# Asteroid Detection Negative

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\*\*Deflection Fails\*\*

# Deflection Fails

Push/pull methods fail-they take decades and are not useful for larger objects

IRWIN I. SHAPIRO et al in 10,( Harvard-Smithsonian Center for Astrophysics, Chair FAITH VILAS, MMT Observatory at Mt. Hopkins, Arizona, Vice Chair MICHAEL A’HEARN, University of Maryland, College Park, Vice Chair ANDREW F. CHENG, Johns Hopkins University Applied Physics Laboratory FRANK CULBERTSON, JR., Orbital Sciences Corporation DAVID C. JEWITT, University of California, Los Angeles STEPHEN MACKWELL, Lunar and Planetary Institute H. JAY MELOSH, Purdue University JOSEPH H. ROTHENBERG, Universal Space Network, *Committee to Review Near-Earth Object Surveys and Hazard Mitigation Strategies Space Studies Board Aeronautics and Space Engineering Board Division on Engineering and Physical Sciences*, THE NATIONAL ACADEMIES PRESS, <http://www.fas.harvard.edu/~planets/sstewart/reprints/other/4_NEOReportDefending%20Planet%20Earth%20Prepub%202010.pdf>)

**“Slow push**” **or** “slow **pull**” **methods**. **For these options the orbit of the target object would be changed so that it avoided collision with Earth**. **The most effective way to change the orbit**, given a constraint on the energy that would be available, **is to change the velocity of the object**, **either in or opposite to the direction in which it is moving** (direct deflection—moving the object “sideways”—is much less efficient). **These options take considerable time to be effective, of the order of decades, and even then would be useful only for objects whose diameters are no larger than 100 meters or so**.

Asteroids are giant balls of rubble, no deflection methods would be able to do anything but break them into more parts.

Oberg 98 [James, Author on Russian and US space programs, US Space Command, “Planetary Defense, Asteroid Deflection & The Future of Human Intervention In The Earth’s Biosphere,” July 23, 1998, SM, accessed: 7/11/11, <http://abob.libs.uga.edu/bobk/oberg.html>]

Not long ago, astronomers thought of asteroids as rocks, perhaps rubble covered, but still mainly single bodies. But evidence has accumulated that asteroids are rubble piles all the way through, loosely bound together by what is generously called "gravity" (escape velocity is 11,000 meters per second on Earth but less than 1 meter per second on a typical small asteroid). The Shoemaker-Levy object was torn apart by a close brush with Jupiter in 1992 so when it fell back onto Jupiter two years later it was a string of smaller objects. Crater chains on the moons of Jupiter, on Earth's moon, and on Earth itself also point to the gravity-induced disintegration of many asteroids prior to impact. Asteroids which rotate fast enough to fling pieces clear are extremely rare -- only two are known -- which suggests that these are the rare single-rock objects. What this means is that big impulses -- say, from another asteroid collision or from a nuclear detonation -- would more likely disperse the material than deflect it. Pushing an asteroid has been likened to clearing a landslide off a road, rather than rolling a rock. So other techniques -- gentle pushes over long periods -- may prove to be required. There are plenty of such ideas. None of them will prove workable, I predict, but the second and third generation ideas will turn out to be quite feasible. And information from a reborn Clementine-2 may powerfully augment new astronomical discoveries.

# Deflection Fails

Deflection fails, an attempt to push the asteroid would only change the impact point, and deflection wouldn’t occur if the asteroid was within the boundries of a non space faring nation, deflection also allows nations to use asteroids as weapons.

Schweickart 04 [Russell, Chairman of the B612 Foundation, Asteroid Deflection: An International Challenge, “Policy Implications of Asteroid Deflection,” December 2004, SM, accessed: 7/11/11]

