a size between 1 to 2 km in diameter, an impact will loft enough debris to cause a global climatic disaster. Even an impact into the deepest ocean would punch through to the bottom and loft solid material, which would blow out of the atmosphere and rain back down at hypersonic speeds to bum up into micron-sized dust, like so many meteors. The resulting dust cloud would shut off sunlight, and hence plant photosynthesis, for months or years, destroying agriculture for at least one growing season. Thus, even though the zone of prompt destruction from the impact still would be small, the population of the entire planet would feel the consequences through famine and disease; perhaps a quarter of the entire world population might perish.
The final category, "global extinction," is so infrequent that the risk, in terms of fatalities per year, is hardly significant. Furthermore, we have already discovered all (we think) asteroids that are large, and none of those objects has our name on it in the foreseeable future (more than a century). So it seems likely that we are safe from extinction, at least from killer asteroids, for the time being.

## COLLISION ADVANTAGE FRONTLINE

**AND, ZERO IMPACT –ASTEROIDS TOO IMPROBABLE OR TOO SMALL**

**BENNETT 2010** [James – William P. Snavely Professor of Political Economy and Public Policy at George Mason University and director @ John M. Olin Institute for Employment Practice and Policy, “The Chicken Littles of Big Science; or, Here Come the Killer Asteroids!” *The Doomsday Lobby*, <http://www.springerlink.com/content/mup70473n166w389/>] ttate

The smallest falling bodies, those with diameters under a few meters, are of “no practical concern,” says Chapman, and in fact they are to be desired, at least by those who keep their eyes on the skies watching for brilliant fireballs whose burning up in the atmosphere provides a show far more spectacular than the most lavish Fourth of July fireworks. Even bodies with diameters of 10–30 meters**,** of which Chapman estimates six may fall to earth in a century, cause little more than broken windows.They explode too high in the atmosphere to cause serious harm. The next largest potential strikers of Earth are those in the Tunguska range of 30 meters–100 meters. The shock waves from the atmospheric explosion would “topple trees**,** wooden structures and ignit[e] fires within 10 kilometers,” writes Chapman. Human deaths could result if the explosion took place over a populated area. Though Chapman estimates the likelihood of a Tunguska occurring in any given century at four in ten, it is worth noting that there is no evidence that such an explosion has killed a single human being in all of recorded history. Either we’re overdue or that 40 percent is high. Moreover, given that the location of such an explosion is utterly unpredictable, it would be far more likely to happen over an ocean or a desert than over, say, Tokyo or Manhattan. The after effects would be minimal,and Chapman says that “nothing practical can be done about this modest hazard other than to clean up after the event.” In fact, “It makes no sense to plan ahead for such a modest disaster… other than educating the public about the possibility.” The cost of a telescopic survey capable of picking up bodies of such diminutive size would be prohibitive. It would be the ultimate Astronomers Full Employment Act. A body of 100 meters–300 metersin diameterwould either explode at low altitude or upon impact with the ground; it would be “regionally devastating,” but Chapman pegs the chances of such a catastrophe at 1 percent per century.A small nation could be destroyed by the impact ofa body of 300 meters—1 km in diameter, or a “flying mountain” of sorts, which would explode with energy yield ten times more than “the largest thermonuclear bomb ever tested.” If striking land, it would carve out a crater deeper than the Grand Canyon. If it hit a populated area, the death toll could be in the hundreds of thousands. The likelihood of such a collision Chapman estimates at 0.2 percent per century. An asteroid or comet of 1–3 kilometers in diameter would cause “major regional destruction,” possibly verging on “civilization-destruction level.” Chapman puts the chances of this at 0.02 percent per century. The impact of a body more than 3 kilometers in diameter might plunge the Earth into a new Dark Age, killing most of its inhabitants, though the chances of this are “extremely remote” — less than one in 50,000 per century. Finally, mass extinction would likely occur should a body greater than 10 kilometers pay us a visit, though the chances of this are less than one in a million every century, or so infinitesimal that even the most worry-wracked hypochondriac will not lose sleep over the possibility**.** In fact, for any impact with a Chapman-calculated likelihood of less than one in a thousand per century, he concedes that there is “little justification for mounting asteroid-specific mitigation measures.” The chance of a civilization-ender is so remote that he counsels no “advance preparations” — or almost none. For Chapman recommends further study of NEOs, as well as investigation into methods of their diversion. 82 This is exactly what the NEO lobby wants.

**AND, YOUR “ANY RISK VOTE AFF” LOGIC DOOMS ALL DECISIONMAKING – EVALUATE PROBABILITY OVER MAGNITUDE**

**MESKILL 2009** [David – professor @ Colorado School of Mines and PhD from Harvard, “The ‘One Percent Doctrine’ and Environmental Faith”, December 09, <http://davidmeskill.blogspot.com/2009/12/one-percent-doctrine-and-environmental.html>] ttate

Tom Friedman's piece today in the Times on the environment (http://www.nytimes.com/2009/12/09/opinion/09friedman.html?\_r=1) is one of the flimsiest pieces by a major columnist that I can remember ever reading. He applies Cheney's "one percent doctrine" (which is similar to the environmentalists' "precautionary principle") to the risk of environmental armageddon. But this doctrine is both intellectually incoherent and practically irrelevant. It is intellectually incoherent because it cannot be applied consistently in a world with many potential disaster scenarios. In addition to the global-warming risk, there's also the asteroid-hitting-the-earth risk, the terrorists-with-nuclear-weapons risk (Cheney's original scenario), the super-duper-pandemic risk, etc. Since each of these risks, on the "one percent doctrine," would deserve all of our attention, we cannot address all of them simultaneously. That is, even within the one-percent mentality, we'd have to begin prioritizing, making choices and trade-offs. But why then should we only make these trade-offs between responses to disaster scenarios? Why not also choose between them and other, much more cotidien, things we value? Why treat the unlikely but cataclysmic event as somehow fundamentally different, something that cannot be integrated into all the other calculations we make? And in fact, this is how we behave all the time. We get into our cars in order to buy a cup of coffee, even though there's some chance we will be killed on the way to the coffee shop. We are constantly risking death, if slightly, in order to pursue the things we value. Any creature that adopted the "precautionary principle" would sit at home - no, not even there, since there is some chance the building might collapse. That creature would neither be able to act, nor not act, since it would nowhere discover perfect safety. Friedman's approach reminds me somehow of Pascal's wager - quasi-religious faith masquerading as rational deliberation (as Hans Albert has pointed out, Pascal's wager itself doesn't add up: there may be a God, in fact, but it may turn out that He dislikes, and even damns, people who believe in him because they've calculated it's in their best interest to do so). As my friend James points out, it's striking how descriptions of the environmental risk always describe the situation as if it were five to midnight. It must be near midnight, since otherwise there would be no need to act. But it can never be five \*past\* midnight, since then acting would be pointless and we might as well party like it was 2099. Many religious movements - for example the early Jesus movement - have exhibited precisely this combination of traits: the looming apocalypse, with the time (just barely) to take action.

## COLLISION ADV EXTS - # 1 - LONG TIMEFRAME

**The probability is low enough and the timeframe is long enough for the plan not to matter – no asteroids in the foreseeable future**

Salazar, 06. (Jorge is a renowned science journalist who has interviewed countless amazing scientists over the years for EarthSky. Jan 05, 2006, “Raymond Bambery on low-probability killer asteroids,” http://earthsky.org/space/how-likely-is-a-killer-asteroid, CALLAHAN)

Some asteroids do have the potential to strike Earth. Raymond Bambery of NASA’s Near-Earth Asteroid Tracking said that scientists consider an asteroid to be potentially hazardous if it’s at least one kilometer in size, and it comes within 5 million miles of Earth. Only several hundred asteroids fall in this category. He said nothing that we know of right now is due to impact Earth in the next several thousand years, at least. Some asteroids do have the potential to strike Earth. Raymond Bambery is Principal Investigator of NASA’s Near-Earth Asteroid Tracking, or NEAT. He said well over 100,000 asteroids have been discovered so far, but of these only a few cross Earth’s orbit. Raymond Bambery: Ninety-nine percent of them are outside of the orbit of Mars and offer no threat. And the 1,000 to 2,000 that come near Earth really don’t offer any major impact on Earth. We do have several hundred that have the potential of being hazardous. Bambery said that scientists consider an asteroid to be potentially hazardous if it’s at least one kilometer in size, and it comes within 5 million miles of Earth. Only several hundred asteroids fall in this category, but one could, potentially, intersect the orbit of Earth at an inopportune time. Still, Bambery says, astronomers’ studies so far indicate that a devastating strike is unlikely in the near future. Raymond Bambery: Nothing right now that we know of is due to impact the Earth in the next several thousand years, at least. An Earth-crosser to watch is 99942 Apophis which is our closest-approaching Near Earth Asteroid right now. Bambery said that although Apophis is classified as potentially hazardous – and is about 300 meters in size – it doesn’t appear to be any threat on its passage in 2029. ‘It will be a great photo opportunity for astronomers,’ he said.

**WE HAVE ALREADY DETECTED ALL THE LARGE ASTEROIDS – NO RISK OF COLLISION FOR AT LEAST ANOTHER CENTURY**

MORRISON 2006 [David – researcher for the Working Group on Near Earth Objects @ International Astronomical Union, “Asteroid and comet impacts: the ultimate environmental catastrophe”, <http://rsta.royalsocietypublishing.org/content/364/1845/2041.full>] ttate

The survey results have already transformed our understanding of the impact threat. If we focus on asteroids larger than 2 km, which is the nominal size for a global catastrophe, then we are already nearly 90 per cent complete. For 5 km diameters, which may be near the threshold for an extinction event, we are complete today. Thus, astronomers have **already assured us that** we are not due for an extinction-level impact from an asteroid within the next century**.** Barring a very unlikely strike by a large comet, we are not about to go the way of the dinosaurs. Thus, the rest of this paper focuses on the more frequent impacts by sub-kilometre asteroids, which are still big enough to destroy a large city or a small country, or to devastate a coastline, with possibly world-altering economic and social consequences.

**YOUR IMPACT IS A FEW THOUSAND YEARS AWAY**

**Sagan and Ostro 94** (Carl, Editor “Issues in Science and Technology”, and Steven, Editor, “Issues in Science and Technology” “Long-range consequences of interplanetary collisions.” 6/22/94 http://elibrary.bigchalk.com/elibweb/ Canova

We have the time to conduct such a survey. The average time interval between civilization-disrupting impacts is a few hundred thousand years, so the risk of such an impact during the next century is one in a few thousand. A major impact would surely devastate the global civilization, but it must be understood in the context of its likelihood and the likelihood of other risks--catastrophic and otherwise. In the actuarial calculus of risk assessment, one combines the roughly 500,000-year interval between global impact catastrophes with the (highly uncertain) estimate that 1.5 billion people would be killed (mostly by starvation or disease) to compute an equivalent annual mortality rate of 3,000 deaths per year. This estimate is very approximate, but serves for comparisons with other risks.

## COLLISION ADV EXTS - #2 – THREAT OVEREXAGGERATED

**ERR NEGATIVE – THE THREAT IS OVEREXAGGERATED - THE AFF IS BASED ON BAD SCIENCE**

**BENNETT 2010** [James – William P. Snavely Professor of Political Economy and Public Policy at George Mason University and director @ John M. Olin Institute for Employment Practice and Policy, “The Chicken Littles of Big Science; or, Here Come the Killer Asteroids!” *The Doomsday Lobby*, <http://www.springerlink.com/content/mup70473n166w389/>] ttate

We should here acknowledg**e**, without necessarily casting aspersions on any of the papers discussed in this chapter, the tendency of scientific journals to publish sexy articles**.** (Sexy, at least, by the decidedly unsexy standards of scientific journals.) Writing in the Public Library of Science, Neal S. Young of the National Institutes of Health, John P.A. Ioannidis of the Biomedical Research Institute in Greece, and Omar Al-Ubaydli of George Mason University applied what economists call the “winner’s curse” of auction theory to scientific publishing. Just as the winner in, say, an auction of oil drilling rights is the firm that has made the highest estimation — often overestimation — of a reserve’s size and capacity, so those papers that are selected for publication in the elite journals of science are often those with the most “extreme, spectacular results**.**” 63 These papers may make headlines in the mainstream press, which leads to greater political pressure to fund projects and programs congruent with these extreme findings. As The Economist put it in an article presenting the argument of Young, Ioannidis, and Al-Ubaydli, “Hundreds of thousands of scientific researchers are hired, promoted and funded according not only to how much work they produce, but also where it gets published.” Column inches in journals such as Nature and Science are coveted; authors understand full well that studies with spectacular results are more likely to be published than are those that will not lead to a wire story**.** The problem, though, is that these flashy papers with dramatic results often “turn out to be false.” 64 In a 2005 paper in the Journal of the American Medical Association, Dr. Ioannidis found that “of the 49 most-cited papers on the effectiveness of medical interventions, published in highly visible journals in 1990–2004… a quarter of the randomised trials and five of six nonrandomised studies had already been contradicted or found to have been exaggerated by 2005.” Thus, those who pay the price of the winner’s curse in scientific research are those, whether sick patients or beggared taxpayers, who are forced to either submit to or fund specious science, medical or otherwise. The trio of authors call the implications of this finding “dire,” pointing to a 2008 158 6 The Chicken Littles of Big Science; or, Here Come the Killer Asteroids! paper in the New England Journal of Medicine showing that “almost all trials” of anti-depressant medicines that had had positive results had been published, while almost all trials of anti-depressants that had come up with negative results “remained either unpublished or were published with the results presented so that they would appear ‘positive.’” Young, Ioannidis, and Al-Ubaydli conclude that “science is hard work with limited rewards and only occasional successes. Its interest and importance should speak for themselves, without hyperbole.” Elitejournals, conscious of the need to attract attention and stay relevant, cutting edge, and avoid the curse of stodginess, are prone to publish gross exaggeration and findings of dubious merit**.** When lawmakers and grant-givers take their cues from these journals, as they do, those tax dollars ostensibly devoted to the pursuit of pure science and the application of scientific research are diverted down unprofitable, even impossible channels. The charlatans make names for themselves, projects of questionable merit grow fat on the public purse, and the disconnect between what is real and what subsidy-seekers tell us is real gets ever wider. 65 The matter, or manipulation, of odds in regards to a collision between a space rock and Earth would do Jimmy the Greek proud. As Michael B. Gerrard writes in Risk Analysis in an article assessing the relative allocation of public funds to hazardous waste site cleanup and protection against killer comets and asteroids, “Asteroids and comets are… the ultimate example of a low-probability/high-consequence event: no one in recorded human history is confirmed to have ever died from one**.**” Gerrard writes that “several billion people” will die as the result of an impact “at some time in the coming half million years,” although that half-million year time-frame is considerably shorter than the generally accepted extinction-event period. 66 The expected deaths from a collision with an asteroid of, say, one kilometer or more in diameter are so huge that by jacking up the tiny possibility of such an event even a little bit the annual death rate of this never-beforeexperienced disaster exceeds deaths in plane crashes, earthquakes, and other actual real live dangers**.** Death rates from outlandish or unusual causes are fairly steady across the years. About 120 Americans die in airplane crashes annually, and about 90 more die of lightning strikes. Perhaps five might die in garage-door opener accidents. The total number of deaths in any given year by asteroid or meteor impact is zero — holding constant since the dawn of recorded time.

