# \*NEO STRIKES ADVANTAGE ANSWERS

## NEO Strikes – 1NC

No chance of collision- impossibly long time frame and we would have decades to respond

Morrison et al 2002 (David, of the NASA Astrobiology Institute, with Alan W. Harris, NASA Jet Propulsion Laboratory; Geoffrey Sommer, RAND Corporation; Clark R. Chapman, Southwest Research Institute; Andrea Carusi, Istituto di Astrofisica Spaziale, Roma, Dealing with the Impact Hazard, http://www.lpi.usra.edu/books/AsteroidsIII/pdf/3043.pdf)

At first, there was considerable skepticism toward proposals for a comprehensive survey to identify any potential impactor decades in advance. Perhaps influenced by their experience with antimissile concepts, many members of the U.S. and Russian defense communities proposed various schemes for shooting down incoming asteroids with only a few days, or even a few hours, of warning [e.g., papers from a Los Alamos workshop collected by Canavan et al. (1993)]. However, there is no warning system in place or likely to be built that would focus on such a short-term threat. Almost any asteroid that is on an impact trajectory will repeatedly pass close to Earth on previous orbits, with multiple opportunities for detection. An optical survey system has negligible probability of finding an object on its final plunge to Earth, relative to discovery on some previous close pass. The Spaceguard Survey, discussed in detail later in this chapter, is just such a comprehensive optical search, with nearly continuous coverage of the space around Earth to distances of ~108 km. Already, we have found and calculated accurate orbits for more than half of the thousand-odd NEAs larger than 1 km. None of these poses any impact threat on the timescale of a human lifetime. On the other hand, it is still impossible to say anything about the orbits of the undiscovered ones. This Spaceguard Survey approach also has limited use against long-period comets. Fortunately, these comets constitute a rather small fraction of the total impact threat, and we generally omit them from consideration in this chapter.

No NEO impact, and the ones that “could happen any day” have literally no impact

Peiser, Chapman and Harris 2003 (Benny, social anthropologist at Liverpool John Moores University in the UK; Clark, scientist at the Southwest Research Institute's Department of Space Studies; and Alan, senior research scientist at the Space Science Institute, an affiliate of the University of Colorado at Boulder, Great Impact Debates, Encore, http://www.astrobio.net/debate/396/encore)

Alan Harris: There are two problems with this concept. First, "all the troublesome objects" at present is zero, and is likely to remain so. We don't expect to find any asteroids on a collision course with the Earth. If we did find one, "mining it out of existence" would be a vastly greater enterprise than simply deflecting it off of a collision course. There is a common misconception of the utility of space resources. With present technology, it makes no sense to go into space for resources to bring back to Earth. The only sensible utility of mining asteroids is for resources to be used in space -- that is, to reduce the amount of mass that must be thrown up into space against the Earth's gravity. We might contemplate mining the offending asteroid to gain fuel to deflect it, or for mass to run a mass driver, but not to bring stuff back home. How many times in recorded history has a significant asteroid or comet impact occurred? You mentioned the event in China where 10,000 people may have been killed by asteroids. Is that the most deadly asteroid event that has occurred for humans? Benny Peiser: We have no idea how many significant impacts have occurred during the last 10,000 years. While we have a number of historical records that appear to refer to cosmic impacts, many of these accounts are too ambiguous to give us any reliable information. This predicament is also true for the various reports regarding the alleged impact disaster in China during the 15th century. Clark Chapman: A paper was published about half-a-dozen years ago that interpreted ancient Chinese records in terms of meteoroid impacts. I found essentially all of the instances in that paper to be \*in\*credible. A case of stones raining down on an army violated one of the most characteristic aspects of meteoroid falls: all the stones were interpreted to have been about the same size. Instead, real debris from outer space -- whether broken up in outer space or in an atmospheric explosion -- forms a "power-law size distribution." There are a few big objects, and increasing numbers of small objects at ever-smaller sizes. Eyewitness reports in modern society are notoriously unreliable, and reports from different cultures in ages long past are even more so. Presumably these historical accounts refer to something, but I doubt that most (or any) of them have much to do with impacts. Benny Peiser: Unless you can verify the existence of an unambiguously dated impact crater, historical records and eyewitness accounts are regarded as insufficient evidence for an impact. We even find it difficult to believe the descriptions of experienced astronomers, such Leon Stuart, who claimed to have observed -- and indeed photographed -- a lunar impact in 1953. This is a real dilemma since only around 5 percent of terrestrial impacts produce a hypervelocity impact crater. For every crater-producing multi-megaton impact, we can expect about 10 atmospheric or oceanic impacts that fail to produce a "smoking gun." In other words, the vast majority of small asteroids striking the Earth explode in the atmosphere. In rare cases, as happened in Tunguska, atmospheric impacts can cause considerable destruction on the Earth's surface without leaving any compelling fingerprints (like an impact crater). It is striking, nevertheless, that significantly more terrestrial impact craters exist that date to the Holocene (the last 10,000 years) than we have historical impact reports for. It seems the vast majority of historical impacts went unnoticed. Another possibility is that impact reports were censored by religious authorities who were concerned about the demoralizing implications of these "divine interventions."

SQ solves- current detection and tech sufficient to divert NEOs

Vasile and Colombo 2011 (Massimiliano and Camilla, Lecturer Ph.D., Department of Aerospace Engineering; and Ph.D. Candidate, Department of Aerospace Engineering at Glasgow, University, Optimal Impact Strategies for Asteroid Deflection, http://arxiv.org/ftp/arxiv/papers/1104/1104.4670.pdf)

The European Space Agency in particular is now assessing the feasibility of the Don Quijote mission1, due to launch in the first half of next decade, which is intended to impact a spacecraft with a high relative velocity onto an asteroid and measure its deflection. Should this mission fly, this would be the first technological demonstration of our capability to deviate an asteroid if needed. Prevention strategies against a potential hazardous object in collision route with the Earth usually consider a change in momentum of the asteroid, with a consequent variation in the semi-major axis which results in an increase of the Minimum Orbit Intersection Distance (MOID), between the Earth and the object. Several different strategies have been considered to achieve this goal; among them the simplest one is the kinetic impact. In fact, as will be shown in this paper, effective kinetic impacts resulting in a variation of the MOID even of thousand of kilometers seem to be already achievable with the current launch technology with a relatively small spacecraft, provided that the time difference between the momentum change and the potential Earth impact is large enough.

Detection is improving now

Easterbrook 2008 (Gregg, Editor of The Atlantic and The New Republic and Sr. Fellow at Brookings, “The Sky is Falling,” June, http://www.theatlantic.com/doc/200806/asteroids)

All known space rocks have been discovered using telescopes designed for traditional “soda straw” astronomy—that is, focusing on a small patch of sky. Now the Air Force is funding the first research installation designed to conduct panoramic scans of the sky, a telescope complex called Pan-STARRS, being built by the University of Hawaii. By continuously panning the entire sky, Pan-STARRS should be able to spot many near-Earth objects that so far have gone undetected. The telescope also will have substantially better resolving power and sensitivity than existing survey instruments, enabling it to find small space rocks that have gone undetected because of their faintness. The Pan-STARRS project has no military utility, so why is the Air Force the sponsor? One speculation is that Pan-STARRS is the Air Force’s foot in the door for the Earth-defense mission. If the Air Force won funding to build high-tech devices to fire at asteroids, this would be a major milestone in its goal of an expanded space presence. But space rocks are a natural hazard, not a military threat, and an Air Force Earth-protection initiative, however gallant, would probably cause intense international opposition. Imagine how other governments would react if the Pentagon announced, “Don’t worry about those explosions in space—we’re protecting you.”

Even a large asteroid wouldn’t cause extinction- detection and mitigation ensure

IAA 2009 (International Academy of Astronautics, Dealing with the THREAT TO EARTH From ASTEROIDS and COMETS, http://iaaweb.org/iaa/Scientific%20Activity/Study%20Groups/SG%20Commission%203/sg35/sg35finalreport.pdf)

As discussed earlier, few NEAs >2 km remain undiscovered, so the chances of such an event are probably <1-in-100,000 during the next century. The warning time would almost certainly be long, in the case of an NEA, but with current technology telescopes might be only months in the case of a comet. With years or decades of advance warning, a technological mission might be mounted to deflect an NEA so that it would miss the Earth (and also possibly a comet should new technologies enable similar warning times for them). Moving such a massive NEA would be very challenging. In any case, given sufficient warning, many immediate fatalities could be avoided by evacuating ground zero and longer-term casualties could be minimized by storing food supplies to survive the agricultural catastrophe. Susceptible infrastructure (transportation, communications, medical services) could be strengthened in the years before impact. However, no preparation for mitigation is warranted for such a rare possibility until a specific impact prediction is made and certified. The only advance preparations that might make sense would be at the margins of disaster planning developed for other, “all-hazards” purposes: considering such an NEA apocalypse might foster "out-of-the-box" thinking about how to define the outer envelope of disaster contingencies, and thus prove serendipitously useful as humankind faces an uncertain future.