It is fairly evident that if a gentle but extended push (e.g. 4 to 12 months) on an asteroid is required to cause it to miss a collision with Earth, any incident which would interrupt or cause early termination of that deflection maneuver would result in a new impact point (IP) at some distance from its initial (act of God) impact point. While every effort would be made, from an operational and design perspective, to ensure that such a contingency would be covered, there nonetheless remains the potential for such a failure or series of failures. Given this unavoidable possibility it must be realized that one of the prices to be paid by undertaking an asteroid deflection mission will be the placing of people and property at risk that would not otherwise be endangered. In fact, if one imagines such a systems failure occurring at various intervals after the initiation of the deflection maneuver, one can visualize the creation of a “risk path” originating at the initial (Act of God) IP and crossing the surface of the Earth to that point (the “lift-off point”) where the asteroid just misses the Earth. Depending on the location of the initial IP this risk path may be thousands of kilometers long and would often cross several international borders. Additionally the risk path would often cross (or pass into) seas or oceans which, should a failure occur at that point, introduce the possibility of an impact tsunami. Such tsunami have the unfortunate characteristic that they are very efficient converters of energy from the three dimensions of a land impact into the two dimensions of a massive ocean wave. The dissipation of energy within such a wave as a function of distance is much less than that of a land impact thereby threatening populations along shorelines at extended distances. Even more improbable than a system failure, but not beyond the realm of consideration would be a purposeful and malicious early termination of a deflection maneuver should the path of risk happen to cross the territory of a nation at odds with that of the deflecting agency. 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?

# Deflection Fails

**Asteroid Deflection is improbable, it requires knowledge of the asteroid too far in advance, and the spin of the asteroid makes moving it almost impossible.**

Walker Et. Al 05 [Roger, European Space Agency Advanced Concepts Team, European Space Agency, “Concepts For Near- Earth Asteroid Deflection Using Spacecraft With Advanced Nuclear and Solar Electric Propulsion Systems,” 2005, SM, Accessed: 7/11/11, <http://www.esa.int/gsp/ACT/doc/PRO/ACT-RPR-PRO-2005-ConceptsForNear.pdf>]

For any deflection technique to be used, clearly its response time capability must be within the given warning time of an impact. If the warning time is only a few months to a year, then the only possible option would be a mass evacuation of the impact zone. The use of nuclear weapons would be unsuitable, since the dispersion of fragments from the disrupted body would not be sufficient and the hazard would be simply spread over a much wider area of the Earth’s surface. For longer warning times of a few years, space-based intercept/impulsive methods are possible but their effectiveness would strongly depend upon the asteroid mass. With only a few revolutions before impact, the required delta-V to be imparted to the body (order 10-20 cm/s) is at least an order of magnitude higher than with warning times of a decade or more 5 . Rendezvous/propulsive methods would not be feasible in this scenario due to the time required for rendezvous and thrusting in addition to the coast time for a miss. Typical warning times for asteroid impact are expected to be on the order of 10-50 years 6 with current optical survey capabilities. Over these timescales, both intercept/impulsive methods and rendezvous/propulsive methods become feasible (assuming that the rendezvous delta-V is not too high). There are a number of significant challenges associated with the propulsive deflection method. Most asteroids rotate about their principal moment of inertia, but some asteroids have been observed to be tumbling about all three axes, e.g. the slow, excited rotation state of NEA Toutatis 7 . In the latter scenario, it may be very difficult to stabilise and control its attitude motion so that propulsive thrusting for the deflection can occur. Additionally, if the asteroid angular momentum is too large (e.g. it is a fast rotator and/or dense), a high delta-V on-board the spacecraft will be required to re-orient the spin axis by the desired amount prior to deflection thrusting, thus reducing the deflection effectiveness. With irregular (but measurable) rotation states and gravity fields due to inhomogeneous internal mass distributions, a safe landing on the surface of an asteroid may also be difficult operationally, though not impossible 8

# Deflection Fails

Mitigation fails.

IRWIN I. SHAPIRO et al in 10,( Harvard-Smithsonian Center for Astrophysics, Chair FAITH VILAS, MMT Observatory at Mt. Hopkins, Arizona, Vice Chair MICHAEL A’HEARN, University of Maryland, College Park, Vice Chair ANDREW F. CHENG, Johns Hopkins University Applied Physics Laboratory FRANK CULBERTSON, JR., Orbital Sciences Corporation DAVID C. JEWITT, University of California, Los Angeles STEPHEN MACKWELL, Lunar and Planetary Institute H. JAY MELOSH, Purdue University JOSEPH H. ROTHENBERG, Universal Space Network, *Committee to Review Near-Earth Object Surveys and Hazard Mitigation Strategies Space Studies Board Aeronautics and Space Engineering Board Division on Engineering and Physical Sciences*, THE NATIONAL ACADEMIES PRESS, [http://www.fas.harvard.edu/~planets/sstewart/reprints/other/4\_NEOReportDefending%20Planet%20Earth%20Prepub%202010.pdf)\](http://www.fas.harvard.edu/~planets/sstewart/reprints/other/4_NEOReportDefending%20Planet%20Earth%20Prepub%202010.pdf%29%5C)