AND, MORE EVIDENCE – THE AFF OVEREXAGGERATES THE IMPACT BY A FACTOR OF THOUSANDS

**BENNETT 2010** [James – William P. Snavely Professor of Political Economy and Public Policy at George Mason University and director @ John M. Olin Institute for Employment Practice and Policy, “The Chicken Littles of Big Science; or, Here Come the Killer Asteroids!” *The Doomsday Lobby*, <http://www.springerlink.com/content/mup70473n166w389/>] ttate

The closest thing to an impact even distantly related to the “catastrophic” occurred just over a century ago. In June 1908, in an event that is central (because seemingly unique in modern times) to the killer asteroid/comet lobby, the so-called Tunguska asteroid, 70 yards (60 meters) in length, exploded about 8 kilometers above the ground in remote Siberia. Its explosion unleashed 20 or more megatons of energy and “flattened about 2,000 square kilometers of forest.” 30 No human casualties were reported, as this was an unpopulated spot in Siberia. Sharon Begley of Newsweek once quoted John Pike of the Federation of American Scientists as saying that a Tunguska-sized rock from outer space could kill 70,000 people if it hit in rural American and 300,000 if it struck an urban area. 31 Maybe. Although it helps to remember that a Tunguska-sized rock did hit the Earth a century ago, and its human death toll was a nice round number: zero. Does Tunguska have antecedents? As Gregg Easterbrook elucidated in the Atlantic Monthly, geophysicist Dallas Abbott of Columbia University has argued that space rocks of, respectively, 3–5 kilometers and 300 meters struck the Indian Ocean around 2800 B.C. and the Gulf of Carpentaria in 536 A.D. 32 The latter led to poor harvests and cold summers for two years, while the former may have unleashed a planetary flood. Abbott’s evidence is a crater 18 miles in diameter at the bottom of the Indian Ocean, the impact from which she believes a 600-foot-high tsunami wracked incredible devastation. It should be noted, as the New York Times did, that “Most astronomers doubt that any large comets or asteroids have crashed into the Earth in the last 10,000 years.” Abbott and what she calls her “band of misfits” in the Holocene Impact Working Group take a decidedly minority view of the matter, and while that does not mean that they are wrong, it does mean that their alternative estimation of the frequency of 10-Megaton-size impacts **—** once every 1,000 or so years as opposed to the more generally accepted once every million years — should be viewed with great skepticism**.** 33 (Easterbrook, ignoring the majority of scientists who dispute Abbott’s contentions, concludes that “Our solar system appears to be a far more dangerous place than was previously believed.”) Easterbrook is a fine science writer but his piece contains certain telltale phrases (100-kilometers asteroids are “planet killers” and NASA’s asteroid and comet-hunting efforts are “underfunded”) that point to an expensive conclusion. He takes up the cause of Dallas Abbott, who complains that “The NASA people don’t want to believe me. They won’t even listen.” Consider this quote: After noting that scientists estimate that a “dangerous” object strikes the Earth every 300,000 to one million years**,** Easterbrook asks William Ailor of The Aerospace Corporation, “a think tank for the Air Force,” what his assessment of the risk is. Ailor’s answer: “a one-in-10 chance per century.” 3

## COLLISION ADV EXTS - #3 - NO EXTINCTION

**AND, IT WAS NOT AN ASTEROID THAT CAUSED THE LAST MASS EXTINCTION**

**Gale Encyclopedia of Science, no date**, (Gale Encycopedia of Science, “The Asteroid-Impact Theory” no date, [http://booklists.narod.ru/P\_Physics/PGe\_Encyclopaediae/Lerner\_K.L.\_\_Lerner\_B.W.\_\_eds.\_\_Vol.2.\_The\_Gale\_encyclopedia\_of\_science.\_Charge\_coupled\_device\_\_\_Eye\_\_Thompson\_Gale\_\_2004\_\_380dpi\_\_T\_\_C\_\_792s\_.20.htm)[Max](http://booklists.narod.ru/P_Physics/PGe_Encyclopaediae/Lerner_K.L.__Lerner_B.W.__eds.__Vol.2._The_Gale_encyclopedia_of_science._Charge_coupled_device___Eye__Thompson_Gale__2004__380dpi__T__C__792s_.20.htm%29%5BMax) Waxman]

The asteroid impact theory is now widely accepted as the most probable explanation of the K-T iridium anomaly, but many geologists still debate whether the impact of this large meteorite was the sole cause of the [mass extinction](http://science.jrank.org/pages/2643/Extinction-asteroid-impact-theory.html) of the dinosaurs and other life forms at that time, as the fossil record seems to show an above-average rate of extinctions in the time leading up to the K-T boundary. A number of gradual causes can accelerate extinction: falling [ocean](http://science.jrank.org/pages/4828/Ocean.html) levels, for example, expose continental shelves, shrinking shallow marine environments and causing drier continental interiors, both changes that encourage extinction. Further, very large volcanic eruptions may stress the global environment. The asteroid that caused the Chicxulub crater may have coincidentally amplified or punctuated an independent extinction process that had already begun. There is no reason why many different causes cannot have acted, independently or in concert, to produce [extinction events](http://science.jrank.org/pages/2643/Extinction-asteroid-impact-theory.html). The asteroid-impact theory has been applied to many mass extinctions since the discovery of Chicxulub. Most of the five major mass extinctions of the last 540 million years, and several of the smaller ones, have been shown to coincide in time with large impact craters or iridium spikes (layers of heightened iridium concentration) in the geological column.

**AND, The probability of an asteroid impact is too small to matter**

Hurd, 11. (Christine A. is a writer for the Harvard Crimson who cites the director of the Minor Planet Center at the Harvard-Smithsonian Center for Astrophysics. April 22, 2011, “Astronomer Talks Asteroid Strikes,” http://www.thecrimson.com/article/2011/4/22/spahr-asteroids-asteroid-lecture/, CALLAHAN)

Timothy B. Spahr, director of the Minor Planet Center at the Harvard-Smithsonian Center for Astrophysics, dispelled Hollywood conceptions of space in a talk last night about his work identifying asteroids whose trajectory may pass near earth. Spahr lectured at the CfA, which opened its doors to the public for its monthly “Observatory Night.” The event included an hour-long lecture by Spahr and an opportunity to use the Center’s high-powered telescope to view Saturn, an Iridium satellite flare, and the International Space Station. Central to Spahr’s lecture was a survey of how far the Minor Planet Center, which identifies asteroids and their trajectories, has come in the past two decades with the aid of a supercomputer, observatories around the world, and even amateur astronomers. In 2008, Spahr, along with the help of his four-person team, accurately predicted where a two-meter-wide asteroid would strike within 20 kilometers of the actual impact site. “The good news is that nearly 100 percent of asteroids one mile across are known and tracked by us,” Spahr said. “I don’t want people to get the idea that I’m running around screaming that asteroids are going to hit.” Spahr also dispelled some myths about the possibility of a doomsday scenario à la “Armageddon” or “Deep Impact.” “If you’ve seen ‘Armageddon,’ they say that an asteroid the size of Texas is going to hit and that it’s coming out of nowhere,” Spahr said. “Well, we found the last asteroid the size of Texas 211 years ago. It’s nice for movies but totally improbable.” Spahr also added that cinematic solutions to averting calamity are fictitious. “You really don’t want to nuke an asteroid,” Spahr said. “Even though it’d be fun, it’s much more effective to just put a heavy object next to the asteroid and drag it away from its predicted trajectory. I think the desire to nuke them stems from the end of the Cold War. They didn’t know what to do with all of the leftover nukes, so they started thinking about nuking asteroids.” Christine E. Pulliam, who works as a public affairs specialist for the CfA, summed up Spahr’s work and highlighted its importance. “He’s really one of the unsung heroes of the astronomical world,” Pulliam said. “He’s seen it all—the ‘Oh my God, the asteroids are coming!’—and he never panics.” Polly S. Stevens, who is taking a course on near-Earth objects through the Harvard Institute for Learning in Retirement, said she generally felt comforted by the lecture, but thinks that it’s more guesswork than is let on. “There’s a big divide between cautious scientists and people saying asteroids are going to bombard us,” Stevens said. “However, [Spahr] didn’t really talk about how different-sized asteroids would affect us.” Jim Brookshire, whose son studies at MIT and paid for his transportation from Virginia to Cambridge as a birthday present, said the lecture made him feel safer about the possible threat of apocalypse by asteroid. “I like to think that I help people sleep at night,” Spahr said. “But I don’t reduce the probability of an asteroid hitting, I just tell you that it’s not likely.”

## COLLISION ADV EXTS – AT: APOPHIS

**No risk of Apophis impact – new NASA study proves**

**Brown, 09.** (Dwayne works at NASA headquarters in Washington, Oct 7, 2009, “Nasa Redefines Asteroid Apophis’ Path Toward Earth,” http://neo.jpl.nasa.gov/news/news164.html, CALLAHAN)

PASADENA, Calif. -- Using updated information, NASA scientists have recalculated the path of a large asteroid. The refined path indicates a significantly reduced likelihood of a hazardous encounter with Earth in 2036. The Apophis asteroid is approximately the size of two-and-a-half football fields. The new data were documented by near-Earth object scientists Steve Chesley and Paul Chodas at NASA's Jet Propulsion Laboratory in Pasadena, Calif. They will present their updated findings at a meeting of the American Astronomical Society's Division for Planetary Sciences in Puerto Rico on Oct. 8. "Apophis has been one of those celestial bodies that has captured the public's interest since it was discovered in 2004," said Chesley. "Updated computational techniques and newly available data indicate the probability of an Earth encounter on April 13, 2036, for Apophis has dropped from one-in-45,000 to about four-in-a million." A majority of the data that enabled the updated orbit of Apophis came from observations Dave Tholen and collaborators at the University of Hawaii's Institute for Astronomy in Manoa made. Tholen pored over hundreds of previously unreleased images of the night sky made with the University of Hawaii's 88-inch telescope, located near the summit of Mauna Kea. Tholen made improved measurements of the asteroid's position in the images, enabling him to provide Chesley and Chodas with new data sets more precise than previous measures for Apophis. Measurements from the Steward Observatory's 90-inch Bok telescope on Kitt Peak in Arizona and the Arecibo Observatory on the island of Puerto Rico also were used in Chesley's calculations. The information provided a more accurate glimpse of Apophis' orbit well into the latter part of this century. Among the findings is another close encounter by the asteroid with Earth in 2068 with chance of impact currently at approximately three-in-a-million. As with earlier orbital estimates where Earth impacts in 2029 and 2036 could not initially be ruled out due to the need for additional data, it is expected that the 2068 encounter will diminish in probability as more information about Apophis is acquired. Initially, Apophis was thought to have a 2.7 percent chance of impacting Earth in 2029. Additional observations of the asteroid ruled out any possibility of an impact in 2029. However, the asteroid is expected to make a record-setting -- but harmless -- close approach to Earth on Friday, April 13, 2029, when it comes no closer than 18,300 miles above Earth's surface. "The refined orbital determination further reinforces that Apophis is an asteroid we can look to as an opportunity for exciting science and not something that should be feared," said Don Yeomans, manager of the Near-Earth Object Program Office at JPL. "The public can follow along as we continue to study Apophis and other near-Earth objects by visiting us on our AsteroidWatch Web site and by following us on the @AsteroidWatch Twitter feed." The science of predicting asteroid orbits is based on a physical model of the solar system which includes the gravitational influence of the sun, moon, other planets and the three largest asteroids. NASA detects and tracks asteroids and comets passing close to Earth using both ground and space-based telescopes. The Near Earth-Object Observations Program, commonly called "Spaceguard," discovers these objects, characterizes a subset of them and plots their orbits to determine if any could be potentially hazardous to our planet. JPL manages the Near-Earth Object Program Office for NASA's Science Mission Directorate in Washington. Cornell University operates the Arecibo Observatory under a cooperative agreement with the National Science Foundation in Arlington, Va.