### Self-interest means we won’t deflect

### Schweickart, 4

[Russell, AIAA Associate Fellow, Chairman, B612 Foundation, “ THE REAL DEFLECTION DILEMMA,” 2004 Planetary Defense Conference: Protecting Earth from Asteroids Orange County, California February 23-26, 2004 ]

This challenge is, by its nature, international. While there is the exceptional circumstance where the deflection path will lie entirely within the bounds of a single nation state, the general case is one where the path of risk will cross several, or even many, national borders. It would therefore seem appropriate that the many legal and risk sharing issues embedded in deflecting asteroids be addressed by either the United Nations or some other authoritative international policy institution. The timing for such policy consideration is a challenging issue in itself. The quality of information on a pending NEO impact is highly variable over time. It ranges from a surprise impact with no prior knowledge to the case of 1950 DA 2 where we know today that there is a probability between 0 and 0.33% that this 1.1 km asteroid will impact Earth on March 16, 2880. For all other known NEOs between these two cases we can only state that with the exception of ~ 45 of them the remaining 2700 pose no threat to the Earth for the next 100 years. The residual 45 pose a very small but non-zero threat of an Earth impact at various times within the next 100 years. The issue then, of what will we know and when will we know it, becomes extremely critical to the timing and development of a coordinated international public policy on the NEO environmental threat. The natural temptation with such an improbable event is to wait until it becomes either a certainty or near-certainty before addressing it seriously. The price that would be paid for such an avoidance option in this instance will be the wielding of extreme selfserving national influence in the policy making process. If, e.g., it is discovered that a modest NEO will impact in Japan and that the deflection path would take it across Korea and over Beijing and China prior to liftoff, one can easily imagine the difficulty in only then initiating international deliberations on appropriate deflection policies. Clearly, rational mission planning criteria and risk sharing policies should be discussed and even put into formal treaty documents well before the specifics of a particular impact come to light. Objective evaluation of risk trade-offs and rational mission design will be far easier to achieve in such a proactive environment than in the power-politics confrontation that would dominate a wait and see alternative. An even more difficult, though similar, situation applies to the considerations of mission execution. What agency or agencies of any national government will be trusted to “truck” a 100+ MT bomb across the countryside in order to eliminate certain devastation in a neighboring country? Could one seriously imagine today the U.S. DoD being accepted by the world as the responsible agency for deflecting an asteroid from an impact in Afghanistan when the path of deflection would take it directly across Tehran? Of course this is a highly improbable example, but the likelihood that similar political considerations will not exist when we discover a probable NEO impact is dangerous wishful thinking. CONCLUSION The Real Deflection Dilemma will arise when the people of Earth awake to discover that a near Earth asteroid is headed for an impact with the planet. It will present itself as a terrible choice; do nothing to prevent it and suffer the consequences, or mount a mission to deflect it from impact thereby, in the process, placing a swath of people and property not otherwise at risk in jeopardy. In a very real sense, however, we are already ensnared in this dilemma, for we all know that such a moment in time will come. Therefore our own Real Deflection Dilemma is whether to confront the intractable policy choices implicit in protecting the Earth from asteroids now, or to avoid this terrible responsibility and force some future generation to face them in real time when they will become all but impossible to resolve.

### NEO strikes won’t cause extinction

**Bennett 10** (James, Professor of Economics – George Mason, The Doomsday Lobby: Hype and Panic from Sputniks, Martians, and Marauding Meteors, p. 144-145)

It should be noted that the Alvarez et al. hypothesis was not universally accepted. As Peter M. Sheehan and Dale A. Russell wrote in their paper “Faunal Change Following the Cretaceous–Tertiary Impact: Using Paleontological Data to Assess the Hazards of Impacts,” published in Hazards Due to Comets & Asteroids (1994), edited by Tom Gehrels, “many paleontologists resist accepting a cause and effect relationship” between the iridum evidence, the Chicxulub crater, and the mass extinction of 65 million years ago.15 For instance, Dennis V. Kent of the Lamont–Doherty Geological Observatory of Columbia University, writing in Science, disputed that a high concentration of iridium is necessarily “associated with an extraordinary extraterrestrial event” and that, moreover, “a large asteroid… is not likely to have had the dire consequences to life on the earth that they propose.”16 Briefly, Kent argues that the Alvarez team mistakenly chose the 1883 Krakatoa eruption as the standard from it extrapolated the effects of stratospheric material upon sunlight. Yet Krakatoa was too small a volcanic eruption from which to draw any such conclusions; better, says Kent, is the Toba caldera in Sumatra, remnant of an enormous eruption 75,000 years ago. (A caldera is the imprint left upon the earth from a volcanic eruption.) The volume of the Toba caldera is 400 times as great as that of Krakatoa – considerably closer to the effect that an asteroid impact might have. Yet the sunlight “attenuation factor [for Toba] is not nearly as large as the one postulated by Alvarez et al. for the asteroid impact.” Indeed, the Toba eruption is not associated with any mass extinctions, leading Kent to believe that “the cause of the massive extinctions is not closely related to a drastic reduction in sunlight alone.”17 Reporting in Science, Richard A. Kerr wrote that “Many geologists, paleontologists, astronomers, and statisticians… find the geological evidence merely suggestive or even nonexistent and the supposed underlying mechanisms improbable at best.” Even the iridium anomalies have been challenged: Bruce Corliss of the Woods Hole Oceanographic Institute argues that the major extinctions associated with the K–T event were not immediate and catastrophic but “gradual and apparently linked to progressive climate change.”18 Others argue that a massive volcanic event predating the Alvarezian killer asteroid created an overwhelming greenhouse effect and set the dinosaurs up for the knockout punch. A considerable number of scientists believe that gradually changing sea levels were the primary cause of the K–T Extinction. If either of these hypotheses is true – and a substantial number of geologists hold these positions — then the “killer asteroid” is getting credit that it does not deserve. Even if the K–T Extinction was the work of a rock from space, the Alvarez team credits a “probable interval of 100 million years between collisions with 10-km-diameter objects.”19 The next rendezvous with annihilation won’t be overdue for about 40 million years. We have time.

## Accidental War – 1NC

### Fail-safes and CBMs check accidental war

**Rosenkrantz 5** (Steven, Foreign Affairs Officer, Office of Strategic and Theater Defenses, Bureau of Arms Control, Weapons of mass destruction: an encyclopedia of worldwide policy, technology, and history, p 1-2)

Since the dawn of the nuclear era, substantial thought and effort have gone into preventing accidental and inadvertent nuclear war. Nuclear powers have attempted to construct the most reliable technology and procedures for command and control of nuclear weapons, including robust, fail-safe early warning systems for verifying attacks. The United States and the Soviet Union also maintained secure second-strike capabilities to reduce their own incentives to launch a preemptive strike against each other during crisis situations or out of fear of a surprise attack. The two nuclear superpowers worked bilaterally to foster strategic stability by means of arms control and confidence-building measures and agreements. Several confidence-building agreements were negotiated between the two-superpowers to reduce the risk of an accidental nuclear war: the 1971 Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War, the 1972 Agreement on the Prevention of Incidents on and over the High Seas, and the 1973 Agreement on the Prevention of Nuclear War. Following the end of the Cold War, the United States and the Russian Federation have continued to offer unilateral initiatives and to negotiate bilateral agreements on dealerting and detargeting some of their nuclear forces to further reduce the likelihood of a catastrophic nuclear accident. They have concluded agreements on providing each other with notifications in the event of ballistic missile launches or other types of military activities that could possibly be misunderstood or misconstrued by the other party.

### No nuclear accidents

**Perrow 99** (Charles, Professor of Sociology at Yale, Normal Accidents: Living with High-Risk Technology, p 257-258)

No such encouraging lessons come from the section on nuclear weapons and early warning systems. We will not dwell on “the fate of the earth,” that is, the destructive power of nuclear weapons, but on the limits of human capabilities and the even narrower limits of organizational capabilities. There is much to fear from accidents with nuclear weapons such as dropping them or an accidental launch, but with regard to firing them after a false warning we reach a surprising conclusion, one I was not prepared for: because of the safety systems involved in a launch-on-warning scenario, it is virtually impossible for well-intended actions to bring about an accidental attack (malevolence or derangement is something else). In one sense this is not all that comforting, since if there were a true warning that the Russian missiles were coming, it looks as if it would also be nearly impossible for there to be an intended launch, so complex and prone to failure is this system. It is an interesting case to reflect upon: at some point does the complexity of a system and its coupling become so enormous that a system no longer exists? Since our ballistic weapons system has never been called upon to perform (it cannot even be tested), we cannot be sure that it really constitutes a viable system. It just may collapse in confusion!

### CTBT verification solves asteroid strikes and accidental war

**Nature News 2002** (“Microphones tell asteroids from A-bombs,” July 17, http://www.nature.com/news/1998/020715/full/news020715-4.html)

Ground-based groups of microphones, called infrasonic arrays, can distinguish atomic blasts from exploding asteroids up to a few hundred kilometres away, say Brown, Tagliaferri and colleagues1. The arrays pick up the very-low-frequency sounds that penetrate hundreds of kilometres of the Earth's atmosphere. Multiple arrays pinpoint the position and size of a blast almost as accurately as the satellites used by US Space Command, the researchers show. Right now, there are 12 such arrays. Sixty will be built within the next 5 years as part of the CTBT International Monitoring Network. The rules of the treaty dictate that their data must be available to all. A global array should spot meteor explosions from most areas of the world, says Brown. The infrasonic network will also be important for research. Meteorites smaller than 10 metres across are hard to detect with telescopes, so scientists have little idea of how often they breach our atmosphere. An idea of how frequently small asteroids occur is important for estimating the likelihood of larger ones, such as the one that devastated thousands of square kilometres of Siberian forest in Tunguska in 1908. The microphone array, says Matthew Genge of the Natural History Museum in London, UK, "will help us tell just how many Tunguskas we can expect".