Perhaps the most significant conclusion that can be drawn is the large uncertainty in the effectiveness of the mitigation techniques because of their dependence on the physical properties of NEOs that are not well known, and because of the difficulty of scaling any laboratory experiments to this regime. At this point we cannot even reliably determine the boundaries of applicability of the various approaches. In a later chapter we address organizational aspects of the decision-making process, but we still lack information to guide that process. Any process must carry out a detailed study of where to draw the boundaries and what additional information would be needed. An applied research program, directed explicitly at the NEO hazard, could significantly reduce the uncertainties. At the lowest meaningful level for the mitigation side, this would include both numerical simulations by multiple groups and laboratory experiments.

The technology does not exist for effective asteroid mitigation.

Urias et al 96 [Research Paper for Air Force 2025, Planetary Defense: Catastrophic Health Insurance for Planet Earth pg. 4, “Vulnerabilities,” October 1996, SM, accessed: 7/11/11, <http://csat.au.af.mil/2025/volume3/vol3ch16.pdf>]

Due to a lack of awareness and emphasis, the world is not socially, economically, or politically prepared to deal with the vulnerability of the EMS-to-ECO impacts and their potential consequences. Further, in terms of existing capabilities, there is currently a lack of adequate means of detection, command, control, communications, computers, and intelligence (C 4 I), and mitigation. Few people are even aware of an ECO problem, much less the potential consequences associated with its impact on the EMS. However, there are hopeful signs in correcting this deficiency as more frequent Planetary Defense workshops are being conducted with active participation by an increasing number of major countries. Nevertheless, other than a congressional mandate requiring further study of the problem, no further globally sanctioned action has been taken. In terms of courses of action in the event of a likely impact of an ECO, other than a nuclear option, no defensive capability exists today. However, new technologies may yield safer and more cost-effective solutions by 2025. These authors contend that the stakes are simply too high not to pursue direct and viable solutions to the ECO problem. Indeed, the survival of humanity is at stake.

# **Nuclear Deflection 🡪 Nuclear war**

Nuclear use could split up the asteroid resulting in impacts around the world which could trigger a world war

O’Neill 10 (Ian, astrophysicist and writer for discoverynews.com, “ANOTHER GOOD REASON NOT TO SHOOT NUKES AT ASTEROIDS”, March 21st, Accessed 7/2/11, AH)

But all these methods need time, and although it is likely that we'd spot a large doomsday asteroid many years before it poses a threat to Earth, one could blindside us. If that was the case ([as Hollywood would have us believe](http://news.discovery.com/space/wake-up-and-smell-the-science-hollywood.html)), we might have to go all Armageddon-style as a last minute desperate measure. However, there is another rather unpalatable solution: let the asteroid hit us. The ramifications of blowing up a deadly asteroid would be a highly contentious issue, especially if the asteroid is big enough to wipe out a city, say, but small enough to keep the majority of damage localized to a country or continent. For example, if it was discovered that an asteroid was heading straight for Los Angeles and the U.S. government decided to fire a nuclear missile at it, only for the resulting explosion to cause chunks of rock to rain down on Moscow, Beijing, Tokyo and London, although LA would be saved, the U.S. wouldn't be very popular. World wars have been triggered over much less. In the grand scheme of things, planning to evacuate and then sacrifice a city where an asteroid has been predicted to hit might be a better option than letting the nuke decide where to scatter the debris. It would be like trying to decide whether to get shot by a single bullet from a pistol (and knowing where that bullet will hit you, so you can prepare yourself) or many pieces of shot from a shotgun (and not knowing which major organs will get hit). It's a tough decision, but logic (and international politics) may dictate that the predictable single bullet might be a better option.