**APOPHIS WILL MISS US – NO RISK OF IMPACT**

**Henderson, 2008**, (Mark, journalist for *The Times*, “Could we be hit by an asteroid?”, April 21, 2008, LexisNexis Academic) [Max Waxman]

Nasa has been known to make schoolboy errors from time to time. In 1999, for instance, its Mars Climate Orbiter crashed because scientists forgot to convert between imperial and metric units. Last week a German schoolboy suggested it had goofed again. An asteroid called Apophis caused a brief stir in 2004 when calculations indicated it had a 3 per cent risk of a collision with Earth in 2029. It was accordingly named after the Egyptian god of destruction. As usually happens, further observations revealed a false alarm. Apophis will miss us - only by a smidgen in astronomical terms, but by more than enough for life to go on. The chances of disaster are just one in 45,000. According to Nico Marquardt, however, Nasa's sums are wrong. Apophis, the 13 year-old calculated, will fly close enough to strike a satellite, which could throw it into a more dangerous orbit. "Boy humbles Nasa" is a fantastic headline, but sadly it isn't true. While Apophis will pass within the distance at which geostationary satellites orbit, it won't affect the belt where they fly. We should be safe - this time. The threat to civilisation from asteroids and comets is a stable of silly season stories and Bruce Willis movies. But if most reports of Earth-bound objects are exaggerated, the broader threat is not. An asteroid probably did for the dinosaurs 65 million years ago. A recent paper suggested that a comet might explain the Biblical destruction of Sodom and Gomorrah, and objects large enough to wipe out London strike every thousand years. The actual chances of a devastating impact may be even greater than that. Nico might have been wrong about Apophis, but he was right that satellites increase the size of the target our planet presents to space. New research by Mark Boslough, of the US Sandia National Laboratories, has also indicated that the asteroid that obliterated more than 800 square miles of Siberian forest in 1908 may have been much smaller than previously assumed. That would mean similar events could be common. There is still no need for us to fear Apophis, but we are sitting in harm's way. Money spent on tracking asteroids, and on investigating how they might be deflected, is certainly not money wasted.

## SMALL ASTEROIDS ADVANTAGE FRONTLINE

**FIRST, IT IS NOT A QUESTION OF US DETECTION – PLAN DOES NOT SOLVE FOR OTHER COUNTRIES’ INABILITY TO DETECT AND THE INABILITY FOR THE US TO DISSEMINATE THE DATA WE HAVE**

**GEORGE MARSHALL INSTITUTE, 2003,** (George Marshall Institute, “National Security Implications of the Asteroid Threat” February 5, 2003, <http://www.marshall.org/pdf/materials/110.pdf>) [Waxman]

Every year about 30 asteroids enter Earth’s atmosphere and explode, releasing as much energy as the Hiroshima A-bomb. Such an event occurred in June 2002 when an asteroid entered the atmosphere and detonated over the Mediterranean. “While it is important not to overly sensationalize the issue, an asteroid impact, when **combined** with the potential for miscalculation and misperception by nations lacking sophisticated observation systems, could be mistaken for a missile strike and precipitate a nuclear conflict,” said Jeff Kueter, the Marshall Institute’s Executive Director. The United States has technology to differentiate between missile attacks, nuclear detonations and asteroid explosions, but many less advanced nations do not. While the U.S. has the capacity to distinguish between nuclear explosions and asteroid impacts, it lacks the systems, procedures, and resources to disseminate this information in a timely manner. “The United States has operational systems capable of distinguishing between nuclear detonations and asteroid impacts, but at the present time, there is no procedure for processing the data from these systems in a routine manner,” Dr. Correll said.

**AND, EVEN SMALL ASTEROIDS ONLY HIT ONCE EVERY 10,000 YEARS**

**MORRISON ET AL 2003** [David, senior scientist at the NASA Astrobiology Institute @NASA Ames Research Center, AW Harris – researcher @ NASA Jet Propulsion Laboratory, G. Sommer – fellow @ RAND Corporation, “Dealing with the impact hazard” in *Asteroids III* (ed. Bottke, Cellino, Paolicchi, and Binzel), pages 739-754] ttate

While most of the data are approximately consistent with a power law, the lunar-derived NEO population curve of Werner et al. (2002) shows an obvious departure, usually interpreted as a shortage of small (diameter less than a few hundred meters) impactors, although it might also suggest an early excess of large asteroids or comets not currently represented in the NEA flux. Interpreted in the usual way, however, the lunar curve indicates that the frequency of Tunguska-size impactors is roughly one per 10,000 yr**,** more than an order of magnitude below the usually quoted frequency of such impacts,and a surprisin**g** result given that we experienced such an event within the last century. We don’t know where the problem lies, but we suggest that the NEA population derived by Werner et al. from the lunar cratering statistics warrants consideration of alternative interpretations of the data

## SMALL ASTEROIDS ADV ANSWERS – AT: OZONE MODULE

**INSIGNIFICANT OZONE DEPLETION FROM A SMALL NEO COLLISION**

**BIRKS et al 2007** [John – professor in the Department of Chemistry and Biochemistry and Cooperative Institute for Research in Environmental Science, “Chapter 13: Frequent Ozone Depletion Resulting from Impacts of Asteroids and Comets” in *Comet/Asteroid Impacts and Human Society: An Interdisciplinary Approach*]

Both water vapor and NOx are rapidly transported downward to the stratosphere for all three impact cases. Figure 13.4 shows changes in the vertical distribution of these species during the first 50 days following large, medium and small impacts; the results for NOx and water vapor are extended to one year in Fig. 13.5. Large fractions of both water vapor and NOx have descended below 50 km (height of the normal stratopause), with concentrations peaking in the stratosphere after only three months. Changes in ozone concentrations are shown in Fig. 13.6 for all three cases out to day 50, and ozone depletions for the large impact are simulated for the first full year following impact in Fig. 13.5. For the large impact case, injection of NO and H2O causes large ozone depletions in the upper stratosphere that persist through the first year. Ozone depletions are summarized in Fig. 13.7 for the large, medium and small impact cases. By day 50 ozone depletion of the globally integrated ozone column (above 30 km) has been depleted by 58%, 9% and 1% for the large, medium and small impact cases. These depletions continue to increase beyond day 50 for the large and medium impact cases. Local depletions within the hemisphere of impact are much larger. Stratospheric ozone levels are expected to recover over a period of 2–3 years as water vapor and NOy are slowly removed to the troposphere.

## SPACE LEADERSHIP ADVANTAGE FRONTLINE

**PLAN WILL NOT SHORE UP US SPACE LEADERSHIP – INTERNATIONAL COMMUNITY RESENTS US UNILATERAL ACTION – PLANETARY DEFENSE REQUIRES INTERNATIONAL COOPERATION**

Dinerman, 09(Taylor Dinerman, author of the textbook Space Science for Students and consultant for the US Defense Department, “the new politics of planetary defense,” 7/16/11, <http://www.thespacereview.com/article/1418/1>) Hou

American leadership in space is much more desired that resented**—except when it gets used unilaterally**, as in the past Administration’s call for “dominance in cislunar space.” Asian countries (China, Japan, India) are especially interested in lunar landings; Western countries, including the US, much less so. However, cooperating with Asian countries in lunar science and utilization would be both a sign of American leadership and of practical benefit to US national interests. Apollo 11 astronaut Buzz Aldrin has been a leader advocating such cooperation. At the same time American leadership can be extended by leading spacefaring nations into the solar system with robotic and human expeditions to other worlds. The US can’t do everything alone. Climate monitoring, Earth observation, space weather prediction, and ultimately asteroid deflection are huge and vital global undertakings that require international participation. That is also true with exploration projects sending robots and human to other worlds. American leadership in these areas is welcomed and used by other countries, even as they develop their own national programs. The US government should make more of this and not treat it as an afterthought—or even worse, prohibit American leadership as the House of Representatives is doing this week by banning any China collaboration or cooperation. (The proposed House continuing resolution for fiscal year 2011 prohibits OSTP or NASA funds to be used for anything to do with China.)

## ASTEROID MINING ADVANTAGE FRONTLINE

**NO ECONOMIC BENEFITS FROM ASTEROID MINING – IT COSTS MORE THAN THE PROFITS IT WOULD YIELD**

**O’Neill 09** (Owner/writer of astroengine.com, [**Mining Asteroids: Not At Those Overheads**](http://www.astroengine.com/2009/06/mining-asteroids-not-at-those-overheads/), http://www.astroengine.com/2009/06/mining-asteroids-not-at-those-overheads/)

Although asteroid mining looks good on paper, once you do a little bit of adding up, you suddenly realize it’s actually one hell of an undertaking. Looking at the economics of asteroid mining is especially daunting, and believe me, my co-author [Greg Fish](http://www.worldofweirdthings.com/) has done the number crunching. When Greg and I started out researching our book, [*Astroeconomics: Making Money from the Vacuum of Space*](http://www.astroengine.com/?p=4316), we initially made the assumption that the key way to make vast wads of cash in space is from asteroid mining. This assumption was purely based on… well, *an assumption*. A quick glance on the various space advocacy websites will demonstrate just how accepted asteroid mining is as a future industry. After all, science fiction has been telling us this for years. Given a sufficiently advanced technology, we’ll be able to build a spaceship, with a mining platform, send it to the asteroid belt (obviously a very short distance), fill up the cargo hold with ore (or, if we are *that* advanced, refined precious metals) and be back on Earth by a week next Friday. However, when we looked at the situation, we decided to focus on the economics of the beast (in all honesty, Greg did the calculations, I can barely balance my own books, let alone the books of an entire space-faring industry). Naturally, we assume it’s going to be *businesses* (not governments) wanting to mine asteroids, and we assume mining/spaceflight technologies that could possibly be available within the next few decades (and no, we didn’t consider nanotech; I’m thinking rock-eating nanobots wont be available in stores for a long while yet). We also assumed these space mining companies will want to make a profit (we might be wrong). Unfortunately, asteroid mining doesn’t make an awful lot of sense from a business perspective. The risk is too high, the overheads are whopping, and the payback — while impressive — won’t pay the bills. And then there’s nasties like space pirates and industrial accidents to consider, adding to the ‘risk’ factor. All in all, it’s not a very attractive business proposition to build a mining fleet and send it on an interplanetary joyride; most businesses would rather set up a mining installation in the middle of Antarctica. But we’re not pouring cold water on the whole venture either, we’ve worked out a few ways future businesses can actually turn asteroid mining into an industry.

**AND, ASTEROID MINING CAN’T OCCUR – INTERNATIONAL TREATIES PROHIBIT**

**LAMB 2001** [David – professor of philosophy and bioethics @ University of Birmingham, *The Search for Extraterrestrial Intelligence: A Philosophical Inquiry*, <http://images.hitungmundur.multiply.multiplycontent.com>] ttate

Space travel, it has been argued, is now or never affair (Breuer, 1982), as we are using up the necessary material resources. There are proposals to mine asteroids. Space Dev is an American exploration company that wants to stake its claim to an asteroid, which is intended to be mined for its minerals when the technology becomes available (Kleiner, 1997: 18). This raises legal problems, as international treaties prevent nations from staking a claim to heavenly bodies. But the status of private companies is not that dear in this field. It h~1s been pointed out that in about 200 years there will not he the fossil and metallic raw material for spaceships and space stations (Breuer, 1982: 256). If work is not undertaken soon to extract material from the I'vloon, it will be too late to exploit the Moon or the asteroids, as there will not be the material left on Earth to create the rockets capable of lifting a minimum o[ 2,000 tonnes of implements and a nuclear }'eactor to the I'vloon. The distances vvithin the solar system are daunting, not only in terms o[ material resources, but in terms of the psychological problems encountered in long periods in space. <112>

**AND, Important technology key to mining asteroids does not exist – little research has been done**

**Gerlach 5** ("Profitably Exploiting Near Earth Objects" Charles is founder and CEO of Gerlach Space Systems and graduate of Harvard Law abundantplanet.org/files/Space-Ast-Profitably-Exploiting-NEO-Gerlach-20)NKnez

Technology issues present many of the greatest challenges to successfully and economically executing an asteroid mining mission. The prohibitively high costs of sending astronauts and potentially long communications delays require that all operations be highly automated. Automated machinery must work perfectly; even minor failures can cause mission failure. However, terrestrial mining experience with automation has generally been poor, and operations will be complex and hard on equipment. New equipment will have to be developed and integrated. To handle industrial quantities of materials, bench-top processes are not sufficient. Developing industrial mining and refining processes will ultimately hinge on deployment of actual working equipment to learn what works and what does not. These systems will be different from those used in traditional robotic space science missions that essentially consist of one-of-a-kind instrument collections designed for generating very specific types of scientific data. Profitably Exploiting Near-Earth Object Resources 2005 Gerlach Space Systems LLC. Some rights reserved. This work is licensed under a Creative Commons License (Attribution & Share Alike). Page 24 Another important area of technical innovation over the past 15 years has been the growing experience in launching lower-cost missions using commercial off the shelf technologies (COTS) and innovative organizational approaches. A whole micro-space industry has emerged building small satellites and space systems. Notable successes with these approaches have included Clementine, Lunar Prospector, and Deep Space 1. The importance of engineering design of mining and extraction equipment cannot be overstated. There is a real possibility that mining equipment masses could be extremely compact, provided elegant ways are found to use the benefits of the unique space environment. Testing of equipment in the relevant environment is a critical step toward feasibility, and should focus on bringing reliability requirements to levels currently accepted by industry. Little research and development has been undertaken into the capabilities required for NEO mining. In 1999, Zealey, Sonter, and a team at the University of Wollongong Department of Engineering Physics in Australia, worked to create a “reasonably realistic design” for an asteroid drill that could one day allow spacecraft to extract volatiles from a comet.69 One aspect of this research required Zealey and Sonter to attempt to create lowdensity comet core simulants on which to perform mining experiments. The drill design was to include a penetrator with a thermal tip and explosive functionality that could bore, melt, and blast through cometary materials. It would also include a “cold finger” that would sit at the surface and collect steam created by the penetrator.