## Ext – Strikes Unlikely

### Err Neg – Aff authors exaggerate

### Bennett, 10

[James, Eminent Scholar and William P. Snavely Professor of Political Economy and Public Policy at George Mason University, and Director of The John M. Olin Institute for Employment Practice and Policy, “The Chicken Littles of Big Science; or, Here Come the Killer Asteroids!” THE DOOMSDAY LOBBY 2010, 139-185, DOI: 10.1007/978-1-4419-6685-8\_6]

 We should here acknowledge, 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.” Elite journals, 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

### Risk is almost nil and civil defense solves

Rozeff, 7

[Michael, retired Professor of Finance living in East Amherst, New York. February 21, 2007, “ Asteroid Risk Mitigation, Anyone?,” <http://www.lewrockwell.com/rozeff/rozeff139.html>]

 The space fliers and explorers of the ASE pass themselves off as experts on the risks of a catastrophe arriving from outer space; but they are far more likely to be biased observers and commentators than scientists who have no space axe to grind. Robert Roy Britt writes for Live Science. In an article posted two years ago, he pointed out many pertinent facts. At that time, he gave the lifetime odds (over one's entire life) of an asteroid hit as 1 in 200,000 or perhaps as little as 1 in 500,000. Death by lightning has odds of 1 in 84,000, by legal execution 1 in 59,000, by air travel 1 in 20,000, by fire 1 in 1,100, by falling down 1 in 246, and by suicide 1 in 121. He pointed out that there are those who have held to asteroid death odds of 1 in 50,000, however, until more asteroids are catalogued and their movements accounted for. Even at 1 in 50,000, the risk is very low. Famine, disease, and war are the biggest killers on the planet and occur constantly. Two of these are preventable, and one can be ameliorated.

The ASE is making noises about an asteroid 140 meters long called Apophis. Astronomers say that it has a chance of striking the earth on April 13, 2036. This will be a Palm Sunday. The odds noised about in the recent spate of articles are 1 in 45,000 that it hits the earth. It's supposed to miss us by 20,000 miles. If it does hit, the damage could be large, depending on many factors. If it landed in the Pacific Ocean, a likely target, it would create 50-foot tidal waves lasting an hour. The odds of being killed are far lower, as Britt notes, and they vary depending upon where one lives. In the worst eventuality that Apophis hit the earth, the area of impact would by the time it headed for earth be pinpointed. People could then evacuate that area, and the death toll could be greatly reduced. The stated odds do not take human action into account.

## Ext – Long Time Frame = Doesn’t Matter

Asteroids don’t just hit every day- if they really do have a short time frame, the plan would be too slow to actually mitigate the impact

The only impact they have access to is thousands of years down the road- technology will be more than advanced enough by then

PARK et al. 1994– President of the American Physical Society, PhD (Richard L., Lori B. Garver of the National Space Society and Terry Dawson of the US House of Representatives, “The Lesson of Grand Forks: Can a Defense against Asteroids be Sustained?” Hazards Due to Comets and Asteroids ed. Tom Gherels, pg. 1225-1228)

Given the frequency of past collisions, major impact is unlikely to occur in the next century. On the other hand, all of modern technology is squeezed into the present century, and the pace of technological advance is accelerating. It would be presumptuous to suppose that defenses devised today will be of more than historical interest to our scientific heirs a century from now, or a millennium, or a thousand millennia, when the rock finally comes. Discussion of mitigation may serve one public purpose. It is important that devastation not be accepted as inevitable, otherwise society might prefer not to know when it is coming. An asteroid interception workshop hosted by NASA in 1992 (Canavan et al. 1993) concluded that available technology can deal effectively with a threatening asteroid, given waiting time on the order of several years. That conclusion validates the view that current efforts should concentrate on detection and orbit determination.

## Ext – Deflection Tech Now

### Tech for effective deflection exists now

Huebner 9 (WF, DC Boice1, P. Bradley2, S. Chocron1, R. Clement2, A. Ghosh1, PT Giguere2, R. Goldstein1, JA Guzik2, LN Johnson3, JJ Keady2, J. Mukherjee1, W. Patrick1, C. Plesko2, M. Tapley1, JD Walker1, RP Weaver2, K. Wohletz2; 1Southwest Research Institute, 2Los Alamos National Laboratory, 3Science Mission Directorate at NASA Headquarters, The Asteroid-Comet Hazard Conference Proceedings, INVESTIGATION OF NEOS IN SITU. COUNTERACTION TO THE NEO HAZARD)

The necessary technologies that may be applied to countermeasures against PHOs have been developed over the last several decades. They are ready to be adapted and applied for the defense of Earth against cosmic im- pacts. It is ethically compelling for us to apply these technologies to defend and protect civilization. We must not fail to exercise our responsibilities! The first step in preparing countermeasures is to investigate in advance the optimum method of countering a PHO under various different circums- tances. This Playbook with precalculated scenarios for potential countermea- sures will be very useful as a guide when we face an impending collision with a cosmic object.

## Ext – Won’t Deflect

### Bureaucratic inertia means no deflection

### Schweickart, 4

[Russel, Chairman B612 Foundation, “ Asteroid Deflection: An International Challenge,” Presented at the World Federation of Scientists meeting of the Multidisciplinary Core Group on Planetary Emergencies, Rome, Italy, December 2004]

 In any event, the minimal policy decision involved in any asteroid deflection would be whether to deflect it at all or simply suffer the consequences of the nominal impact. If the incoming asteroid were on the order of 100 meters in diameter the resultant impact would be on the order of 80 MT and the resulting damage could lie entirely within the borders of one nation. If this nation were not a space faring nation who would respond to a request to mount such a mission? Conversely if the nominal impact were located within the borders of a space faring nation, would the risk to others along the deflection risk path deter that nation from mounting a deflection mission? Who will make these decisions? Who will pay for a deflection mission? Who will be charged with the responsibility for executing such a mission? How is liability to be assigned? Who will trade off local devastation vs. placing many remote lives at slight risk? Who will determine the planning criteria? Who will monitor and/or control the deflection mission? These and many other difficult and critical policy questions are implicit in the concept of asteroid deflection. In all but the exceptional case the choices to be made involve several, if not many, nations. The entire subject is planetary in scope since asteroid impacts may (and eventually will) strike anywhere on the globe. An Alternative to Institutional Inertia The easiest and perhaps most likely course of action for international institutions facing questions of this kind is to simply avoid them. And yet, for those involved in the Spaceguard Survey and others informed on the subject it is clear that addressing these choices only after the announcement of a pending impact will result in great contention, self serving argument, and power politics. Once a specific IP is determined the hope for rationale, equitable policies emerging from such a belated undertaking becomes futile. In the limit an asteroid impact which destroys all human civilization is possible, though extremely improbable. No other natural disaster is capable of such destruction, and yet this natural hazard, unlike most others, can actually be prevented by human intervention. We therefore face the daunting challenge of convincing the international community to plan for a highly unlikely but devastating global event, and to do it now. Yet many more immediate problems involving the lives of millions of people face the international community on virtually a continuous basis. It is “natural” to avoid this issue. Risk situations characterized by extreme infrequency and devastating consequences are difficult for individual human beings, let alone bureaucratic institutions to handle. This is even more the case when the questions to be addressed are so intractable and without precedent. Yet the time for rational policy to be developed to guide behavior and prepare for such an eventuality is prior to the discovery of an asteroid actually bound for an impact. The reality we face, however, is that there is about a one in twenty chance that within the next decade or so we may in fact discover such a pending impact. Worse still, from the standpoint of alarming the public, is the much higher likelihood that in completing the inventory of NEOs down to 100 meters, the astronomical community will in fact discover one or more objects destined to pass within several Earth radii. The problem in this case will arise in that it may take many years before the telescopic observations are able to distinguish between this near miss and an impact. During this period of time no one will be able to state with certainty whether or not an impact is coming. This circumstance, with perhaps a 50/50 likelihood of occurrence, will be extremely frustrating to the professionals and alarming to the public.

## A/T “Long-Period Comets”

The tech doesn’t exist to detect long-period comets

NRC 2010 (National Research Council, Defending Planet Earth: Near-Earth Object Surveys and Hazard Mitigation Strategies, Committee to Review Near-Earth-Object Surveys and Hazard Mitigation Strategies, http://www.nap.edu/catalog.php?record\_id=12842)

Long-Period Comet Impacts Stokes et al. (2003) provide considerable description of the threat represented by long-period comets, and there is no need to repeat all of their arguments here. In brief, they find that the comet hazard constitutes only a tiny fraction (on the order of <1 percent) of the total risk to life on Earth by impacting NEOs (prior to the Spaceguard Survey) and that producing a complete catalog of hazardous long-period comets is far beyond the abilities of any proposed survey. For these reasons, they suggested that limited resources would be better utilized in finding and cataloging Earth-threatening near-Earth asteroids and short-period comets. With the completion of the Spaceguard Survey (that is, the detection of 90 percent of NEOs greater than 1 kilometer in diameter), long-period comets will no longer be a negligible fraction of the remaining statistical risk, and with the completion of the George E. Brown, Jr. Near-Earth Object Survey (for the detection of 90 percent of NEOs greater than 140 meters in diameter), long-period comets may dominate the remaining unknown impact threat. Furthermore, these comets present a difficult challenge, as they are large objects, and there will be only a short warning time (months to a very few years maximum) before impact. Thus mitigation options are very limited, as noted in Chapter 5.