# Nuclear Deflection fails

Nukes don’t solve – Can’t take out extinction scenario asteroids

Uttley 11 (Caitlin, science.howstuffworks.com editor, Could we really blow up an incoming asteroid with a nuclear bomb?, 2/11/11, Accessed 7/1/11, AH)

You've seen it plenty of times on the big screen: Scientists spot an enormous [asteroid](http://science.howstuffworks.com/asteroid.htm) hurtling toward Earth and the only hope for mankind is to send a team to plant a nuclear bomb inside the looming monster. Despite several suspenseful setbacks, the intrepid team is ultimately successful, and the asteroid explodes into millions of pieces. [Earth](http://science.howstuffworks.com/earth.htm) is saved yet again from certain doom. Yahoo. Movies like "Deep Impact" and "Armageddon" make it seem so easy. Surely nuclear weapons that can obliterate entire cities contain enough destructive power to blow a giant space rock to bits, right? The answer is yes and no. To start with, asteroids come in all shapes and sizes. Ceres, the largest known asteroid, stretches 580 miles (933 kilometers) in diameter, while one of the smallest on record, 1991 BA, measures 20 feet (6 meters) across. An asteroid larger than 6.2 miles (10 kilometers) in diameter is considered "extinction class," or powerful enough to destroy life on Earth if it collides with our hapless planet [source: [NASA](http://howstuffworks.com/framed.htm?parent=asteroid-nuclear-bomb.htm&url=http://www.nasa.gov/worldbook/asteroid_worldbook.html)]. Technically, a nuclear bomb could obliterate a smaller asteroid, but it's not these smaller entities that pose a threat to Earth's safety. The asteroids that would be really worrisome -- those larger than 1,312 feet (400 meters) -- wouldn't be easily wiped out by such a bomb. Sure, great hunks of one might break off, but not enough to neutralize the danger. A 2007 [NASA](http://science.howstuffworks.com/nasa.htm) report indicated that planting a nuclear bomb on or under the surface of an asteroid would most likely cause it to fracture into several pieces -- and large pieces of an even larger asteroid can still be pretty dangerous if they're hurtling toward the Earth [source: [NASA](http://howstuffworks.com/framed.htm?parent=asteroid-nuclear-bomb.htm&url=http://www.nasa.gov/pdf/171331main_NEO_report_march07.pdf)]. So while yes, a nuclear bomb could be used to blow up a small asteroid, it's unlikely that world leaders would waste expensive resources on that endeavor. As for large, Earth-threatening asteroids, a nuke likely wouldn't succeed at blowing it up completely. Keep reading to learn whether NASA thinks the whole explosive business is a good idea.

Nukes don’t solve, asteroids will just regenerate under mutual gravity

New Scientist 10 ("Terminator" asteroids could reassemble after a nuke. New Scientist, 02624079, 3/13/2010, Vol. 205, Issue 2751, Accessed 7/2/11, AH)

In Brief We better make sure that we send a big enough nuke to stop an incoming asteroid, because if not, the space rock could reassemble THE regenerating liquid-metal robots in the Terminator movies have a cosmic relation: incoming asteroids that quickly reassemble if blasted by a nuclear bomb. If a sizeable asteroid is found heading towards Earth, one option is to nuke it. But too small a bomb would cause the fragments to fly apart only slowly, allowing them to clump together under their mutual gravity. Simulations now show this can happen in an alarmingly short time. Don Korycansky of the University of California, Santa Cruz, and Catherine Plesko of the Los Alamos National Laboratory in New Mexico simulated blowing up asteroids 1 kilometre across. When the speed of dispersal was relatively low it took only hours for the fragments to coalesce into a new rock. "The high-speed stuff goes away but the low-speed stuff reassembles in 2 to 18 hours," Korycansky says. The simulations were presented last week at the Lunar and Planetary Science Conference in Houston, Texas. Reassuringly, a 2009 study led by David Dearborn of the Lawrence Livermore National Laboratory in California showed that a 900-kiloton nuclear device - which is within our capability - would permanently disperse a 1-kilometre asteroid.

# Nuclear deflection 🡪 weaponization

Nuclear deflection will be perceived as weaponization.