## ASTEROID MINING ADVANTAGE ANSWERS – AT: HYDROGEN ECONOMY MODULE

**A HYDROGEN-BASED ECONOMY IS NOT SUSTAINABLE – THE ECONOMIC VALUE OF HYDROGEN IS NOT GREATER THAN THE COSTS OF THE TRANSITION**

Zyga 06 (Lisa, a contributing author to Physorg.com, PhysOrg is a popular science, research and technology news website specializing in the [hard science](http://en.wikipedia.org/wiki/Hard_science) subjects of physics, space and earth science, biology, chemistry, electronics, nanotechnology and technology in general, “Why a hydrogen economy doesn't make sense,” PhysOrg, 12/11/06, <http://www.physorg.com/print85074285.html>) nikhil

**In a recent study, fuel cell expert Ulf Bossel explains that a hydrogen economy is a wasteful economy. The large amount of energy required to isolate hydrogen from natural compounds (water, natural gas, biomass), package the light gas by compression or liquefaction, transfer the energy carrier to the user, plus the energy lost when it is converted to useful electricity with fuel cells, leaves around 25% for practical use — an unacceptable value to run an economy in a sustainable future. Only niche applications like submarines and spacecraft might use hydrogen.** “More energy is needed to isolate hydrogen from natural compounds than can ever be recovered from its use,” Bossel explains to *PhysOrg.com*. “Therefore, making the new chemical energy carrier form natural gas would not make sense, as it would increase the gas consumption and the emission of CO2. Instead, the dwindling fossil fuel reserves must be replaced by energy from renewable sources.” While scientists from around the world have been piecing together the technology, Bossel has taken a broader look at how realistic the use of hydrogen for carrying energy would be. His overall energy analysis of a hydrogen economy demonstrates that high energy losses inevitably resulting from the laws of physics mean that a hydrogen economy will never make sense. “The advantages of hydrogen praised by journalists (non-toxic, burns to water, abundance of hydrogen in the Universe, etc.) are misleading, because the production of hydrogen depends on the availability of energy and water, both of which are increasingly rare and may become political issues, as much as oil and natural gas are today,” says Bossel. “There is a lot of money in the field now,” he continues. “I think that it was a mistake to start with a ‘Presidential Initiative’ rather with a thorough analysis like this one. Huge sums of money were committed too soon, and now even good scientists prostitute themselves to obtain research money for their students or laboratories—otherwise, they risk being fired. But the laws of physics are eternal and cannot be changed with additional research, venture capital or majority votes.”Even though many scientists, including Bossel, predict that the technology to establish a hydrogen economy is within reach, its implementation will never make economic sense, Bossel argues. “In the market place, hydrogen would have to compete with its own source of energy, i.e. with ("green") electricity from the grid,” he says. “For this reason, creating a new energy carrier is a no-win solution. We have to solve an energy problem not an energy carrier problem." In his study, Bossel analyzes a variety of methods for synthesizing, storing and delivering hydrogen, since no single method has yet proven superior. To start, hydrogen is not naturally occurring, but must be synthesized. “Ultimately, hydrogen has to be made from renewable electricity by electrolysis of water in the beginning,” Bossel explains, “and then its energy content is converted back to electricity with fuel cells when it’s recombined with oxygen to water. Separating hydrogen from water by electrolysis requires massive amounts of electrical energy and substantial amounts of water.” Also, hydrogen is not a source of energy, but only a carrier of energy. As a carrier, it plays a role similar to that of water in a hydraulic heating system or electrons in a copper wire. When delivering hydrogen, whether by truck or pipeline, the energy costs are several times that for established energy carriers like natural gas or gasoline. Even the most efficient fuel cells cannot recover these losses, Bossel found. For comparison, the "wind-to-wheel" efficiency is at least three times greater for electric cars than for hydrogen fuel cell vehicles. Another headache is storage. When storing liquid hydrogen, some gas must be allowed to evaporate for safety reasons—meaning that after two weeks, a car would lose half of its fuel, even when not being driven. Also, Bossel found that the output-input efficiency cannot be much above 30%, while advanced batteries have a cycle efficiency of above 80%. In every situation, Bossel found, the energy input outweighs the energy delivered by a factor of three to four. “About four renewable power plants have to be erected to deliver the output of one plant to stationary or mobile consumers via hydrogen and fuel cells,” he writes. “Three of these plants generate energy to cover the parasitic losses of the hydrogen economy while only one of them is producing useful energy.” This fact, he shows, cannot be changed with improvements in technology. Rather, the one-quarter efficiency is based on necessary processes of a hydrogen economy and the properties of hydrogen itself, e.g. its low density and extremely low boiling point, which increase the energy cost of compression or liquefaction and the investment costs of storage.

**AND, MORE EVIDENCE – HYDROGEN FUEL IS NOT SUSTAINABLE – TAKES MORE ENERGY TO CONVERT IT INTO FUEL**

**Kreith & West 03** [Frank is a Professor Emeritus in the Mechanical Engineering Department at the University of Colorado in Boulder, “Gauging Efficiency” June 2003 http://css.engineering.uiowa.edu/~me\_048/fall2008/fuelcell2.pdf]

Although it's far from new, the idea of using hydrogen to replace fossil fuels seems, at first blush, like a dream come true. The reality is more complex. Hydrogen does not exist in nature in a form that can be used as a fuel. It occurs naturally in water or in carbon compounds such as methane, and must be converted into the combustible form, H2, by chemical processing. This processing requires energy from a primary source, such as coal, natural gas, uranium, wind, or the sun, and is thus at least somewhat inefficient and polluting.

## POLITICS DA LINKS – OBAMA GOOD – LAWMAKERS

**PLAN WILL BE DIVISIVE AND THE BATTLE WILL BE LONG – CONGRESS DOES NOT SEE ASTEROID COLLISION AS A THREAT**

Borchers, 09 (Brent W. Borchers, USAF Major, “Should the US be involved in Planetary Defense?” http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA539693&Location=U2&doc=GetTRDoc.pdf, 7/17/11)

Whoever gets the final nod to go ahead with the project of planetary defense,chances are there would be a lot of debate in Congress as to who gets the funding for such a project and some of it probably won’t be altruistic in nature**.** Senators and Representatives could be swayed to vote for a certain agency to take the lead depending on the economic impact it would have in their districts. This problem is exacerbated because we’re talking about building a system before we need it.Most people still wouldn’t see a NEO as a serious threat and the elected representatives may only see this project as a “cash cow” to argue over on Capitol Hill and play politics within their districts. To this day there are still Congressional “food fights” that we see over who gets to build the next tanker aircraft for the USAF or the next search and rescue helicopter contract for the AF. These “food fights” in Congress don’t really take into account what the organization knows that it needs or what it wants for the mission. We’d have to be sure such a problem doesn’t derail a planetary defense project before it is even started.

**NEO detection not popular – plan drains political capital**

Dearing, 11. (Matthew, MA in Physics @ Cornell, former intern @ Argonne National Laboratory, April 12, 2011, “Protecting the Planet Requires Heroes, Money, and Citizen Scientists” http://research.dynamicpatterns.com/2011/04/12/protecting-the-planet-requires-heroes-money-and-citizen-scientists/, CALLAHAN)

Recently, the New Yorker published a narrative about the current struggles NASA is experiencing with fulfilling this civilization-saving task. It features the plight of an astronaut-turned-NEO evangelizer, Russell Schweickart, who now heads the B612 Foundation, which is driven by the goal to “significantly alter the orbit of an asteroid in a controlled manner by 2015.” NASA has money to search-and-destroy NEOs, but the allotted budget just might cover snacks and bagels pre-purchased at the grocery store for departmental meetings. So, the NEO program at NASA certainly could use some loud support. The article overviews one of these meetings held in 2010 to develop a direction for moving NASA forward in the crapshoot that was once only considered to be a popular Atari game (play now! Can you now calculate the energy from each laser shot?). This meeting, called the The NASA Advisory Council Ad-Hoc Task Force on Planetary Defense, was held in two sessions during 2010, and was co-chaired by Mr. Schweickart. The council’s purpose was to review NASA’s current and future role in the issue of near-earth asteroids, and to create a formal recommendation on what NASA should and should not continue to be doing. The interesting notes from the first of the two sessions are available online: April 15-16, 2010 Minutes [PDF] There are many issues that NASA must juggle with here, including political, financial, and scientific. Who is willing to risk one’s political capital to champion the destruction of once-in-an-epoch giant fireballs in the sky, albeit one that can destroy our civilization as we know it? How much of taxpayer dollars can be appropriated to a once-in-an-epoch event, albeit one that can destroy our civilization as we know it? And, with deflection technology really already at hand, how professionally interesting is it to track and monitor orbiting rocks, since a Nobel Prize doesn’t target too many rocks these days? The bottom line is that the political will and the money are not available from the United States federal government, so the financing of advancing technology–well in advance of pending doom–is not really an option right now, and will likely continue to not be an option for some time. Methods of averting potentially impacting objects have already been proposed, and should be reasonable to implement without too much of a technological leap, if any, although the funding factor will always be an application killer. In fact, according the the task force’s minutes, NASA should stay out of the direct defensive activities, and leave that to those who know how to defend, like the Air Force. Of course, the United States is already over-criticized for being the police force of the world, so why should it now have to be the defender of the planet and of all civilization?

**No support from Congress**

Dearing, 11. (Matthew, MA in Physics @ Cornell, former intern @ Argonne National Laboratory, April 12, 2011, “Protecting the Planet Requires Heroes, Money, and Citizen Scientists” http://research.dynamicpatterns.com/2011/04/12/protecting-the-planet-requires-heroes-money-and-citizen-scientists/, CALLAHAN)

Many of us while growing up and listening to our bedtime stories learned to not freak out and run screaming through the streets if we thought that the “sky is falling.” As little chickens, we were taught at an early age that it was best to be brave, calm, and rational, else be considered a crazed lunatic. This childhood behavioral bias infiltrated adulthood in the relationship between professional astronomers, policy-makers and national budget-number crunchers. When a scientist expresses probabilistic concerns about the impending doom of our planet from a cataclysmic change of a major impact event, say, in the next 100, 1,000, or 10,000 years, it requires just too much risk of political capital and tax-payer dollars to divert significant budget resources to something that might only be a concern for our uber-great grandchildren. “Earth Impact Effects Program: A Web-based computer program for calculating the regional environmental consequences of a meteoroid impact on Earth” [PDF] Gareth S. Collins, et al. Meteoritics & Planetary Science 40, Nr 6, 817–840 (2005) The simultaneous efforts of two Hollywood studios in the late nineties of the last century tried to get something stirring in our cultural awareness with their mega-disaster flicks, Armageddon and Deep Impact. These features did bring us through the box office (which was certainly their primary goal!), but they did not push us en masse to the round table to prepare for the ultimate defensive plan for our planet. Combating Earth-bound asteroids, or “near-earth objects” (NEOs), is an unsolved problem, and one that citizen scientists largely ignore because it’s assumed that this issue must be only approached via the domain that has access to the massive amounts of taxpayer dollars and the international collaborations between those nations who can liberally spend all of that money. It’s this requirement of essentially unlimited funds that is the sticking point to making serious progress on defending against an event that may, or may not, happen in the upcoming budget cycle.

## POLIITCS DA LINKS – OBAMA GOOD – LAWMAKERS

**Asteroid detection efforts are ridiculed and not supported in Congress**

New Yorker, 11. (Tad Friend has been a staff writer at the New Yorker since 1998 and has been an editor at several other publications, including *Esquire*, “Vermin of the Sky; Who will keep the planet safe from asteroids?” lexis, CALLAHAN)

The difficulty that planetary defense has always faced is that until an asteroid looms in its "death plunge" the topic seems remote from constituent concerns. No political glory or capital accrues from taking measures that might, decades later, prove to have been prudent. There's also the gravitas question, a.k.a. the "giggle factor." Representative Dana Rohrabacher, a conservative Republican from California's Orange County, who has been the leading (if not the only) voice in Congress for planetary defense, told me, "Anybody who talks about objects from space is ridiculed as the Chicken Little congressman." As a speechwriter for Ronald Reagan, he was an early proponent of the Star Wars initiative to blast incoming missiles, and he explains, "If you're going to protect yourself from some rogue missile out of Pakistan or Iran, yeah, that could cost hundreds of thousands of lives, but some NEO could land in the Pacific and cause a tsunami that would kill millions of people in California!" When Rohrabacher was six, he remembers, he was overwhelmed on a family vacation by the sight of Arizona's Meteor Crater. In his congressional tenure, he's been disturbed by visions of similar impacts, so he's discouraged by the relative modesty of his legislative accomplishments: he sponsored the original bill that established the 1998 NASA survey, and at his instigation Congress recently gave the White House's Office of Science and Technology Policy the task of assigning a federal agency to oversee planetary defense. In his office, surrounded by model rockets, Rohrabacher gloomily observed, "I have no doubt that, if we saw one of these things, all of a sudden the members who now ridicule me would be saying, 'Oh, Dana, how visionary you were!' " In the meantime, he said, "the stampede of people trying to get the public to move on global warming versus the tiny number on an issue that really could destroy us-it gives me a further understanding of the flaws of humankind."