Long-period comets are extremely rare, impossible to predict, and would bypass even advanced detection

Huebner et al 2009 (WF, DC Boice1, P. Bradley2, S. Chocron1, R. Clement2, A. Ghosh1, PT Giguere2, R. Goldstein1, JA Guzik2, LN Johnson3, JJ Keady2, J. Mukherjee1, W. Patrick1, C. Plesko2, M. Tapley1, JD Walker1, RP Weaver2, K. Wohletz2; 1Southwest Research Institute, 2Los Alamos National Laboratory, 3Science Mission Directorate at NASA Headquarters, The Asteroid-Comet Hazard Conference Proceedings, INVESTIGATION OF NEOS IN SITU. COUNTERACTION TO THE NEO HAZARD)

Determination of whole-body properties is still funded poorly, but is nevertheless crucial for the development of countermeasure techniques. It suffers from limited progress. We must develop and launch a number of coordinated multiple rendezvous missions, possibly based on relatively in- expensive microsatellite technology to visit different types of asteroids and comet nuclei to establish their detailed structure and physical properties. In particular seismology experiments are needed. It will not be possible to in- vestigate all NEOs, but we must collect a statistically meaningful sample. Long-period comets usually are ignored when discussing countermea- sures, because they are extremely rare, impossible to predict (because their orbital periods range from 200 years to over one million years), very large and fast moving, and can have very short warning times. For example, a re- trograde long-period comet can have a speed greater than 70 km/s relative to the Earth. Thus, since they are large (massive) and fast, they release enorm- ous amounts of energy in an Earth collision, with the potential to destroy civilization. Although they are rare, we must not ignore them. They must be included in countermeasures to protect the Earth. Hopefully we never will have to defend against one, but that is no reason to ignore them in counter- measure plans.

The speed of LPCs makes advance detection impossible

Huebner, Patrick and Walker 2009 (Walter, Wesley and James, all PhDs, Countering Cosmic Collisions, Technology Today, Spring, http://www.southwestresearchinstitute.org/3pubs/ttoday/Spring09/PDFs/Cosmic.pdf)

The NASA Authorization Act of 2005 furthered its small-objects sky survey program with a congressionally mandated goal to identify, track and catalog 90 percent of NEOs larger than 140 meters by 2020. By March 2009, the original “Spaceguard Survey” for objects larger than 1 kilometer had found 6,108 near-Earth asteroids and 83 near-Earth comets, for a total of 6,191 NEOs. Of these, only 773 are believed to be larger than 1 kilometer, so 87 percent of the detected NEOs are smaller than the survey’s targeted objects. Similarly, objects smaller than 140 meters are likely to be found in a new survey focused on objects larger than 140 meters. More importantly, objects smaller than one hundred meters are of significant interest because they are thought to be up to 1,000 times more numerous than kilometer-size objects. Since smaller objects reflect less light they are generally fainter and thus harder to detect. Consequently, they will likely provide much shorter warning times between discovery and impact on Earth. Additionally, threats from long-period comet nuclei with orbital periods of hundreds to millions of years, although relatively rare, appear unexpectedly and provide little warning time because they transit very rapidly through the inner solar system. For example, the long-period Comet C/1983 H1 (IRAS-Araki- Alcock) was discovered in April of 1983, and passed within 0.03 astronomical unit (AU), or about 4.5 million kilometers, of Earth just two weeks later. Such comets come from the outer solar system at high speed and are not necessarily confined to the ecliptic plane. They can even be in a retrograde orbit that would combine the speed of the comet with the orbital speed of the Earth in a head-on collision.

## A/T “Small Objects”

Even if we can’t detect them- it would kill a few hundred people at most, and they only hit once every few centuries

IAA 2009 (International Academy of Astronautics, Dealing with the THREAT TO EARTH From ASTEROIDS and COMETS, http://iaaweb.org/iaa/Scientific%20Activity/Study%20Groups/SG%20Commission%203/sg35/sg35finalreport.pdf)

Once-in-a-Century Mini-Tunguska Atmospheric Explosion Consider a 30-40 m office-building-sized object striking at 100 times the speed of a jetliner. It would explode ~15 km above ground, releasing the energy of ~100 Hiroshima-scale bombs. Some researchers consider that such an event would be spectacular to witness but would not have lethal consequences. Our review of the literature suggests, however, that weak structures might be damaged or destroyed by the overpressure of the blast wave out to 20 km. The death toll might be hundreds; although casualties would be far higher in a densely populated place, they would much more likely be zero (i.e., if the impact were in the ocean or in a desolate location). Such an event is likely to occur before or during our grandchildren's lifetimes, although most likely over the ocean rather than land. Even with the proposed augmented Spaceguard Survey, it is unlikely that such a small object would be discovered in advance; impact would occur without warning. Since it could occur literally anywhere, there are no location-specific kinds of advance measures that could or should be taken, other than educating people (perhaps especially military forces that might otherwise mistake the event as an intentional attack) about the possibilities for such atmospheric explosions. In the lucky circumstance that the object is discovered years in advance, a relatively modest space mission could deflect such a small body, preventing impact (see ref. 65).

We can already track small objects- no hits are coming

RTT News 6/7/2011 (Asteroid On The Way: Mark Your Calendar, But No Cause For Alarm, lexis)

Near-earth-objects, or NEOs for short, refer to comets and asteroids passing close to Earth and have always fascinated astronomy buffs and laymen alike. Later this year, a asteroid will pass by the Earth at a distance of only a few hundred thousand kilometers - extremely close in cosmic terms. But while this will provide a prime sky-watching event, as well as a rare scientific opportunity, experts assure us that there is no danger from the object. Movies like "Armageddon" and "Deep Impact" have trained us to think of large space objects as a potential source of disaster, and in fact, NEOs could pose a problem someday. The general scientific consensus, according to famed British physicist Stephen Hawking, is that there will be a complete annihilation of our planet if it is hit by a comet or asteroid greater than 20 kilometers in diameter. But the probability of an object that size colliding with Earth is extremely low and it is estimated that large impacts occur only once every 100 million years. It is widely believed that the last major asteroid impact on Earth took place some 65 million years ago, with many scientists believing that the collision resulted in the extinction of the dinosaurs. But there have been some damaging NEO strikes in more recent history. On June 30, 1908, a small asteroid (about 50 meters in diameters) exploded mid-air over Tunguska, Siberia, and devastated more than half a million acres of forest. Asteroid flybys are common occurrences but they usually go unnoticed because of the small size of the objects, according to Lindley Johnson, program executive of the Near-Earth Object Observations program at NASA headquarters in Washington. However, the upcoming flyby of the asteroid 2005 YU55, which is on the list of potentially dangerous asteroids, on November 8, 2011, has received much attention. 2005 YU55, which is about 400 meters in diameter, was discovered on December 28, 2005, by Robert McMillan of the Spacewatch program. (Spacewatch is a project at the University of Arizona that specializes in the study of minor planets, including various types of asteroids and comets). On November 8 of this year, YU55 will fly past Earth within a distance of about 325,000 kilometers. This might seem like a rather long way, but in space terms it is very close. (For perspective, this means that as it flies past, the object will be closer to the Earth than the moon, crossing at 0.85 lunar distance.) This near-earth asteroid should be easily visible to observers in both the northern and southern hemispheres, according to NASA. The best time for new ground-based optical and infrared observations will be late in the day on November 8, after 21:00 hours UT from the eastern Atlantic and western Africa zone. Although 2005 YU55 is considered a potentially hazardous object, astronomers say it poses no threat of an earth collision over at least the next 100 years. Scientists say the upcoming flyby of 2005 YU55 will be the closest approach to date by an object of this size that we knew was coming in advance and for which we have had the technology to take advantage of the opportunity. The next close flyby of a similar large-sized object will happen in 2028 when asteroid (153814) 2001 WN5 will pass within 0.6 lunar distances (230,640 kilometers) from Earth.

An object like the “Tunguska event” their ev cites might hit once every *thousand years-* at most

Brown et al 2002 (P., Department of Physics and Astronomy, University of Western Ontario; R. E. Spalding‡, D. O. ReVelle†, E. Tagliaferri§& S. P. Worden; † Los Alamos National Laboratory, ‡ Sandia National Laboratory, § ET Space Systems, k Directorate of Operations, United States Space Command, The flux of small near-Earth objects

colliding with the Earth, http://meteor.uwo.ca/~pbrown/flux-final.pdf)

Asteroids with diameters smaller than ,50–100m that collide with the Earth usually do not hit the ground as a single body; rather, they detonate in the atmosphere1. These small objects can still cause considerable damage, such as occurred near Tunguska2, Siberia, in 1908. The flux of small bodies is poorly constrained, however, in part because ground-based observational searches pursue strategies that lead them preferentially to find larger objects3. A Tunguska-class event—the energy of which we take to be equivalent to 10 megatons of TNT—was previously estimated to occur every 200–300 years, with the largest annual airburst calculated to be ,20 kilotons (kton) TNT equivalent (ref. 4). Here we report satellite records of bolide detonations in the atmosphere over the past 8.5 years. We find that the flux of objects in the 1–10-m size range has the same power-law distribution as bodies with diameters >50 m. From this we estimate that the Earth is hit on average annually by an object with ,5 kton equivalent energy, and that Tunguska-like events occur about once every 1,000 years. Our data are based on observations made by United States Department of Defense and Department of Energy space-based systems in geostationary orbits. These systems are designed to detect the signature of nuclear explosions and other objects of military interest on or above Earth’s surface5. For the past eight years, data from optical events registered as probable bolides have been recorded and saved for later examination. In total, 300 events from February 1994 to September 2002 have been designated as probable bolides, and a time–intensity plot for each event recorded. From these time–intensity plots, the peak radiated power (maximum brightness) and the integrated energy were determined. Figure 1 shows an example of the original data for a large bolide recorded on 6 June 2002.