Buckman and Gold 2008 (Buckman is Deputy Director for Plans in the Policy Planning Office of the Office of the US Secretaryof Defense, Colonel in the US Air Force, PhD in War Studies. Gold is Chief Technologist for the Space Department at the Applied Physics Laboratory of Johns Hopkins University. Survival, “Asteroid Threat? The Problem of Planetary Defence”, vol. 50 no. 5, October–November 2008, pg. 141–156, EBSCOhost, TDA)

Some aspects of testing and implementing planetary-defence systems should be relatively uncontroversial. For example, practice fly-by missions, or rendezvous to implant homing transponders, could also be used as occasions to study PHOs, thereby serving the interests of scientists and planetary defenders alike.26 But there are legal impediments and thorny policy choices associated with certain proposals. Although nuclear detonations offer the only feasible hope of imparting enough energy to deflect the largest PHOs, several treaties prohibit placing nuclear weapons in space. Indeed, the mere prospect of testing or deploying nuclear explosives in space would draw opposition from many quarters. The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (the Outer Space Treaty) came into force in October 1967. It banned the placement of weapons of mass destruction in outer space, in orbit around the Earth, or on celestial bodies. It also established principles of responsibility and liability for a state’s actions in space and has served as the basis for other space-specific treaties. If nuclear explosives offered the most promising means of deflecting an incoming asteroid or comet, the threat of annihilation would presumably convince parties to the treaty to make an exception to it. But absent a palpable threat – a named asteroid and a known collision date – signatories to the treaty might resist placing nuclear bombs in space. Such reluctance could undermine defences against long-period comets, where the probability of success could very well hinge on having a system in place before the threatening object was detected. Before world leaders agree to amend Article IV of the Outer Space Treaty to allow nuclear weapons in space, they will need to be convinced that the threat posed by asteroids and comets is not only real, but that it exceeds the dangers that led to Article IV in the first place. Assuming the Outer Space Treaty could be modified for planetary defence, several difficult policy issues would remain. Treaty signatories would have to decide how many nuclear devices to place in space, and where and for how long they should be left there. There would need to be a policy for disposing of them once they exceeded their shelf life. There would need to be agreement about who would put them in place, monitor them and maintain their orbits. Finally, there would need to be agreement over who could decide upon and control their use. Given the complexities of conducting rendezvouses and precisely timed stand-off nuclear explosions to deflect inbound asteroids or comets, responsible authorities would certainly want to conduct tests before having to rely on a deflection system to avert a catastrophe. However, the Limited Test-Ban Treaty of 1963 prohibits the testing of nuclear weapons in outer space. Ideally, a PHO should be deflected well before the anticipated collision, meaning that if nuclear explosives were used for planetary defence, they would detonate so far from Earth they would be harmless and utterly inconsequential for anything but their targets. The treaty could be modified to allow tests for planetary defence, so long as they were conducted sufficiently far from Earth. But if an existing nuclear weapon were to be used in a planetary-defence test, the country that designed it might use the test in a way that would contribute to its military weapons programme. Monitoring of the test for military purposes would be indistinguishable from monitoring for the ostensible purpose of evaluating asteroid-deflection results.

# **Nuclear Deflection – Turn**

**Turn - Nuclear blasts only make asteroids more threatening by creating multiple sizable fragments to hit the earth, resulting in worldwide incineration**

Tyson in 95 (Peter Tyson is the Managing Editor of Earthwatch and a contributor to Technology Reviw, Technology Review vol. 98 iss. 2, Cometbusters, http://proxy.foley.gonzaga.edu/login?url=http://search.ebscohost. com/login.aspx?direct=true&db=a9h&AN=9502076494&site=ehost-live) DF

Physicists agree that the only way to generate enough energy to deal with a large object on short notice would be with a nuclear device. "A nuclear weapon has the highest energy per unit mass, and we're limited right now by the amount of mass we can put in space," says Gregory Canavan, a physicist at Los Alamos National Laboratory who coedited the proceedings of the 1992 NASA interception workshop. Either a U.S. Titan missile or a Proton, which the Russians routinely use to launch military payloads into low-earth orbit, could be used as a booster rocket, he says. To ensure that the object or objects were destroyed and not merely fragmented, with pieces still raining down on earth, Edward Teller, the developer of the hydrogen bomb, says simply that he would send up enough explosives to make sure the job was done right. "In other words," he says, "we are very sick, I have a cure, and my only concern is to achieve overkill."