**No support for asteroid detection**

Reich, 10. (Eugenie covers physics, science policy, and alleged scientific misconduct. She has published a book on scientific fraud and was a Knight Science Journalism Fellow at MIT. Before joining Nature, she was a features editor at New Scientist and a researcher at the BBC. She has a BA in physics and philosophy from the University of Oxford, September 8, 2010, “NASA panel weighs asteroid danger,” http://www.nature.com/news/2010/100908/full/467140a.html, CALLAHAN)

Sometime in the next decade, a US president will probably be presented with this dilemma: is it worth spending US$1 billion to deflect a space rock that may never hit Earth? A NASA panel is wrestling with this question, which is growing more pertinent as scientists' ability to find asteroids that pose a potential risk, termed near-Earth objects (NEOs), outstrips their capacity to track them accurately. The Ad-Hoc Task Force on Planetary Defense, set up to suggest ways for the agency to protect Earth against a deadly impact, is expected to release its report next month. But public deliberations and interviews with its members have revealed their thinking. The dilemma stems from a 2005 congressional mandate directing NASA to log 90% of the estimated 20,000 NEOs larger than 140 metres in diameter by 2020. NASA seems unlikely to meet the goal, but the agency is stepping up its detection and tracking of smaller objects. That will create a new problem: if the pace of NEO detections (see graph) grows but precision tracking of orbits lags behind, observers will start to find more rocks — perhaps a few per year — that seem, at first, to have a significant chance of hitting Earth, say panel members. "I don't think that issue has been understood outside the NEO community," says Lindley Johnson, NEO programme officer at NASA and a member of the panel. Launching missions to track or deflect all potential asteroid threats will be prohibitively expensive, but even a small probability of regional or global devastation may not be politically palatable. One solution from the panel is to increase the amount that the United States invests in NEO detection and tracking from the current $5.5 million a year. The panel may also recommend the launch of a survey telescope into a solar orbit similar to that of Venus. It would orbit faster than Earth and, looking outwards, would see asteroids in Earth-crossing orbits more often than would ground-based instruments (see diagram). This could improve follow-up observations, narrow estimated trajectories and remove as many asteroids as possible from the threat list. It could also spot and track asteroids on the sunward side of Earth, removing a worrisome blind spot in ground-based surveys. "It is a wonderful rapid technique to track bodies down to 140 metres and smaller," says Tom Jones, a former astronaut and panel co-chair.

**No support in Congress for NEO detection**

Clark, 10. (Stephen Clark is a correspondent for Spaceflight Now, “More funding needed to meet asteroid detection mandate,” http://spaceflightnow.com/news/n1001/22neo/index.html, CALLAHAN)

NASA is not doing enough to complete a mandated search for Earth-threatening asteroids and comets because the space agency is not receiving enough money for the problem, according to a National Research Council report. In a report released Friday, scientists said Congress and the administration have not requested or appropriated funding to complete a survey mandated in the NASA Authorization Act of 2005. Called the George E. Brown, Jr., Near-Earth Object Survey, the detection program was tasked with discovering 90 percent of Near-Earth Objects, or NEOs, larger than 140 meters, or 459 feet, by 2020. NEOs of that size would have regional or continental affects if they struck Earth. "You have this conflict between having a very small probability of anything bad happening, versus a terrific impact if there is a bad event," said Irwin Shapiro, chairman of the NEO committee from the Harvard-Smithsonian Center for Astrophysics. Congress asked the National Research Council in 2008 to determine the best way to achieve the George Brown survey. "If there were really a credible threat, money would flow like water, but it may be too late if we don't do anything preparing ahead of time," Shapiro told Spaceflight Now in a Friday interview. NASA currently spends about $4 million per year searching for NEOs, but accomplishing the George Brown survey by the 2020 deadline is now unattainable. "To complete the George Brown survey, you're probably talking about something like $50 million a year, at least to complete it in a reasonable time scale," said Michael A'Hearn, the research committee's vice chairman and an astronomy professor at the University of Maryland, College Park. Knowing where threatening objects are and developing viable mitigation strategies is like buying insurance on your house, Shapiro said. With current technologies, it may take up to a century to find the bulk of the 140-meter class asteroids, according to scientists. "There's no way to do it by 2020 now because there's been no funding for it since it was mandated," A'Hearn said.

## POLITICS DA LINKS – OBAMA GOOD – PUBLIC

**Asteroid detection not popular**

New Yorker, 11. (Tad Friend has been a staff writer at the New Yorker since 1998 and has been an editor at several other publications, including *Esquire*, “Vermin of the Sky; Who will keep the planet safe from asteroids?” lexis, CALLAHAN)

That was a long time ago, even before Ben Franklin or Copernicus. More recently, in 2002, an asteroid exploded over the Mediterranean, and later that year a fiery NEO crashed into a Siberian mountain. In 2008, S.U.V.-size asteroids plunged into the Sudanese desert and streaked over Saskatchewan, and, in 2009, one blew up high above Indonesia, with three times the power of the atom bomb that destroyed Hiroshima. Just last week, a several-ton rock blazed across the noonday sky above the Atlantic Ocean so brightly that it was visible from Massachusetts to Maryland. And still we earthlings haven't mustered a response. The administrator of NASA, Charlie Bolden, recently declared that deflecting a NEO will be "what keeps the dinosaurs-we are the dinosaurs, by the way-from becoming extinct a second time." Then he admitted that the agency couldn't afford to do that. The annual federal allocation for "planetary defense" is $5.8 million-.03 per cent of NASA's budget-which supports a shoestring program to find NEOs and track their orbits. In truth, NASA doesn't really want the job of global savior, and no one else does, either. "With planetary defense, there's a complex interaction of science, psychology, politics, and money-and everything falls into a gap between disciplines," Robert Arentz, who heads the NEOs team at Ball Aerospace and Technologies Corp., said. "The science guys say, 'NEOs are not scientifically interesting, and saving the planet is not our job,' and the military guys say, 'We'll blow them up, but we don't have anything to do with telescopes or space missions.' The issue's an orphan."

**Public won’t support --- no known threat or historical examples**

Morrison 6 (David, senior scientist at the NASA Astrobiology Institute, NASA Ames Research Center, Moffett Field, Calif., where he participates in a variety of research programs in astrobiology -- the study of the living universe, “Asteroid and comet impacts: the ultimate environmental catastrophe,” Philosophical Transactions: Mathematical, Physical and Engineering Sciences, Vol. 364, No. 1845, Extreme Natural Hazards, pp.2041-2054, 8/15/06, <http://www.jstor.org/stable/25190313>) [Iuliano]

In any action scenarios, it is not clear whether the population of the target area or of the Earth as a whole will trust either scientific judgments or the decisions of public officials. If an asteroid is discovered with an initial well-publicized non-zero chance of collision, and subsequent observations ultimately convince the scientific community that it will miss by a very small margin, will the public believe them? Or suppose an asteroid is found that is indeed on a collision course but the scientists estimate that it is only 30 m in diameter and thus will disintegrate harmlessly at high altitude. Will the people who live at ground zero trust this conclusion? What level of proof (or acceptance of responsibility) will be required? Nor is it clear whether the public is likely to support continued and perhaps accelerated government spending to protect the Earth from impacts. It is difficult to sustain interest and support in the absence of known threats (Park et al 1994). While an occasional media 'scare story' may stimulate public interest, they can also backfire if the public conclude either that the astronomers don't know what they are doing or that they are 'crying wolf to attract public attention (Sommer 2005). Communicating the nature of this hazard, with no historical examples but possible fatalities of a billion or more people, is a continuing challenge (Slovik 1987; Posner 2004).

**PLAN WOULD CREATE MASSIVE PUBLIC BACKLASH – PERCEIVED AS UNNECESSARY SPENDING**

**VILLARD 2009** [Ray – astronomy writer and news director for the Hubble Space Telescope, “Ignoring Clear and Present Danger”, *Discovery Channel Online,* August 13, <http://blogs.discovery.com/cosmic_ray/2009/08/ignoring-a-clear-and-present-danger.html>] ttate

One of the last men to walk on the moon, New Mexico senator [Harrison Schmidt,](http://history.nasa.gov/alsj/a17/a17.crew.html) wrote in the Wall Street Journal this week that the United States once had the capability, with the Apollo Saturn V rocket, to place a propulsion source on an asteroid and altered its path so as to miss the Earth. (Simply blowing it up with nuclear bombs won’t work for numerous reasons, sorry [Bruce Willis](http://www.imdb.com/title/tt0120591/).) In the shadow of President Obama’s [Augustine Committee](http://www.spacetoday.net/Summary/4622) that is reviewing NASA’s current manned space program, Schmidt was putting in a plug for the planned Ares V rocket – a monster Saturn V class heavyweight. “The Ares V, combined with a helium-3 fusion propulsion system, would be a giant step toward protecting the Earth in the future,” Schmidt wrote. But I cynically can’t imagine lawmakers getting serious about funding an Earth-defense payload, until it is too late. You can just imagine the uproar from some taxpayers.  The government would be accused, as it was in the early 1990s, of being “Chicken Little’s,” or simply looking for an excuse to build bigger rockets, bigger telescopes, and bigger super-bombs.

## SPACE MILITARIZATION DA LINKS

**PLAN LEADS TO MILITARIZATION OF SPACE – DETECTION OF NEOs CAN ALSO SERVE AS ADDITIONAL SURVEILLANCE**

Mellor 07 (Felicity, Lecturer in Science Communication in the Humanities Department at Imperial College London, “Colliding Worlds: Asteroid Research and the Legitimization of War in Space,” Social Studies of Science, Vol. 37, No. 4, 499-531, August 2007, <http://www.jstor.org/stable/25474533>) Ben I.

In contrast to traditional astronomical systems, which passively watched the skies, asteroid detection systems were to be surveillance systems that actively hunted the skies for objects of human import. The Spaceguard Survey was predicated on a will to action in a way in which the earlier Spacewatch Survey was not. Similarly, when it fired its impactor at Comet Tempel 1, NASA’s Deep Impact mission took a far more active intervention in space than did earlier generations of probes. This was not far from Edward Teller’s call for ‘experimentation’ with near-Earth objects to test defence technologies (Tedeschi & Teller, 1994; Teller, 1995), an idea dismissed at the time as extreme by some civilian scientists (Chapman, 1998). Likewise, one of the recommendations of the 2004 Planetary Defense Conference was that deflection techniques should be demonstrated on an actual asteroid (Ailor, 2004: 5).28 The technologization of space promoted in both the fictional works and the scientists’ technical proposals, also formed an integral part of the imagery and rhetoric that surrounded SDI, as its detractors highlighted when they re-named the project Star Wars. SDI was always premised on a vision of space as a technologized theatre of war. In the hands of a technoenthusiast such as Edward Teller, SDI was configured as a space-based technological extravaganza with few limits.29 In SDI, as in asteroid research and science fiction, space became a dynamic arena through which our technologies would move, in which our weapons would be placed, and across which our wars were to be waged.30 As discussed in the introduction to this paper, narrative is an inherently teleological form. In conventional narratives, the action is moved towards closure by the heroes of the story. In the impact narratives, the heroes are technological heroes set the task of saving the world. By drawing on these narratives and following the call for human agency inherent in the narrative structure, the scientists implicitly accepted this role as a necessary one. Having shifted apocalypse from the realm of nuclear politics to that of natural science, the impact-threat scientists were able to position themselves as heroes whose combined far-sightedness and technological know-how would save us all. Emphasizing the role of the unacknowledged hero in a foreword to a volume of conference proceedings, astronomer Tom Gehrels (2002: xiii) claimed: ‘There is a beauty also in hazards, because we are taking care of them. We are working to safeguard our planet, even if the world does not seem to want to be saved.’ In a paper in another volume of conference proceedings, astrophysicist Eugene Levy was even more explicit about the scientists’ expanded role: In the arms race, the motivating dynamic was a political one. A dynamic in which scientists and engineers provided the technical tools, but, as a group, brought no special and unique wisdom to the table in making judgements about what to do. In the present case, the dynamic is different. The adversary is not another nation; the calculus is not one of political fears, anxieties, and motivations, for which we scientists have no special expertise. Rather the ‘adversary’ is the physical world. In assessing this adversary, we scientists have special and unique expertise. (Levy, 1994: 7; italics in original) Eclipsing the political dimension of the impact threat with their appeals to the natural, the scientists appropriated for themselves a heroic role. This technological hero was a moral hero – he would warn us of the danger and save us despite ourselves. Thus the scientists frequently quoted Representative George Brown’s opening statement to a Congressional hearing when he warned that if we were to do nothing about the impact threat, it would be ‘the greatest abdication in all of human history not to use our gift of rational intellect and conscience to shepherd our own survival and that of all life on Earth’.31 Through such claims, the issue of planetary defence became a moral frame through which other threats of more human origin could also be addressed. Increased knowledge and surveillance of asteroids, the scientists insisted, would help stop mistakes by the military decision-makers by preventing the misidentification of asteroid airbursts as enemy nuclear warheads (Chapman & Morrison, 1994: 39). At the same time, destroying asteroids would provide us with a way of using up those unwanted bombs. As John Lewis (1997: 215) put it: ‘The net result of the asteroid deflection is really a twofold benefit to Earth: a devastating impact would be avoided and there would be one less nuclear warhead on Earth.’ Similarly, Duncan Steel saw the use of SDI technologies in asteroid missions such as Clementine II as ‘a prime example of beating swords into ploughshares’ (quoted in Matthews, 1997). Furthermore, the international tensions that led to the proliferation of nuclear weapons in the first place, would also be resolved by uniting against the common enemy of the asteroid. Thus Carl Sagan and Steve Ostro, although largely critical of the promotion of the impact threat, suggested that: In an indirect way the threat of interplanetary collision may have a political silver lining. They represent a common enemy to all nations and ethnic groups. By posing two different classes of danger to the human species, one natural and the other of our own making, Earth-approaching objects may provide a new and potent motivation for maturing international relations, ultimately helping to unify the human species. (Sagan & Ostro, 1994b: 72; see also Gehrels, 1988: 303) Even for Sagan and Ostro, then, as for the other civilian scientists, the impact threat offered hope of salvation.