## War Outweighs Asteroids

War outweighs asteroids

IAA 2009 (International Academy of Astronautics, Dealing with the THREAT TO EARTH From ASTEROIDS and COMETS, http://iaaweb.org/iaa/Scientific%20Activity/Study%20Groups/SG%20Commission%203/sg35/sg35finalreport.pdf)

Summary findings The problem The report analyzes the nature of the threat, which consists of a size spectrum of asteroids and comets whose orbits bring them to the vicinity of Earth and are thus called Near Earth Objects (NEOs). The Earth has been subjected to a bombardment by thousands of very large NEOs since its formation, extremely intensely initially, which has mostly dwindled to the current impact frequency since about 3.5 billion years ago. While the great majority of NEOs are small and pose little or no danger the most damaging ones are 6 km or more in diameter, and the effects of their impact on Earth would likely cause the extinction of most life on Earth This has occurred several times, the most recent being the impact 65 million years ago which extinguished the dinosaurs and 60% of other species, but fortunately their average impact frequency is only every 100,000,000 years. The impact of NEOs 1-6 km in diameter would result in catastrophic damage regionally or globally. There are an estimated over 1,100 such NEAs (Near Earth Asteroids) and their estimated average impact frequency is every 1,000,000 years. NEOs about 300 m diameter would result in great local or regional damage and millions of deaths, and their average impact frequency is every 10,000 years. Smaller NEOs in the 45 m diameter class may not penetrate the atmosphere but could still create extensive local damage and deaths due to blast, and their average impact frequency is every 100 years. The average NEO hazard is very important in the spectrum of hazards humanity faces, being greater than that from biological warfare and terrorism (to date), though smaller than that from major wars.

# \*NUCLEAR OPTION ADVANTAGE ANSWERS

## Nuclear Option – 1NC

Nuclear deflection *works-* fragmented pieces miss Earth or burn up in the atmosphere

Zhang et al 2010 (XL, E Ball,C Granier, L Kochmanski, and S D Howe, Centre for Space Nuclear Research, Idaho National Laboratory, Near-Earth object interception using nuclear thermal rocket propulsion, SPECIAL ISSUE PAPER 181, http://journals.pepublishing.com/content/x225kt32h67735w8/fulltext.pdf)

Deflection and destruction of the approaching comet are both viable options. While some proposals suggest avoiding fragmentation because of the potential to create multiple assailants on course for Earth, fragments may cause less damage by spreading out the energy. Fragmentation is the most efficient method of moving the comet, since a larger fragment can deliver the same impulse to the comet with less energy. Given the uncertain composition of a comet and its unknown response to high-yield detonations, not enough information is available to determine whether a surface-burst nuclear explosion would cause it to fragment. If so, the goal should be to spread the pieces out over an area much larger than Earth, so that most will pass by harmlessly. Additionally, the rest should be reduced to a size that cannot penetrate the atmosphere. A strategy incorporating multiple sequential explosions, delivered by separately propelled vehicles, lends itself quite well: after fragmentation by the initial explosion, any large pieces remaining on course for Earth become the new targets for the later interceptions. If, however, the comet remains essentially cohesive, the goal must be to deflect it far enough to definitively avoid impact. In each case, the velocity (of either the main comet body or the majority of the fragments) must be enough that the orbit is displaced by two Earth radii before it crosses Earth orbit. In the first case, this spreads the material over a diameter twice that of Earth, while in the second it ensures a miss by a safe margin. The velocity change VC to accomplish this shift is given as a function of the interception time by the same numerical simulation used for modelling the flight of the interceptors (discussed in section 5.2).

Double-bind: either- 1. Their impact is short-term, and they don’t solve because NASA will invest in the nuclear option in the short term

IAA 2009 (International Academy of Astronautics, “Dealing with the Threat To Earth From Asteroids and Comets,” http://iaaweb.org/iaa/Scientific%20Activity/Study%20Groups/SG%20Commission%203/sg35/sg35finalreport.pdf)

Many analyses have been carried out to compare the various techniques discussed briefly above. While much detail exists the fundamentals of orbit dynamics are simple: The longer the action time of a force applied to a NEO the lower is the energy required to move its impact point off the Earth and the larger is the NEO than can be so moved. Conversely the greater the energy available the shorter the action time can be and the larger is the NEO that can be moved. One comparison is shown in Figure 4-7, which clearly shows that if the NEOs are large and if little time is available then there is no choice but the use of nuclear devices to prevent impact. It also shows that in general there will be a significant advantage to a kinetic “fast push” approach over any “slow push” technique for the same available action time, at least for the parameters considered in this comparison. In summary, although there are well founded aversions to use of nuclear devices, their use against NEOs in space is probably one of the best and most desirable applications of these devices; and is the only technique that might be able to prevent a horrendous regional or global catastrophe when we are faced with a large NEO, or one with little warning time, or both. And the occurrence of such a situation is not a question of IF, but rather a question of WHEN.

Or 2. Their impact is long-term, and status quo tech development solves by 2020

Russell L. (Rusty) Schweickart is a retired business and government executive and serves today as Chairman of the Board of the B612 Foundation. The organization, a non-profit private foundation, champions the development and testing of a spaceflight concept to protect the Earth from future asteroid impacts and flew on Apollo 9, total badass, March 2008, NASA's Flimsy Argument for Nuclear Weapons, http://www.scientificamerican.com/article.cfm?id=nasas-flimsy-argument-for-nuclear-weapons&page=2

As NASA continues to find big NEOs, the calculations of risk change accordingly. A decade ago, before astronomers began to systematically locate NEOs larger than 400 meters in diameter, they estimated that we faced a statistical risk of being struck by such an object once every 100,000 years. But now that researchers have identified and are tracking about 37 percent of these NEOs, the frequency of being hit by one of the remaining large objects has dropped to once in 160,000 years. Unless NASA finds a large NEO on an immediate collision course by 2020 (a very unlikely event), the frequency of a collision with one of the 80 still undiscovered objects (2 percent of 4,000) will drop to once every five million years. Thus, the probability that nuclear explosives might be needed to deflect an NEO is extremely small. And even this minuscule probability will diminish to the vanishing point as researchers improve nonnuclear interception technologies. After 2020 the need to keep nuclear devices on standby to defend against an NEO virtually disappears. As a result, the decision to move toward the worldwide elimination of nuclear weapons can be made strictly on the basis of human threats to global security. Extraterrestrial dangers need not be considered.

Other countries will still press for the nuclear option, or use their own nukes

Lee Valentine is a physician, a long time space advocate, and a director of the Space Studies Institute. 2002, “A Space Roadmap: Mine the Sky, Defend the Earth, Settle the Universe,” http://www.hobbyspace.com/AAdmin/archive/Articles/Guests/atwgBriefingLeeValentine.html

The other obvious considerations are the nuclear option are the international legal prohibitions and the world-wide public concern with most things nuclear and especially weapons. The challenge of obtaining widespread international agreement that a nuclear explosion should be used in deflecting a NEO will be daunting, to understate it. Nevertheless, if the world is unable to come to agreement in time to utilize a non-nuclear deflection method the final option, due to its greater total impulse capability, will be nuclear. The ultimate alternative to using a nuclear device for diverting a NEO is "taking the hit". This is an ominous choice given the psychological and physical implications of mass evacuations, refugees, destruction of infrastructure and the like. This reality should put strong emphasis on the world dealing early with the challenge of making timely NEO deflection decisions.

## Ext.: Nuclear Deflection Effective

Nukes can deflect comets up to 5.1 kilometers in diameter- larger than the “civilization killers” in their impact ev

Zhang et al 2010 (XL, E Ball,C Granier, L Kochmanski, and S D Howe, Centre for Space Nuclear Research, Idaho National Laboratory, Near-Earth object interception using nuclear thermal rocket propulsion, SPECIAL ISSUE PAPER 181, http://journals.pepublishing.com/content/x225kt32h67735w8/fulltext.pdf)

8 MISSION PROFILE,CONCLUSIONS,AND FUTUREWORK The assumption, then, is that each launch carries a 9 Mt payload, and that seven interceptors can be launched every 30 days. All 21 devices would detonate within a few days of each other, so for simplicity they will be treated here as simultaneous. The combined detonations produce 8.79e16 J of yield for an impulse of 2.37e14 kg m/s, using the C value from section 4.5. Assuming a comet density of 573 kg/m3, a comet with diameter of nearly 5.1km could be deflected. To deflect the comet effectively, launch should take place as close as possible to the optimal date. However, delays are not catastrophic. Given a 7 km/s interceptor v and thrust to weight of 0.3 (similar to the optimal trajectory described above), the first set of launches should take place 59.4 days after detection. Vehicles in the first set intercept the comet 18.24 days before impact. A second set, 30 days after the first, intercepts 17.65 days before impact.The third, 60 days after the first, intercepts 16.33 days out. Given the small intervals between interceptions – 0.59 and 1.91 days – the momentum delivered by three sets of warheads is roughly the same as detonating them all at once, as assumed above. Several conclusions are evident from these results. First, NTRs can achieve NEO interception missions not feasible for chemical rockets. Optimum intercept trajectory is shown to be independent of the size of the comet and is calculated for the assumed trajectory. Estimation of yield requirement for a hypothetical comet is performed. Deflecting a 10 km comet requires 2 million kilograms of mass delivered to LEO, which is impossible. Considering realistically the availability of nuclear weapons and launching capacity, the largest comet that can be intercepted is estimated to have a diameter of 5.1 km. One eighty nine megatons of nuclear warheads must be launched from LEO on NTR interceptors. The overarching plan is to have international coordination which enables 21 launches of interceptors with payloads into LEO, after which the NTRs are activated.