If overkill did not succeed and large chunks still came at earth, researchers say the danger could actually be greater than if the original object were left alone. Recent studies show that a host of fair-sized pieces could have more devastating global consequences than a single "winter"-causing object, by igniting many separate conflagrations that merge into a global firestorm. For this reason, the Planetary Science Institute's Chapman says that if the lead time were very short, he would prefer to mount efforts to ride an impact out, such as evacuating the region expected to become ground zero and stockpiling food, rather than risk worldwide incineration.

\*\*Detection Fails\*\*

# Space Based Detection Bad

Space based Detection Bad – ground based systems are cheaper to maintain and more effective

NASA ’06 (“2006 Near Earth Object Survey and Reflection Study”, Nasa Office of Program Analysis and Evaluation, Pg. 34, December 28, 2006, http://www.b612foundation.org/papers/NASA-finalrpt.pdf, TDA)

Ground-based optical systems have several advantages over space-based systems. In general, ground-based systems are mostly based on mature technology (some have new focal planes) and are relatively easy to maintain and upgrade because they are easily accessible. Consequently, these systems can be implemented using a phased approach and may take advantage of shared software. This typically means that ground systems cost less to build, verify, operate, maintain and upgrade than their space-based counterparts.

# Squo Solves Detection

Squo solves – ground based detection adequate

Lunau 09 (Kate Lunau is an assistant editor at Maclean’s magazine, “*Look out Below!”* Maclean’s, June 29 2009, http://www2.macleans.ca/2009/06/25/look-out-below/ TDA)

Thousands of asteroids, most of them untracked, swarm around our planet; some are over 10 km wide. "Right now, the most probable amount of warning we'll have for an asteroid impact is zero, because we don't know where most of them are," says Robert Jedicke, 46, a University of Hawaii astronomer originally from Niagara Falls, Ont. Jedicke is part of a team at UH's Institute for Astronomy that's working to change that. A new program, called Pan-STARRS, will combine the world's most powerful asteroid-tracking telescope with the largest digital camera ever built. The first of four planned telescopes is set to begin its full scientific mission any day now. "In the past 200 years, we've discovered half a million asteroids," he says. The first telescope alone "should find a comparable number in a single year." Asteroids, which are leftovers from the creation of our solar system, pepper our planet more often than most realize. "Basketball-sized objects come in every day, and Volkswagen-sized objects come in once or twice a year," says Don Yeomans, who manages the Near-earth Object Program Office at NASA's Jet Propulsion Laboratory. Those under 25 m in diameter cause little damage. (Sand-sized particles burning up in the atmosphere can be seen from the ground as "shooting stars.") Events like Tunguska happen two or three times every 1,000 years. Asteroids one kilometre across or wider strike our planet only about once or twice every million years, but their impact is devastating on a global scale: 65 million years ago, a 12-km asteroid crashed into earth, killing off 70 per cent of all species, including the dinosaurs. In 1998, NASA set about discovering and tracking asteroids one kilometre in diameter or greater. Scientists now say they've found about 83 per cent of them, and that none threaten us within the next century; but when it comes to those under one kilometre--including potential city killers, like the one at Tunguska--it's another story. A 140-m asteroid "packs about 250 megatons of equivalent energy," Yeomans says. "Even five megatons is a substantial nuclear weapon." The U.S. Congress is now pushing NASA to find asteroids that measure 140 m and up. It's these objects that Pan-STARRS will be hunting for. Tracking asteroids, which are only visible by the reflected light of the sun, requires a telescope with a wide mirror to concentrate light: the fainter the object, the larger the mirror that's needed. Instead of building one giant telescope, which can be prohibitively expensive, Pan-STARRS will combine images from four smaller ones watching the same patches of sky. (PS1, the first of the four, is ramping up to its full-time mission now. All four telescopes, called PS4, will be in use within the next few years.) At a cost of roughly $10 million apiece, they are as powerful as a single 3.5-m telescope, at half the price. Within each telescope will be a 1.8-m mirror and the biggest digital camera ever made, with 1.4 billion pixels over an area of 40 sq. cm. (Your average digital camera has about five million pixels on a chip just a few millimetres across.) "The sheer amount of information we'll be able to generate is amazing," says Jedicke, who notes that each telescope will gather about six gigabytes of image data per minute--enough to fill up a typical laptop in under an hour.