**Technology developed for asteroid detection and deflection can be coopted for evil intent – technology can be used to militarize space**

**Sagan and Ostro 94** (Carl, Editor “Issues in Science and Technology”, and Steven, Editor, “Issues in Science and Technology” “Long-range consequences of interplanetary collisions.” 6/22/94http://elibrary.bigchalk.com/elibweb/elib/) Canova

We sometimes hear that this or that technology would certainly not be misused, or that only a madman would misuse it. We note that madmen exist and sometimes achieve the highest levels of political power in modern industrial states. This is the century of Hitler and Stalin, tyrants who posed great dangers not just to the rest of humanity, but to their own people. In the winter and spring of 1945, Hitler ordered Germany to be destroyed--even "what the people will need for elementary survival"--because the surviving Germans were "inferior" to those who had already died. If Hitler had nuclear weapons, the threat of a counterstrike by Allied nuclear weapons is unlikely to have dissuaded him. If the technology to deflect NEOs away from the Earth can with equal facility be used to turn inoffensive NEOs to Earth-impact trajectories, is it wise to develop such a technology? Might it be used not as a weapon of war between nations but as a means for the indiscriminate murder of multitudes? How sure can we be that it will not get into the wrong hands--a Hitler or a Stalin, some misanthropic sociopath, a religious fanatic hastening the Day of Judgment, some victim of ethnic violence bent on revenge, or technicians incompetent or insufficiently vigilant in handling the controls and safeguards? These examples from 20th-century history could be multiplied many fold. They urge on us great caution in the development of potentially apocalyptic technologies. No matter what reassurances are given, the acquisition of such a package of technologies by any nation is bound to raise serious anxieties worldwide. A vision of a launch-ready armada standing by to deal with impact threats is not reassuring. The technologies in question are on a wholly unique scale, implying dangers never before faced by the human species. Surely those who argue the prudence of preventing catastrophic impacts with a probability per century of one in a few thousand will recognize the prudence of preventing comparable catastrophes from the misuse of this technology--with unknown but probably much higher annual probabilities.

## SPACE MILITARIZATION DA LINKS

**ASTEROID DEFLECTION TECHNOLOGY CAN ASSIST IN THE WEAPONIZATION OF SPACE – CAN ALLOW COUNTRIES TO PLAY “COSMIC GOLF” WITH ASTEROIDS**

**Henderson, 2001**, (Mark, Science editor of The Times, “Secret game of cosmic golf could smash cities” April 12, 2001, LexisNexis Academic) [Waxman] ASTEROIDS could be used to destroy enemy cities in what astronomers describe as a deadly game of "cosmic golf". Lumps of rock weighing millions of tons could be nudged out of their normal orbit and guided towards particular cities on Earth by a string of nuclear explosions. The process is likened to golf because it takes several nuclear "shots" to hit the asteroid into its target "hole". The final putt would cause an explosion 50,000 times larger than the Hiroshima bomb and obliterate a region the size of Belgium. The perpetrators could escape blame for an apparent natural disaster.

**ASTEROID DEFLECTION TECHNOLOGY CAN BE MANIPULATED AS WEAPONS – CAN TURN BENIGN ASTEROIDS INTO EARTH-IMPACTORS**

**Sagan and Ostro, 1994** (Carl Sagan, Professor of Planetary Studies Cornell University; Steven Ostro, Jet Propulsion Laboratory Scientist, “Dangers of Asteroid Deflection,” Scientific Correspondence, 7/11/11) Hou

The proposed ‘Spaceguard’ survey could, in 25 years, find about 95% of these potentially threatening asteroids. We can predict with >99.9% certainty that no object will be found on a trajectory posing any danger during at least the next century, in which case Spaceguard would seem to reduce the *a priori* risk of a global impact catastrophe by nearly two orders of magnitude. In the improbable case that an asteroid *were* found on a threatening trajectory, the most likely warning time would be several decades or more, long enough to mitigate the hazard. The most efficient approach with existing technology would be to deflect the object through a herding series of standoff nuclear explosions. The proposal is a double-edged sword. If we can perturb an asteroid out of impact trajectory, it follows that we can also transform one on a benign trajectory into an Earth-impactor. For example, the asteroid 1991 OA could in 2070 be deflected into Earth-impact trajectory with an aggregate yield of only about 60 MT. Although a single asteroid can more readily be deflected away from, than into, an impact trajectory, there is not an orders-of-magnitude difference in technical effort; but there are orders-of-magnitude more Earth-crossing asteroids that can be induced to impact the Earth than will do so on their own. With a Spaceguard-like inventory of such asteroids and a launch-ready deflection system of nuclear-armed missiles, it might take only a few years to identify a suitable large asteroid, alter its orbit through a series of nuclear explosions with individual yields of about 10 MT (available in existing arsenals), and send it crashing into Earth. There is no other way known in which a few nuclear weapons could by themselves threaten the global civilization. In our view, development of this asteroid-deflection technology would be premature. Given twentieth-century history and present global politics, it is hard to imagine guarantees against eventual misuse of an asteroid deflection system commensurate with the dangers such a system poses. Those who argue that is would be prudent to prevent catastrophic impacts with annual probabilities of 10-5 will surely recognize the prudence of preventing more probable catastrophes of comparable magnitude from misuse of a potentially apocalyptic technology. It is of course sensible to seek cost-effective reduction of risk from all hazards to our civilization – even low-probability hazards, of which many remain identified. At a total cost of some $300 million, Spaceguard arguably constitutes a reasonable measure of defense against the impact hazard. But premature deployment of any asteroid orbit-modification capability, in the real world and in light of well-established human frailty and fallibility, may introduce a new category of danger that dwarfs that posed by the objects themselves.

## DA IMPACT HELPERS – NUCLEAR WAR OUTWEIGHS

**Nuclear war outweighs a probable asteroid impact**

Toon et al 97 (Owen, Now at Laboratory for Atmospheric and Space Physics and Program in Atmospheric and Oceanic Sciences, University of Colorado, Boulder; Richard P. Turco; Curt Covey; Kevin Zahnle; David Morrison, Environmental Perturbations Caused by the Impacts of Asteroids And Comets, February 1997, <http://www.lpl.arizona.edu/graduate/classes/spring2011/Griffith_656B/Toon97.pdf>) [Iuliano]

On the other hand, nuclear wars could be worse in some ways than impacts that release comparable or even substantially larger amounts of energy. In a nuclear war the infrastructure of society—the transportation, communications, and energy supplies—would be purposefully targeted for destruction. Much of the ability of society to rally for recovery would be intentionally suppressed. Although even a relatively small impact may have the potential to disrupt crop harvests for a year, such an impact would be unlikely to destroy the world’s economic and transportation infrastructure. It is therefore much more likely that society could cope with the problems following a small impact better than it could adjust to the problems following a nuclear war. For instance, an impact occurring in the southern hemisphere during the late fall of the northern hemisphere might lead to crop loss in the southern hemisphere. However, enough food might still be stored in the northern hemisphere and grown during the next harvest to make up for the agricultural losses in the southern hemisphere, thereby alleviating mass starvation. However for an impact rivaling the size of the K-T event, global fires may rage that would destroy most structures and therefore make it impossible for portions of society that still have food to help those that do not.

## DA IMPACT HELPERS – GLOBAL WARMING OUTWEIGHS

**GLOBAL WARMING OUTWEIGHS YOUR ASTEROID IMPACT – THREAT IS MORE REAL AND IMMEDIATE**

**Madsen 10** (Editor, NY times, Asteroids and Global Warming, [**http://www.nytimes.com/2010/11/05/opinion/lweb05asteroid.html**](http://www.nytimes.com/2010/11/05/opinion/lweb05asteroid.html) nov, 4, 2010)

Russell Schweickart suggests that we need a planetary defense system against asteroids to prevent the kind of catastrophe that killed off the dinosaurs and 75 percent of all species on earth (“[Humans to Asteroids: Watch Out!](http://www.nytimes.com/2010/10/26/opinion/26schweickart.html?scp=1&sq=humans%20to%20asteroids:%20watch%20out!&st=cse),” Op-Ed, Oct. 26.) I would suggest that we already have that kind of catastrophe on our hands, and it is called global warming. Instead of staring off into space, America should rapidly reduce our dependence on fossil fuels and our emissions of global warming pollution. By taking meaningful action to reduce pollution now, at all levels of government, “we can save millions of people, or even our entire species.”

## DEPARTMENT OF DEFENSE COUNTERPLAN – 1NC

**AND, THE COUNTERPLAN SOLVES – PLANETARY DEFENSE IS A NATIONAL SECURITY ISSUE, NOT A SPACE EXPLORATION ISSUE - DOD HAS THE MOST EXPERTISE**

Lt col **Garretson and** Major **Kaupa 07** (peter United States Air Force HQ USAF Future Concepts, the Pentagon, Douglas United States Air Force 445th Flight Test Squadron, “Planetary Defense: Potential Department of Defense Mitigation Roles”, Jan 3, 2007, <http://www.aero.org/conferences/planetarydefense/documents/Potential-DoD-Roles--Garretson.pdf>) rory

Both NASA and the DoD have space expertise and operate space assets, but NASA's core mission is space exploration. The DoD's core missions are US security, the protection of American lives, and ensuring the security of our allies. Expertise aside, planetary defense is clearly a defense mission. Further, since DoD maintains a robust space mission, the mission appears more closely aligned with the strengths and scope of the DoD than with the DoHS. Within the DoD, possible options might include the AFSPC, the National Security Space Office, the Missile Defense Agency, and STRATCOM. Several reasons make STRATCOM the best option. First, STRATCOM’s mission is to “Provide the nation with global deterrence capabilities and synchronized DoD effects to combat adversary weapons of mass destruction worldwide.” 25 STRATCOM is the home for coordinating DoD capabilities to thwart weapons of mass destruction. An inbound Earth-impacting rock, similar to a city or nation-destroying asteroid, could be considered as a weapon, though with no adversary. STRATCOM is a combatant command with established lines of communication and authority to react to strategic-level threats. STRATCOM already maintains global vigilance and space situational awareness. The former US SPACECOM has been dissolved and subsumed by STRATCOM. Through Air Force Space Command, STRATCOM already maintains daily space surveillance for ballistic missile launch detection and tracking of artificial satellites and Earth-orbital debris. Although space assets are maintained by AFSPC, operational control falls under STRATCOM authority. STRATCOM controls all military nuclear capability, which might be the only option in certain minimum warning scenarios. Also, STRATCOM is well practiced and competent with respect to rapid warning dissemination to civilian leadership and civil defense networks. Finally, STRATCOM has years of experience in negotiating and executing collective security arrangements, such as the North American Aerospace Defense Command with Canada (NORAD) 26 and the North Atlantic Treaty Organization. 27

**AND, STRATCOM is the best option for planetary defense – multiple reasons**

Garretson and Kaupa, 8 (Lieutenant Colonel Garretson, chief of Future Science and Technology Exploration Branch, Major Kaupa, chief of staff of the Air Force’s top-priority acquisition program, Air & Space Power Journal - Fall 2008, “ Planetary Defense Potential Mitigation Roles of the Department of Defense, 7/13/11, http://www.airpower.maxwell.af.mil/airchronicles/apj/apj08/fal08/garretson.html) Hou

 Within the DOD, possible options might include AFSPC, the National Security Space Office, the Missile Defense Agency, and STRATCOM. Several reasons make STRATCOM the best option. For one, STRATCOM’s mission calls for “provid[ing] the nation with global deterrence capabilities and synchronized DOD effects to combat adversary weapons of mass destruction worldwide.”**18** The command coordinates DOD capabilities to thwart weapons of mass destruction. We can consider an inbound Earth-impacting rock a weapon, despite the absence of an adversary. A combatant command**,** STRATCOM has the established lines of communication and the authority to react to strategic-level threats.It already maintains global vigilance and space situational awareness. The former US Space Command has been dissolved and subsumed by STRATCOM. Through AFSPC, the command already maintains daily space surveillance for detecting launches of ballistic missiles and tracking artificial satellites and Earth-orbital debris.Although AFSPC maintainsspace assets, operational control falls under STRATCOM’s authority. It also controls all military nuclear capability, perhaps the only option in certain minimum-warning scenarios. Moreover, STRATCOM is well practiced and competent with respect to disseminating rapid warnings to civilian leadership and civil defense networks. Finally, the command has years of experience in negotiating and executing collective security arrangements**,** such as that of the North American Aerospace Defense Command with Canada and those involving the North Atlantic Treaty Organization.19

## DEPARTMENT OF DEFENSE COUNTERPLAN SOLVENY EXTS

**DOD SHOULD DO THE PLAN – THEY HAVE THE TECHNOLOGY AND EXPERTISE**

**USAF 11** (“PREPARING FOR PLANETARY DEFENSE: Detection and Interception of Asteroids on Collision Course with Earth” Unclassified White Papers,Tue, 28 Jun 2011, <http://csat.au.af.mil/2020/papers/app-r.pdf>) rory

The anticipated nation-wide call for action. Were an impactor to be detected in advance, the nation and perhaps the entire planet will quite naturally look to the DoD for the fortitude, technical expertise and leadership, not to mention the required force in the form of nuclear devices, to counter such a threat to its citizen's lives and well being. Other organizations and agencies will certainly be involved, including the National Aeronautics and Space Administration (NASA), the Department of Energy (DOE), the Federal Emergency Management Agency (FEMA), and the Office of Foreign Disaster Assistance. There will also most likely be an international effort. However, few organizations other than the US DoD have the experience and wherewithal to even attempt such an effort. The Russian military and space infrastructure is probably the only other viable capability equal to the task, but such a project could indeed take a consolidated effort and probably rightfully should, given the common fate. Suffice it to say that the DoD will form the core around which the rest could organize.