Nuclear deflection is the most effective option- we have the tech to accurately determine how NEOs will react to the blast

Bradley et al 2010 (P. A. Bradley a, C. S Plesko a, R. R. C. Clement a, L. M. Conlon a, R. P. Weaver a, J. A. Guzik a, L. A. Pritchett-Sheats a and W. F. Huebner b; a: Los Alamos National Laboratory, b: Southwest Research Institute; Challenges of Deflecting an Asteroid or Comet Nucleus with a Nuclear Burst, http://www.astrosociology.org/Library/PDF/SPESIF2010\_Bradley-etal\_DeflectingAsteroids.pdf)

The method we are most interested in is the use of nuclear munitions in a standoff mode to deflect a PHO. As mentioned earlier, we do not claim that this procedure is the only viable one. However, it is the only present method that is both technically feasible and capable of large amounts of energy for deflecting a PHO. Note that we consistently talk about deflection. While disruption of a PHO is possible, we are not convinced that we could disrupt a PHO into harmless pieces. Therefore, we consider disruption a method of last resort. In addition, the NASA (2007) white paper “Near-Earth Object Survey and Deflection Analysis of Alternatives” affirms deflection as the safest and most effective means of PHO impact prevention. It also calls for further studies of object deflection. Although technically viable, many questions remain as to the response of an asteroid or comet nucleus to a nuclear burst. Recent increases in computing power and scientific understanding of the physical properties of asteroids and comets make it possible to numerically simulate the response of these porous, nonspherical, and inhomogeneous bodies to strong shocks and radiation. Here we use the radiation-hydrocode RAGE (Gittings et al., 2008) to explore energy coupling from a nuclear burst to a simplified PHO. We start with simple one-dimensional (1-D) and twodimensional (2-D) models of material responses to variations in device yield, along with the composition and porosity of the PHO. We can calculate the neutron deposition of energy from a nuclear device into an asteroid using MCNP, a neutron/photon Monte-Carlo transport code (Brown et al., 2002). Once calculated, we can then input the neutron energy into RAGE to calculate the hydrodynamic response to the neutron energy deposition. The neutron energy is typically deposited into the asteroid in less than a microsecond, whereas the hydrodynamic response time of the asteroid is typically milliseconds or longer. This disparity in timescales makes it possible to accurately include both the x-ray and neutron energy deposition, which is important because there is no single code available that includes all of these effects. Previous calculations of deflection by nuclear munitions (Ahrens and Harris 1994; Shafer et al., 1994; Simonenko et al., 1994; Solem and Snell, 1994; Dearborn et al., 2007) either do not assume a standoff burst and/or do not account for the substantial porosity or internal composition variations from object to object. These properties may substantially affect how a PHO responds to a standoff nuclear burst (Holsapple, 2004a and 2004b). Plesko et al. (2008) and Bradley et al. (2009) have started calculations of the response of small solid-body asteroids to a nuclear burst, and we report on extensions of this work here. We do not include effects of porosity in this initial survey to keep the calculations simple and provide a reference point for comparison to other work and future calculations with porosity.

# \*SOLVENCY ANSWERS

## Solvency – 1NC

Tech barriers guarantee deflection attempts fail- additional information won’t be processed

IAA 2009 (International Academy of Astronautics, Dealing with the THREAT TO EARTH From ASTEROIDS and COMETS, http://iaaweb.org/iaa/Scientific%20Activity/Study%20Groups/SG%20Commission%203/sg35/sg35finalreport.pdf)

The detection and cataloguing of 90% of asteroids of 1 km size or larger is essentially completed by now through the Spaceguard Survey, and NASA has been instructed to extend the survey to asteroids as small as 140 m within the next decade. However, even if those goals are met most of these asteroids are not and will not be characterized in that time frame. Given the wide diversity in characteristics of these objects and the continuing dynamics in the NEO population the certainty of a successful deflection, even if all systems of the mitigator work as designed, is not great. Furthermore neither today’s technologies nor those likely to be available in the next decade or two lead to systems with extremely high reliability. Thus the probability of a successful deflection of a NEO with single mission using any known concept is far lower than desired, given the likely horrendous consequences of a failure. It is therefore clear that the development and deployment of a robust, multiple option, redundant, coordinated system of multiple and diverse systems is needed; and that the deflection of a NEO cannot be a mission but must rather be a campaign of multiple orchestrated missions19. Furthermore, these missions will probably have to be deployed sequentially in increasingly capable stages, with means in place to rapidly assess the status and effects of the missions as they unfold. All this requires not only the hardware and software to physically mount the campaign against a NEO but an extensive, expensive, and well coordinated command and control infrastructure which has been internationally designed, vetted, manned, and accepted. This task is technically not very different from structures emplaced by the adversaries during the cold war, or from current means in place by the space-faring nations for command and control of their space activities. However the political and policy obstacles to be overcome are much greater, even if the payoff will also be greater. These issues are discussed in depth in the Policy chapter.

Detection *decreases* chances to deflect- false alarms mean nobody pays attention

IAA 2009 (International Academy of Astronautics, Dealing with the THREAT TO EARTH From ASTEROIDS and COMETS, http://iaaweb.org/iaa/Scientific%20Activity/Study%20Groups/SG%20Commission%203/sg35/sg35finalreport.pdf)

False Alarms False alarms, often referred to within the NEO community as “one day wonders,” are another unique characteristic of NEO impact threats, and deserve special attention. In the early phases of discovery and orbit refinement the impact time and location will be very imprecise. False alarms, even and perhaps especially from authoritative sources who may in fact believe in their projections, excite the media and engage the public. The periodic outbreak of attention from a false alarm may seem to be beneficial at first glance, as it serves to raise public awareness of the threat. However, any awareness enhancing features are outweighed by detrimental consequences including inducing panic and unnecessary anxiety; desensitizing the public or trivializing the threat; and diverting the attention and damaging the [credibility] credible of the NEO community.

Detection fails --- no international coordination

Russell L. (Rusty) Schweickart is a retired business and government executive and serves today as Chairman of the Board of the B612 Foundation. The organization, a non-profit private foundation, champions the development and testing of a spaceflight concept to protect the Earth from future asteroid impacts and flew on Apollo 9, total badass, 2008, “ASTEROID THREATS: A CALL FOR GLOBAL RESPONSE,” http://www.space-explorers.org/ATACGR.pdf

As previously pointed out, humankind now possesses the technology to provide the first two essential elements necessary to protect the planet from asteroid impacts. Early impact warning is already underway for the largest objects of concern and new telescopes will soon increase the capability to provide impact warning for more numerous smaller objects of concern. Asteroid deflection capability, while not yet proven, is possible with current spaceflight technology and is being actively investigated by several of the world’s space agencies. The missing third element is the readiness and determination of the international community to take concerted action in response to a perceived threat to the planet. An adequate global action program must include deflection criteria and campaign plans which, can be implemented rapidly and with little debate by the international community. In the absence of an agreed-upon decision-making process, we may lose the opportunity to act against a NEO in time, leaving evacuation and disaster management as our only response to a pending impact. A single such missed opportunity will add painful fault-finding to the devastating physical effects of an impact. The international community should begin work now on forging its warning, technology, and decision-making capacities into an effective shield against a future collision.

Lack of international action means deflection fails

IAA 2009 (International Academy of Astronautics, Dealing with the THREAT TO EARTH From ASTEROIDS and COMETS, http://iaaweb.org/iaa/Scientific%20Activity/Study%20Groups/SG%20Commission%203/sg35/sg35finalreport.pdf)

The threat posed by a pending asteroid impact is inherently international in scope. While the physical extent of an impact could range from local to regional to global, the entire world would be engaged in the unfolding drama from the announcement of a potential collision through either the successful mitigation or the disastrous consequences of impact. Fortunately, the resources of the global community would also be available to respond to the challenge. Effectively harnessing and applying these resources, however, will require unprecedented cooperation and organization. Without adequate planning and preparation before an event is underway, the challenge may overwhelm even the most enthusiastic international proponents of a coordinated response. There is an international community of astronomers participating in surveys of the asteroid population. But beyond that, technologies to prepare, respond, and recover from asteroid impacts can also be drawn from throughout the world. Budget resources and talent are limited within individual nations, even in countries making significant contributions today, such as the United States. Pooling and leveraging funds and talent through wider cooperation in commonly agreed upon priority areas and more effective use of resources can substantially improve the posture of future responses. Many nations approach technological solutions differently and offer specialized areas of competence that, when shared widely, can illuminate issues and help other nations develop effective responses. Considering and accounting for cultural differences and sensitivities in dealing with mass evacuations, establishment of relocation centers, and eventual remediation add perspective that, when applied early in the planning cycle, can save time, money, and more importantly, lives, if a call for action is necessary.