## UNITED NATIONS CP SOLVENCY HELPERS

**THE US DOES NOT HAVE THE RESPONSIBILITY TO BE THE WORLD’S ASTEROID COP – IT IS LIKELY AN ASTEROID WOULD NOT EVEN HIT THE UNITED STATES - THE UNITED NATIONS SHOULD TAKE THE LEAD IN DEVISING PROGRAMS FOR ASTEROID DETECTION**

**Keating, 2010** (Joshua, associate editor at Foreign Policyand the editor of the Passport blog, “Foreign Policy: Asteroid Shield Must Be Global Affair”, NPR, 9-14-10, <http://www.npr.org/templates/story/story.php?storyId=129851855>) [Max Waxman]

The U.S. currently spends about $5.5 million per year to track NEO's and less than a million on researching ways to counter them, but is [falling far short](http://articles.cnn.com/2009-08-13/tech/nasa.asteroid.detection_1_earth-object-program-near-earth-minor-planet-center?_s=PM:TECH) of asteroid-detection goals. Some might say that's already too much, given the more terrestrial problems the U.S. faces. On the other hand, the United States spends more than $1 billion — the amount NASA says it needsto meet its goal of detecting all potentially dangerous objects by 2020 — on far less lofty goals than saving humanity from [the fate of the dinosaurs](http://www.foreignpolicy.com/articles/2009/11/13/the_end_of_the_world). Even an asteroid just one kilometer in diameter would be enough to cause worldwide crop failures and a shift in the earth's climate. One just a few meters wide could wipe out a major city. But why, in this supposedly [post-American world](http://www.amazon.com/gp/product/0393334805?ie=UTF8&tag=fopo-20&linkCode=as2&camp=1789&creative=390957&creativeASIN=0393334805), is the United States expected to take the lead on this? Unlike, say, missile defense, asteroid detection and deterrence benefits all countries — if NASA does detect a potentially dangerous asteroid, chances are it's probably going to hit somewhere else. And unlike global warming, smaller developing countries can't say that the United States should accept more of the blame for asteroids. (Though Hugo Chavez could certainly try.) Scientists have been [urging the United Nations](http://www.guardian.co.uk/science/2008/dec/07/space-technology-asteroid-shield) to coordinate international asteroid detection efforts for years. But despite coordinating work by the [U.N. Office for Outer Space Affairs](http://www.oosa.unvienna.org/) (yes, there is one), progress seems to be slow-going.

**AND, THE US CANNOT ACT UNILATERALLY – INTERNATIONAL COOPERATION WITH DATA AND TECHNOLOGY NEED TO SOLVE ASTEROID THREAT**

**Easterbrook 08** (Gregg, senior editor of The New Republic, “The Sky Is Falling,” The Atlantic, June 2008, http://www.lsst.org/files/docs/TheSkyisFalling-AtlanticMonthly.pdf) [JHegyi14]

None of this will be easy, of course. Unlike in the movies, where impossibly good-looking, wisecracking men and women grab space suits and race to the launchpad immediately after receiving a warning that something is approaching from space, in real life preparations to defend against a space object would take many years. First the necessary hardware must be built—quite possibly a range of space probes and rockets. An asteroid that appeared to pose a serious risk would require extensive study, and a transponder mission could take years to reach it. International debate and consensus would be needed: the possibility of one nation acting alone against a space threat or of, say, competing U.S. and Chinese missions to the same object, is more than a little worrisome. And suppose Asteroid X appeared to threaten Earth. A mission by, say, the United States to deflect or destroy it might fail, or even backfire, by nudging the rock toward a gravitational keyhole rather than away from it. Asteroid X then hits Costa Rica; is the U.S. to blame? In all likelihood, researchers will be unable to estimate where on Earth a space rock will hit. Effectively, then, everyone would be threatened, another reason nations would need to act cooperatively—and achieving international cooperation could be a greater impediment than designing the technology.

## INTERNATIONAL CP HELPERS – COOPERATION BEST

**A multilateral detection program is best --- better tracking, avoids international concern**

Gerrard and Barber 97 (Michael B., partner in the New York office of Arnold & Porter; a member of the adjunct faculties of Columbia Law School and the Yale School of Forestry and Environmental Studies, and Anna M., associate in the New York office of Arnold & Porter and was a Submissions Editor of the Yale Journal of Regulation, “Asteroids and Comets: U.S. and International Law and the Lowest-Probability, Highest-Consequence Risk”, 1997, <http://heinonline.org/HOL/Page?handle=hein.journals/nyuev6&div=8&g_sent=1&collection=journals>) [Iuliano]

Practical reasons also support a multilateral detection effort. International cooperation will be necessary not only to address potential treaty violations, but also because it is impossible to track all approaching NEOs from one continent. To achieve a comprehensive tracking system, wide geographical coverage of optical observatory sites is essential; both the northern and southern hemispheres must be covered.188 The Spaceguard Survey proposal for six detection sites worldwide, for example, involves five countries. International cooperation among asteroid- spotters is not a new idea; for years astronomers have communicated their sightings to one another through the Central Bureau for Astronomical Telegrams in Cambridge, Massachusetts.189 Similarly, nations have historically cooperated in the placement and tracking of satellites and the division of the frequency band spectrum through the International Telecommunications Union, a U.N. body established in 1982. Decision-making will of course be more difficult as more nations are involved, particularly because matters of national security are implicated. The decision to establish an international NEO detection and tracking system should be simple, given that the costs are relatively low and current technology could be employed. The three critical decision points are the commencement of a planetary defense program, the decision that a particular threat warrants its use, and the selection of how and when to use it. While nations will certainly differ on the structure of a planetary defense program, acting by consensus with full transparency will be less likely to create international concern and possible instability in response to a program that involves weapons development and testing. If there are vehement disagreements about proceeding with such a program, however, commencing a NEO response testing program may cause greater detriment—in the form of international political instability—than benefit.

## INTERNATIONAL CP HELPERS – COOPERATION BEST

**Planetary defense needs to be an international effort – risks US weaponization of space**

Sweet, 99 (K. Sweet, Department of Criminal Justice, “Planetary Preservation: The need for legal provision,” Space Policy, http://www.sciencedirect.com/science/article/pii/S0265964699000375, 7/17/11) Hou

It is important to understand that regardless of the fact that all nations unanimously agree that space should be reserved for peaceful purposes does not mean it will always be so. As mentioned, the US, and some other countries, have always taken the position that only “aggressive” systems were prohibited – never defensive methods. In fact, the US Aeronautics and Space Act of 1958 stated that “it is the policy of the United States that activities in space shall be devoted to peaceful purposes for the benefit of all mankind” [15]. However, reading only a few paragraphs further, the same law provides for the military departments of the US to conduct space activities for “the development of weapon systems, military operations, or the defense of the US”. The provision for defensive systems has a long-standing history in US law. Considering the fact that the US is currently the leader in space exploration and exploitation, it behooves scholars to scrutinize and ponder just where US space programs will lead the planet in the 21st century. The US Air Force, to a certain degree, purports to have the “planetary defense” issue under control and wants to have it as an actual assigned mission, if the leadership can be convinced it is a viable threat. Indeed, it could be argued that they really want the mission for the money. Such funds would likely be used for enhanced surveillance and mitigation systems, which, of course, have offensive capabilities as well as defensive ones. Policymakers are well aware of the fact that one of the most pressing national security issues for the West is protection from hostile missiles. Consequently, it is not unreasonable to conclude that policymakers might use “planetary defense” to secure funding for missile defense. Therefore, abrogating responsibility for “planetary defense” to a supra-national entity could resolve some important and larger issues of control of space well into the next millenium. Firstly, any allegations of misrepresentation as to the true purpose of the project would dissolve. Secondly, further accusations of potential militarization of space by a single power would also no longer pass scrutiny. Consequently, the US Air Force could be one of the tools, if needed, to effectuate international policy as opposed to being the sole responsible agent for “planetary defense”. This may well be a difficult concept for military planners to accept but the time for new and somewhat radical approaches might be at hand. September 18, 1997, marked the 50th Anniversary of the United States Air Force. The newest published strategic document envisions a concept referred to as Global Engagement: A Vision for the 21st Century Air Force. The philosophy contained in this document all flows from the already publicized National Security Strategy, the National Military Strategy of the United States, and the Chairman of the Joint Chief of Staff's Joint Vision 2010. Global Engagement is the Air Force's present blue print on how the Air Force will integrate its mission with the rest of the joint warfighting team well into the next century. In conjunction, the Air Force leadership has also initiated the idea of Air Force core competencies, which include, but are not limited to, Air and Space Superiority. The entire concept is flawed on one major premise. By limiting itself to “global” engagement, it fails to address the potential threats from space itself and, as in the past, focuses on concentrating on enemies on the ground. This is short- sighted and sidesteps an opportunity to unite the global community instead of only creating better technologies to annihilate the planet. A more far-reaching perspective might be to consider the concept of what the future security of the planet actually encompasses. For example, it might include defense of the planet itself. The US government considers space an essential element of US military operations. At present those measures encompass only the first steps toward “air superiority” in space. The US, through an intricate system of combined commercial and military satellites, already enhances force projection with sophisticated space systems. However, by far the majority is redirected back toward the planet and is considered as ground and air force enhancement. All of which, of course, is in complete compliance with applicable treaties. However, the next real step, and more in line with the concept of the futuristic unlimited peaceful uses of space is to look outward toward planetary preservation and beyond. Many years ago the American humorist Will Rogers pointed out, “seems to me the United States is the only nation in the world that waits until it is in a war to get ready for it”. Humanitarian missions, threats of terrorism, and regional conflicts are all still legitimate current threats, but to focus entirely on them is to miss the forest for the trees. It is the premise of this discussion that a planetary defense system should be constructed which can protect the Earth from asteroids and comets and do so within a viable international legal framework. It should be noted that the US Air Force has, solely as an independent actor, considered the issue of “planetary defense”. One Air Force officer has stated, “Throughout the Air Force, there is strong interest and good support for doing this. Admittedly, the Defense Department has conducted studies on “near earth objects” and the Air Force has even completed some long range planning on planetary defense. But at the present time it is not an assigned mission” [16]. What has not been fully considered is the idea of moving toward policy formation in an international context. There is no denying that the funded search for NEOs needs to continue and that funding has recently been scarce. Unfortunately, the simple fact that “planetary defense” is not an assigned Air Force mission virtually excludes any effective financial support from the military. On the other hand, NASA and the US SPACE Command have recently begun discussing the expanded use of the Ground Based Electro-Optical Deep Space Surveillance (GEODESS) system. The system, which includes using the Near-Earth Asteroid Tracking (NEAT) facility in Hawaii, will involve the use of a camera affixed onto the GEODESS telescope. The military, of course, would still benefit from the ability to detect man-made objects as well, consequently the availability of funds to support this project. Realistically, the entire proposal is likely to die if the project does not in some manner benefit current space missions. Hence the dilemma of the work either not being funded at all or, by default, the US Air Force assuming complete control. Furthermore, it is not unreasonable to speculate that just as the militaries’ interest in space has progressed from scientific curiosity, to intelligence collection, and now to force enhancement, inevitably it will shift toward the militarization of space. Regardless of the best intentions of international lawmakers, such efforts are already in progress and also need to be recognized and addressed. Certainly the Russians have not missed this obvious leap. General Major Evgeny G. Nikitenko, currently a serving officer on the Russian General Staff, has recently reasoned that, “the nature of military art can change in the most revolutionary manner under the influence of the following factors …. one will get advantages in the information sphere by realizing the study of cosmic space. Consequently, the struggle for information implies a fight for space” [17]. The US Secretary of Defense, William S. Cohen also endorsed the following comment, “DOD will exploit and, if required, control space to assist in the successful execution of the National Security Strategy and National Military Strategy. In the future, space power will be as important as sea power and air power are today. The control and utilization of space as a warfighting medium will help to enable the United States to establish and sustain dominance over an area of military operations. Establishing such dominance will be a key to achieving success during a crisis or conflict” [18]. As a start, the international community should consider immediate efforts to create appropriate policies and institutions to support global controls on “planetary defense”. Otherwise, any chance for international control could be overtaken by events. In addition, scientists, either in conjunction with the military, or separate from it, will have a significant role in how the planet sensibly, or not, reacts to this inevitability. A concept also difficult for many in the military will be to digest the fact that the adversary is the physical universe itself. On top of this, sometimes the cure is more painful than the disease. Eugene Levy, professor at the University of Arizona, wrote that, “More difficult is the recognition that many of the possible protection schemes incur their own large costs – both in financial and social measures; that many protection schemes entail their own risks, and that, in some cases, these risks, as well as the associated anxieties, may be large – as large, or larger, than the provoking hazards [19]. Regardless, from whichever direction the problem is tackled, it should be based on universally accepted principles of international law.

## EUROPEAN SPACE AGENCY CP HELPERS

**AN EFFECTIVE NEO DETECTION PROGRAM WILL REQUIRE AN INTERNATION EFFORT HEADED UP BY EUROPE**

**URIAS ET AL 1996** [John M – colonel, “Planetary Defense: Catastrophic Health Insurance for Planet Earth”, A research paper presented to Air Force 2025, October, <http://csat.au.af.mil/2025/volume3/vol3ch16.pdf>] ttate

As discussed in this paper, the development, testing, and deployment costs of a planetary defense system likely will be staggering, especially if the three-tier PDS concept is adopted. However, we believe the catastrophic results of a large asteroid or comet impact, including the potential extinction of the human race, justify such an expenditure, especially if it can be incrementally funded. Obviously, since the planetary defense problem is global in nature, one should not expect that the PDS costs will be borne by one or even a few countries. Indeed, such an endeavor will certainly fail without the cooperation and commitment of the entire global community. In this sense, Europe must be a major player in the successful implementation of a PDS. When considering future European involvement in space-related issues, it is important to include the activities of the European Space Agency (ESA), with its international perspective and influence. Without a doubt, the ESA will be critical to the successful development and deployment of the PDS, especially with its close ties to France as one of ESA’s most influential members.

**ESA WORKING IN CONCERT WITH RUSSIA NOW TO DEVELOP ASTEROID DETECTION PROGRAM**

Delgado, 10. (Laura M. is a recent graduate from George Washington University’s Space Policy Program and part of the Institute for Global Environmental Strategies. June 24, 2010, “Russia, Europe to Discuss Asteroid Deflection Options,” http://spacepolicyonline.com/pages/index.php?option=com\_content&view=article&id=994:russia-europe-to-discuss-asteroid-deflection-options&catid=91:news&Itemid=84, CALLAHAN)

Officials from the Russian space agency, Roscosmos, will meet with European Commission members on July 7 to discuss options for developing a joint anti-asteroid defense program, RIA Novosti reported today. The initiative comes after Anatoly Perminov, head of the agency, expressed interest to lead an international effort to deal with the risk of a near-Earth object (NEO) collision last December. According to the article the meeting will include the input of scientists and engineers from Roscosmos, as well as experts from the Russian Academy of Sciences and other institutions. Scientists from the Astronomy Institute at the Russian Academy of Sciences have reportedly detected a total of 6,690 NEOs as of April, the majority of which measure between 100 and 1,000 meters in diameter. This is part of what Perminov described as growing international awareness on the threat of NEOs. He was quoted as saying that "in recent years, the attention of scientists, technicians, politicians and the military has become increasingly focused on the asteroid and comet hazard, namely the threat of the Earth's collision with large space bodies." A recent report by the U.S. National Research Council, Defending Planet Earth: Near-Earth Object Surveys and Hazard Mitigation Strategies, released last January stressed the need to increase research in identifying and mapping NEOs that could pose a potential threat in order to devise effective mitigation strategies. The main finding of the report is that NASA would be unable to meet the deadline of 2020 to map 90% of NEOs 140 meters or more in diameter as Congress mandated in 2005, because of lack of funding. In response to the NRC report, the proposed FY2011 NASA budget request substantially increases funding for the Near Earth Object Observations (NEOO) program under the Science Mission Directorate, from approximately $4 million to $16 million. The increase will be used to improve use of current and planned observatory missions, including the WISE spacecraft and the ground-based PAN-STARRS and Arecibo facilities. The funding will "significantly" increase NASA's efforts "to find and characterize asteroids and comets ... which may be destinations.

**EUROPEAN SPACE AGENCY DEVELOPING PLANETAY DEFENSE PROGRAM NOW**

Iredale, 06 (Will Iradale, reporter of the Sunday Times, “Asteroid buster to save planet,” <http://www.lexisnexis.com.turing.library.northwestern.edu/lnacui2api/results/docview/docview.do?docLinkInd=true&risb=21_T12361856212&format=GNBFI&sort=RELEVANCE&startDocNo=1&resultsUrlKey=29_T12361856215&cisb=22_T12361856214&treeMax=true&treeWidth=0&csi=332263&docNo=3>, 7/17/11) Hou

A BRITISH-LED team of scientists is designing a "space ram" to be fired at speeds of more than 20,000mph into any largeasteroid that threatens Earth. Although the craft, called Hidalgo, would be only the size of a domestic cooker, the force of its high-speed impact should be enough to deflect an asteroid far enough off course to pass harmlessly by. The craft is being designed by scientistsat Qinetiq, formerly the government's defence research agency, as part of a project by the European Space Agency (ESA). The team, which has won a £ 315,000 grant for its preliminary designs, hopes to send the ram on a test mission against a harmless asteroid within 10 years. Called the Don Quijote mission, it will cost about £ 200m and will be funded by the ESA. Designs from Qinetiq and two rival European teams will be assessed by the ESA before a winner is announced early next year. While the chance of an asteroid hitting the planet is remote, research into the risks was given impetus by an incident in 1994 when a comet punched a hole the size of Earth into Jupiter. "This mission will be a bit like a game of solar system billiards," said Nigel Wells, project manager for the Qinetiq team. The test launch is scheduled for 2011 when the mission will target two asteroids flying into the zone between Earth and Mars, 43m miles away. Although their trajectory poses no threat to Earth, scientists want to see if Hidalgo can nudge one of them off course

## CHINA CP HELPERS

China developing an asteroid detection program

H. B. Zhao et al, J. S. Yao and H. Lua 08 (Professor at Northeastern University, “China NEO Survey Telescope and its preliminary achievement,” Chinese Academy of Science, Proceedings of the International Astronomical Union, 6-8-08, <http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=1932944>) [JHegyi14]

In recent years, there has been an increasing appreciation for the hazards posed by Near Earth Objects (NEOs), those asteroids and periodic comets whose motions can bring them into the Earth’s neighborhood. An NEO Survey Telescope (NEOST) was built in China to be taken part in the international NEO joint survey. This telescope is a 1.0/1.2m Schmidt telescope, equipped with a 4K by 4K CCD detector with a drift-scanning function. After adjusting the telescope and test observations, in December 2006 the NEOST began its NEO survey program. We have found 188 new asteroids including an NEO – 2007 JW2 and one periodic comet – P/2007 S1 (Zhao). The rate of asteroid discoveries shows an exponential growth. After astronomer Guiseppe Piazzi of Palermo, Sicily, discovered the ﬁrst asteroid on January 1, 1801, the number of new ﬁnds per year increased to ﬁve by 1865, 15 per year by 1895, 25 by 1910 and up to about 40 by 1930. By the end of September of 2007, the number of numbered asteroids was more than 160,000 including about 800 Potential Hazardous Asteroids (PHA). (see http://neo.jpl.nasa.gov/stats/) According to NASA’s report (NASA 2007), the further objectives of NEO Survey Program are to detect, track, catalogue, and characterize the physical characteristics of NEO equal to or larger than 140 meters in diameter with a perihelion distance of less than 1.3 AU from the Sun, achieving 90% completion of the survey within 15 years after enactment of the NASA Authorization Act of 2005. Chinese scientists have contributed substantially to the ﬁeld of asteroid survey and related aspects. In the early 1960s, Purple Mountain Observatory began observations of asteroids and found over 130 new numbered asteroids during the following decades. The Schmidt CCD Asteroid Program (SCAP) of Beijing Astronomical Observatory started in 1995 and found 575 asteroids in several years (Ma, Zhao & Yao 2007).

China has the capability to detect NEO’s

NRSCC 02 (National Remote Sensing Center of China, “Earth observation Technology in China,” <http://www.nrscc.gov.cn/english/about-mj1.asp>) [JHegyi14]

China aims at building up a comprehensive Earth observation system. Since DFH-1, the first Chinese satellite in 1970, many Earth observation missions have been launched, including meteorological satellites, Earth resource satellites, marine satellite, small satellites and manned spacecrafts. China is capable in designing airborne and spaceborne remote sensors, covering a spectrum of visible, near infrared, thermal infrared and microwave. The sensors have been successfully operated in various satellite missions. The Chinese Earth observation system has been fully applied in many social and economic development fields such as weather forecasting, ocean exploration, natural resource investigation, and disaster monitoring and management.

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In October 2006, the 1.0/1.2 m NEOST equipped with a 4096×4096 SI CCD detector was installed and began the test observations. Due to the small focal ratio and the high quantum eﬃciency (QE) of the CCD detector, the observational system can reach B=22.5 with a 40 s exposure, **which makes the asteroid survey very eﬃcient**. About 22 Gb of raw image data, corresponding to the sky coverage of 2700 deg 2 , are produced each good observing night providing on average more than 2000 asteroid positions. To reduce the observational data and to report the asteroid positions to Minor Planet Center (MPC) in a timely fashion is a challenge to us. We have established a set processing software to reduce the data with good precision (Table1 where D29 is the station code for NEOST)

## KRITIK LINK HELPERS – SPACE IMPERIALISM/MILITARISM KRITIKS

**EMPIRICALLY, ASTEROID THREAT DETECTION DISCOURSE HAS BEEN USED OT JUSTIFY SPACE WEAPONIZATION – IT PROVIDES US COVER BY LEGITIMIZING AN ENEMY IN ORDER TO FURTHER DOMINANCE OF SPACE**

Mellor 07 (Felicity, Lecturer in Science Communication in the Humanities Department at Imperial College London, “Colliding Worlds: Asteroid Research and the Legitimization of War in Space,” Social Studies of Science, Vol. 37, No. 4, 499-531, August 2007, <http://www.jstor.org/stable/25474533>) Ben I.

Even as the scientists themselves attempted to pull back from concrete proposals for weapons systems, their own discourse irresistibly drew them towards the militaristic intervention demanded by the narrative impera tive. The identification of asteroids as a threat required a military response. Astronomer Duncan Steel (2000b), writing about the impact threat in The Guardian newspaper, put it most clearly when he stated that 'we too need to declare war on the heavens'. Just as the overlap between science and science fiction was mutually supportive, so the overlap between impact science and defence helped legitimize both. The civilian scientists could draw on a repertoire of metaphors and concepts already articulated by the defence scientists to help make the case for the threat from space. They would no longer be a marginalized and underfunded group of astronomers, but would take on the ultimate role of defending the world. Similarly, in the context of the impact threat, the defence scientists could further develop their weapons systems without being accused of threatening the delicate nuclear balance of mutually assured destruction or, in the period between the fall of the Soviet Union and the 9/11 attacks, of irresponsibly generating a climate of fear in the absence of an identifiable enemy. The civilian scientists attempted to still their consciences in their dealings with the defence scientists by suggesting that, with the end of the Cold War and the demise of SDI, the latter had lost their traditional role. This argument was naive at best. In fact, as we have seen, the US defence scientists had taken an interest in the impact threat since the early 1980s, from the time that SDI had greatest political support during the defence build-up of the Reagan era. Even at the time of the fractious Interception Workshop, George H.W. Bush was maintaining SDI funding at the same level as it had been during the second Reagan administration. If outwardly the Clinton administration was less supportive when it took office in 1993 and declared that SDI was over, many of those involved in the programme felt that it would actually go on much as before (FitzGerald, 2000: 491). SDI was renamed, and to some extent reconceived, but funding continued and was soon increased when the Republicans gained a majority in Congress.33 After George W. Bush took office in 2001, spending on missile defence research was greatly increased, including programmes to follow on from Brilliant Pebbles (Wall, 2001a; 2001b). Thus the defence scientists had shown an interest in the impact threat from the time of the very first meeting onwards, regardless of the state of funding for missile defence, which in any case continued throughout the period. This is not to suggest that the impact threat was not used by the defence scientists as a means of maintaining the weapons establishment. Indeed, the impact threat offered a possible means of circumventing or undermining arms treaties.34 But it does mean that the attempt to access new sources of funding, while being an important factor in the promotion of asteroids as a threat, did not fully explain either the weapons scientists' interests or the civilian scientists' repeated meetings with them. The asteroid impact threat offered a scientifically validated enemy onto which could be projected the fears on which a militaristic culture depends. Far from providing a replacement outlet for weapons technologies, the promotion of the asteroid impact threat helped make the idea of war in space more acceptable and helped justify the continued development of space based weaponry. Arguably, with the Clementine and Deep Impact missions, the asteroid impact threat even facilitated the testing of SDI-style systems. The asteroid impact threat legitimized a way of talking, and thinking, that was founded on fear of the unknown and the assumption that advanced technology could usher in a safer era. In so doing, it resonated with the politics of fear and the technologies of permanent war that are now at the centre of US defence policy.