### Can’t solve small strikes --- too many objects

Lewis 96 - professor of planetary science at the University of Arizona's Lunar and Planetary Laboratory (John S., Rain of Iron and Ice, p. 183-222)

About a quarter of the total hazard is due to megaton-yield (25-meter diameter) asteroids that make airbursts at low altitudes. About once per century a megaton explosion will occur over a populated land area. The average expected death rate from airburst ignition of fires, ballistic projection of window glass, and blast-wave-induced structural failure is about one thousand people per year. Most of these fatalities (several hundred thousand) will occur in the single worst event of the millennium. There are about 20 million bodies in near-Earth orbits that have megaton impact energies. About 4 percent of the bodies in this population are physically strong irons, stony-irons, or achondrites that are capable of penetrating to the surface and excavating craters if their entry velocity is not too high. Most of these crater-forming small bodies are irons. At the opposite extreme, most of the 20 million bodies are probably structurally weak, similar to carbonaceous asteroids or cometary debris, prone to explosion at altitudes above 30 kilometers. Such explosions can be spectacular, but are not a threat to Earth's surface. The remaining 40 percent or so of the population of 25-meter bodies consists of moderate-strength chondritic asteroidal material. Slow-moving ordinary chondrite material can penetrate deep enough into the atmosphere to be a serious threat at the surface. These Tunguska-type bodies present a peculiar problem: the danger presented by them is not so easily anticipated because of the vast number of bodies in this size range that must be discovered and tracked. There are ten thousand times as many Tunguska-class (25-meter) bodies as there are kilometer-class global killers. They are so faint that they are not easy to detect. Not only are they sixteen hundred times smaller in cross-section area than the kilometer-size bodies, but there is the serious possibility that they are, on average, darker than their larger cousins. Fortunately, the ones that are hardest to find (the very dark carbonaceous and cometary bodies) also so weak that they present a negligible threat to Earth's surface lace. Because of these factors, the cost of a telescope system sensitive enough to detect these bodies and extensive enough to find 20 million of them boggles the mind. Instead of the roughly 150 telescopes needed to find and track our 250-meter bodies, we would need 1.5 million telescopes {each of them superior in sensitivity, size, and cost) to find and track the 25-meter bodies. Instead of a few hundred million dollars for the entire operation, we would require an annual budget of several hundred billion dollars, comparable to the Department of Defense budget. This is not remotely feasible. The cost per life saved escalates to tens of millions of dollars per person. Clearly, political entities in the modern world do not attach anywhere near this value to the average human life. At this price, the cost of an insurance policy is prohibitive. Besides, Tunguskas are local, not global, in their effects. They do not present a hazard to civilization or to humanity, only to a single region of a thousand or so square kilometers.

# \*SOFT POWER ADD-ON ANSWERS

## Soft Power – Frontline

Obama restores soft power

Nye ’08 (Joseph S. Nye, Jr., Distinguished Service Professor at Harvard University and Sultan of Oman Professor of International Relations, was Dean of the John F. Kennedy School of Government from December 1995 through June, 2004. June 12, 2008, Barack Obama and Soft Power, http://www.huffingtonpost.com/joseph-nye/barack-obama-and-soft-pow\_b\_106717.html)

I have spent the past month lecturing in Oxford and traveling in Europe where Barack Obama could be elected in a landslide. I suspect that this fascination with Obama is true in many parts of the world. In fact, as I have said before, it is difficult to think of any single act that would do more to restore America's soft power than the election of Obama to the presidency. Soft power is the ability to obtain the outcomes one wants through attraction rather than using the carrots and sticks of payment or coercion. As I describe in my new book The Powers to Lead, in individuals soft power rests on the skills of emotional intelligence, vision, and communication that Obama possesses in abundance. In nations, it rests upon culture (where it is attractive to others), values (when they are applied without hypocrisy), and policies (when they are inclusive and seen as legitimate in the eyes of others.) Polls show that American soft power has declined quite dramatically in much of the world over the past eight years. Some say this is structural, and resentment is the price we pay for being the biggest kid on the block. But it matters greatly whether the big kid is seen as a friend or a bully. In much of the world we have been seen as a bully as a result of the Bush Administration policies. Unfortunately, a President Obama will inherit a number of policy problems such as Iraq, Afghanistan, Pakistan, Iran and North Korea where hard power plays a large role. If he drops the ball on any of these issues, they will devour his political capital. At the same time, he will have to be careful not to let this inherited legacy of problems define his presidency. Some time between November 4 and January 20, he will need to indicate a new tone in foreign policy which shows that we will once again export hope rather than fear. This could take several forms: announcement of an intent to close Guantanamo; dropping the term "global war on terror;" creation of a special bipartisan group to formulate a new policy on climate change; a "listening trip" to Asia, and so forth. Electing Obama will greatly help restore America's soft power as a nation that can recreate itself, but the election alone will not be sufficient. It is not too soon to start thinking about symbols and policies for the days immediately after the election.

Multiple alt causes

Jacques, 09 (Martin, co-founder of Demos, “A sense of an Ending”, July 6, 2009, New Statesman, Lexis)

The Bush administration was the exemplar par excellence. The invasion of Iraq mired the US in an expensive and debilitating war, making it deeply unpopular throughout the world and undermining its soft power. Furthermore, it became so preoccupied with the Middle East that it neglected American interests elsewhere, such as in east Asia, which is in fact far more important by most criteria, but where its position is declining rapidly. In contrast to the gung-ho mentality of its predecessor, the Obama administration has been anxious not to overreach itself, employing a rhetoric that emphasises limits to US power and the need to work with other nations. However, even this enlightened administration has greatly increased its military commitment to an unwinnable war in Afghanistan. Declining imperial nations enter into military entanglements shaped by power and ambitions that they previously took for granted, but increasingly can no longer sustain. In other words, they overreach themselves in a manner that often ends in humiliating retreat; the Soviet withdrawal from Afghanistan is a case in point. Iraq, in a less drastic way, serves as a similar warning to the US. Of course, this has been considerably less humiliating than the US defeat in Vietnam, but it occurred at a different point in the arc of the country's global hegemony. In the mid-1970s, the US was very much the dominant power in the world and it was to remain so for another quarter-century or more. Today US power is palpably on the wane. The Middle East, more than any other region, is likely to ensnare a declining America in a costly and energy-sapping commitment. As we all know, the region is highly unstable, riddled with conflict and fraught with dangerous uncertainties. America's two closest allies in the region are Saudi Arabia, a deeply dysfunctional state, and Israel, whose future is utterly dependent on the United States. Both are living testimony to the extent to which the Middle East has been shaped by US power since 1945. Obama has been cautiously seeking a way of resolving the seemingly intractable problems of the region. He has sought to find a modus vivendi with Iran and has been pressurising Israel to accept a two-state solution and an end to the expansion of its settlements. But recent events illustrate just how difficult this will be: Iran remains firmly in its bunker, even more so since its disputed presidential election, and Israel is loath to make the slightest concession. If any American president is going to cut the Gordian knot of Palestine - the central impasse of life in the region, linked to so many other political difficulties - he will have to be far bolder and braver than any other leader we have seen.

Heg solves nothing- past two decades prove

Mearsheimer 2011 (John J., R. Wendell Harrison Distinguished Service Professor of Political Science at the University of Chicago, The National Interest, Imperial by Design, lexis)

One year later, Charles Krauthammer emphasized in "The Unipolar Moment" that the United States had emerged from the Cold War as by far the most powerful country on the planet.2 He urged American leaders not to be reticent about using that power "to lead a unipolar world, unashamedly laying down the rules of world order and being prepared to enforce them." Krauthammer's advice fit neatly with Fukuyama's vision of the future: the United States should take the lead in bringing democracy to less developed countries the world over. After all, that shouldn't be an especially difficult task given that America had awesome power and the cunning of history on its side. U.S. grand strategy has followed this basic prescription for the past twenty years, mainly because most policy makers inside the Beltway have agreed with the thrust of Fukuyama's and Krauthammer's early analyses. The results, however, have been disastrous. The United States has been at war for a startling two out of every three years since 1989, and there is no end in sight. As anyone with a rudimentary knowledge of world events knows, countries that continuously fight wars invariably build powerful national-security bureaucracies that undermine civil liberties and make it difficult to hold leaders accountable for their behavior; and they invariably end up adopting ruthless policies normally associated with brutal dictators. The Founding Fathers understood this problem, as is clear from James Madison's observation that "no nation can preserve its freedom in the midst of continual warfare." Washington's pursuit of policies like assassination, rendition and torture over the past decade, not to mention the weakening of the rule of law at home, shows that their fears were justified. To make matters worse, the United States is now engaged in protracted wars in Afghanistan and Iraq that have so far cost well over a trillion dollars and resulted in around forty-seven thousand American casualties. The pain and suffering inflicted on Iraq has been enormous. Since the war began in March 2003, more than one hundred thousand Iraqi civilians have been killed, roughly 2 million Iraqis have left the country and 1.7 million more have been internally displaced. Moreover, the American military is not going to win either one of these conflicts, despite all the phony talk about how the "surge" has worked in Iraq and how a similar strategy can produce another miracle in Afghanistan. We may well be stuck in both quagmires for years to come, in fruitless pursuit of victory. The United States has also been unable to solve three other major foreign-policy problems. Washington has worked overtime-with no success-to shut down Iran's uranium-enrichment capability for fear that it might lead to Tehran acquiring nuclear weapons. And the United States, unable to prevent North Korea from acquiring nuclear weapons in the first place, now seems incapable of compelling Pyongyang to give them up. Finally, every post-Cold War administration has tried and failed to settle the Israeli-Palestinian conflict; all indicators are that this problem will deteriorate further as the West Bank and Gaza are incorporated into a Greater Israel. The unpleasant truth is that the United States is in a world of trouble today on the foreign-policy front, and this state of affairs is only likely to get worse in the next few years, as Afghanistan and Iraq unravel and the blame game escalates to poisonous levels. Thus, it is hardly surprising that a recent Chicago Council on Global Affairs survey found that "looking forward 50 years, only 33 percent of Americans think the United States will continue to be the world's leading power." Clearly, the heady days of the early 1990s have given way to a pronounced pessimism.

Heg collapse doesn’t cause global nuclear war – conflicts would be small and managable

Richard Haas (president of the Council on Foreign Relations, former director of policy planning for the Department of State, former vice president and director of foreign policy studies at the Brookings Institution, the Sol M. Linowitz visiting professor of international studies at Hamilton College, a senior associate at the Carnegie Endowment for International Peace, a lecturer in public policy at Harvard University’s John F. Kennedy School of Government, and a research associate at the International Institute for Strategic Studies) April 2008 “Ask the Expert: What Comes After Unipolarity?” <http://www.cfr.org/publication/16063/ask_the_expert.html>

Does a non polar world increase or reduce the chances of another world war? Will nuclear deterrence continue to prevent a large scale conflict? Sivananda Rajaram, UK Richard Haass: I believe the chance of a world war, i.e., one involving the major powers of the day, is remote and likely to stay that way. This reflects more than anything else the absence of disputes or goals that could lead to such a conflict. Nuclear deterrence might be a contributing factor in the sense that no conceivable dispute among the major powers would justify any use of nuclear weapons, but again, I believe the fundamental reason great power relations are relatively good is that all hold a stake in sustaining an international order that supports trade and financial flows and avoids large-scale conflict. The danger in a nonpolar world is not global conflict as we feared during the Cold War but smaller but still highly costly conflicts involving terrorist groups, militias, rogue states, etc.

## Ext – Soft Power Fails

Soft power doesn’t solve conflict – can’t be harnessed for foreign policy goals.

Nye, Professor at Harvard University, -07 (Joseph, Leashing the Dogs of War, ed. Crocker, p.396

Soft power can play an important role in managing conflicts, but one must not oversell it. For one thing, as mentioned earlier, soft power is often difficult for governments to use directly. Much of it is produced and controlled by civil society outside the control of government. To some extent, national soft power in the form of values is almost an inadvertent by-product of domestic political life, and American popular cultural exports are controlled more by Hollywood than by Washington. Even in countries with more central political control than in the United States, the importance of credibility limits the extent to which governments can manipulate their soft power in an information age. Moreover, as mentioned, setting an example does not provide power unless others choose to follow it. Sometimes examples are ignored; and sometimes, when cultural values differ dramatically, examples can be counterproductive. Thus soft power is not simply another “tool” to be added to the peacekeeper’s “tool kit” like an additional battalion of troops. But attraction to the values for which peacekeepers stand can facilitate their tasks.

American soft power is unworkable – nations don’t believe in benevolent hegemony enough to overwhelm their resentment and fear\*\*\*

Christopher Layne (Associate Professor in the Bush School of Government and Public Service at Texas A&M University) 2007 “American Empire: A Debate” p 68

Doubtless, American primacy has its dimension of benevolence, but a state as powerful as the United States can never be benevolent enough to offset the fear that other states have of its unchecked power. In international politics, benevolent hegemons are like unicorns—there is no such animal. Hegemons love themselves, but others mistrust and fear them—and for good reason. In today's world, others dread both the overconcentration of geopolitical weight in America's favor and the purposes for which it may be used. After all,"Nogreat power has a monopoly on virtue and, although some may have a greatdeal more virtue than others, virtue imposed on others is not seen as such bythem. All great powers are capable of exercising a measure of self-restraint, butthey are tempted not to and the choice to practice restraint is made easier by theexistence of countervailing power and the possibility of it being exercised."While Washington's self-proclaimed benevolence is inherently ephemeral, the hard fist of American power is tangible. Others must worry constantly that ifU.S. intentions change, bad things may happen to them. In a one-superpower world, the overconcentration of power in America's hands is an omnipresent challenge to other states's ecurity, and Washington's ability to reassure others of its benevolence is limited by the very enormity of its power.

Their evidence overestimates the US’s ability to shape the international system – doesn’t contain conflict and wont shape the new multipolar system

Christopher Layne (Associate Professor in the Bush School of Government and Public Service at Texas A&M University) 2006 “The Peace of Illusions” p 176-7

A second contention advanced by proponents of American hegemony is that the United States cannot withdraw from Eurasia because a great power war there could shape the post conflict international system in ways harmful to U.S. interests. Hence, the United States "could suffer few economic losses during a war, or even benefit somewhat, and still find the postwar environment quite costly to its own trade and investment."sa This really is not an economic argument but rather an argument about the consequences of Eurasia's political and ideological, as well as economic, closure. Proponents of hegemony fear that if great power wars in Eurasia occur, they could bring to power militaristic or totalitarian regimes. Mere, several points need to be made. First, proponents of American hegemony overestimate the amount of influence that the United States has on the international system. There are numerous possible geopolitical rivalries in Eurasia. Most of these will not culminate in war, but it's a good bet that some will. But regardless of whether Eurasian great powers remain at peace, the outcomes are going to be caused more by those states' calculations of their interests than by the presence of U.S. forces in Eurasia. The United States has only limited power to affect the amount of war and peace in the international system, and whatever influence it does have is being eroded by the creeping multipolarization under way in Eurasia. Second, the possible benefits of "environment shaping" have to be weighed against the possible costs of U.S. involvement in a big Eurasian war. Finally, distilled to its essence, this argument is a restatement of the fear that U.S. security and interests inevitably will be jeopardized by a Eurasian hegemon. This threat is easily exaggerated, and manipulated, to disguise ulterior motives for U.S. military intervention in Eurasia.

# \*OTHER

## Politics Links: Obama Good

NEO deflection tanks capital- no supporters, seen as spending money on nothing

New Yorker 2011 (Vermin of the Sky; Who will keep the planet safe from asteroids?, 2/28, lexis)

Schweickart observed, "The real decision people are going to have to make is 'Do we spend a billion dollars for a mission that up to ninety per cent of the time will turn out to be unnecessary?' " The prevailing scientific view is that we should try to divert any large object that has at least a one-in-a-hundred chance of hitting us; however, most politicians would be loath to spend significant sums-and a 2004 study put the cost of a nuclear-defense campaign at about twelve billion dollars-unless it's absolutely clear that they must. Richard Binzel said, "So maybe the thing to focus on is a super-precise way of determining orbits, by putting a dish on-oh, I'm being crazy-Mercury." "Not Mercury!" Don Yeomans, the manager of NASA's NEO program at the Jet Propulsion Laboratory, called out. To have the best view of near-Earth objects, he argued, you'd want to be inside Earth's orbit, looking away from the sun-but you'd also want to be much closer than Mercury, so that objects appeared larger and brighter. "O.K., Mars," Binzel said. Yeomans shook his head: then you'd be looking toward the sun. "I'm just trying to make them go away in the first place," Binzel continued, crossly. "Pretend that astronomers on Venus had helped us out for ten years-maybe Apophis is already gone as a threat." Yeomans nodded his approval. Schweickart protested the conversation's drift away from deflection, saying that while the scientists were busy trying to pinpoint orbits an asteroid might heave up and strike us. Ed Lu added, "It'd be like putting smoke alarms in your house, but not having a fire department. All you can do is run out of the house." Unless you're stuck there. In 1980, only ninety-seven NEOs had been identified, and no one was really looking for more. We view the sky as fundamentally sheltering, and it's hard to conjure with events that occur on a timescale longer than our own; few people have firsthand recollections of the last major impact, in 1908, when an asteroid flattened two thousand square kilometres of forest in the Tunguska region of Siberia. Ken Ford, the chair of the NASA Advisory Council, said, "The very short perspective we have as humans makes the threat of asteroids seem smaller than it is. People of all sorts find it easier to kick the can down the road and hope for a mystical solution later." It's also hard to gauge, with low-probability, high-consequence events like a NEO strike, whether it's more appropriate to be paranoid or blasé. Statistics from the National Research Council suggest that future asteroid impacts could kill an average of ninety-one people a year; by way of comparison, five people die annually from shark attacks, and a million from malaria. But the impacts figure is nothing more than a guesstimate, as the number of people known for sure to have been killed by asteroids is, well, zero. (In 1954, a woman in Sylacauga, Alabama, was somewhat bruised by a brick-size meteorite that plunged through the roof and bounced off her radio.) Global anxiety over the matter spiked in 1994, when the comet Shoemaker-Levy 9 hit Jupiter, leaving scars the size of Earth. The impressive photographs inspired screenwriters and bill writers alike. In 1998, Congress directed NASA to find and track ninety per cent of the NEOs greater than one kilometre in diameter, any one of which could obliterate France. In 2005, it amended the legislation to require the detection, by 2020, of NEOs larger than a hundred and forty metres in diameter: ones that could annihilate the Washington, D.C., region. By renting time on telescopes in the Western U.S., Puerto Rico, and Australia, NASA has met the earlier target; nine hundred and nine large NEOs have been identified, of the estimated thousand or so out there. But the agency lacks the resources to meet the deadline for smaller asteroids, having found only 6,903 of an estimated twenty-five thousand. "We need a leap, new tools," Jim Green, the director of NASA's Planetary Science Division, acknowledged. 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!"

No constituency and media spin

Dinerman 2009 (Taylor, author and journalist based in New York City, The new politics of planetary defense, Space Review, http://www.thespacereview.com/article/1418/1)

As a planning tool this matrix had its uses, but it lacked the ability to give political weight to the various threats. From the point of view of the US president and his administration, a low-level hostage seizure may or may not be a major event, depending on who the hostage is and how media-savvy the terrorists involved are. In contrast, the threat of a catastrophic celestial hit against planet Earth carries far less political weight, due to a lack of media interest and the fact that the problem does not fit into any of the normal government structures.