Ground based systems solve – easily accessible and work just as well

NASA ’06 (“2006 Near Earth Object Survey and Reflection Study”, Nasa Office of Program Analysis and Evaluation, Pg. 131-132, December 28, 2006, http://www.b612foundation.org/papers/NASA-finalrpt.pdf, TDA)

Ground-based optical systems have several advantages over space-based systems. In general, ground-based systems are mostly based on mature technology (some have new focal planes) and are relatively easy to maintain and upgrade because they are easily accessible. Consequently, these systems can be implemented using a phased approach and may take advantage of shared software. This typically means that ground systems cost less to build, verify, operate, maintain and upgrade than their space-based counterparts.

# Detection Expensive

Asteroid Detection massively offsets NASAs budget, from $4 million a year to $250 million.

Foust 10 [Jeff, Aerospace analyst journalist and publisher of The Space Review, The Space Review, “Death from the skies? Ho- Hum,” January 25, 2010, SM, accessed: 7/11/11, <http://www.thespacereview.com/article/1550/1>]

The second issue is the funding needed to achieve these survey goals. The report includes three funding scenarios and what could be achieved under each. A budget of $250 million a year could support a number of ground- and space-based surveys as well as research into characterizing NEOs and studying mitigation techniques. For $50 million a year a groundbased survey could achieve the 140-meter NEO detection goal by 2030. At just $10 million a year some NEO surveys could be continued, but could not achieve the detection goals “on any timescale.” The problem with these scenarios? Currently NASA spends only about $4 million a year on NEO search efforts, with no indication that will change in the upcoming fiscal year 2011 budget proposal.

Asteroid Detection costs $300 million that the government simply doesn’t have.

Gilster 09 [Paul, Author for Centauri Dreams news forum, Centauri Dreams, “Hunting Asteroids (and Money)” August 17, 2009, SM, Accessed: 7/11/11, <http://www.centauri-dreams.org/?p=9094>]

A recent report from the National Academy of Sciences points out that NASA has been tasked to locate 90 percent of the most deadly objects that could conceivably strike our planet. Yet only about a third of this assignment has been completed, and the money has yet to be found to complete the job. The agency calculates it needs about $800 million between now and 2020 to make the needed inventory, while $300 million would allow it to find most objects larger than 300 meters across. The problem is that even the smaller sum is not available, and this AP story quotes space policy expert John Logsdon (George Washington University) as saying the money may never come through, calling the program “a bit of a lame duck.” In other words, there is not yet enough pressure on Congress to produce the needed funds. Meanwhile, asteroid detection remains a low priority for other governments as well, making this a problem we’re choosing to ignore in the absence of recent reminders of its potential.

# Can’t Find All Asteroids

NASA is incapable of finding all asteroids because of its lack of funding and planning!

Millis no date [John Millis: received his Ph.D., is an assistant professor of physics and astronomy at Anderson University, in Anderson Indiana, “Killer Asteroids and Comets: How will we stop Armageddon?”, Obstacles still remain, accessed 07-11-11, ZR]

**With the previously mentioned defenses in place we should be able to prevent future planet-killing collisions. The problem is that these defenses are not in place**, some of them only exist in theory. **Only a very small part of NASA's budget is designated for monitoring NEOs and developing technology to prevent a massive collision.** **The justification for the lack of funding is that such collisions are rare, and this is evidenced by the fossil record.** True. But, what Congressional regulators fail to realize is that it only takes one. **We miss one NEO on a collision course and we don't have enough time to react; the results would be fatal.** Clearly **early detection is key, but this requires funding and planning that is beyond what NASA is currently being allowed**. And even though NASA can find the largest and deadliest NEOs, those 1 kilometer across or more, rather easily, we would need dozens of years to prepare a proper defense -- a forewarning that we may not readily have. **The situation is worse for smaller objects** (those a few hundred meters across or less) **that are more difficult to find**. We would still need significant lead time in order to prepare our defense. And **while collisions with these smaller objects would not create the widespread destruction that the larger objects would, they could still kill hundreds, thousands or millions of people** if we don't have enough time to prepare. Time we may not have unless the government begins taking these threats more seriously

We will not find every NEO – Amount skyrocketing and size diminishing

Ball 7-4 (Loren C., Amateur Astronomer who works at the Minor Planet Center at Harvard University (Has discovered over 150 asteroids), natureorgod.com, 7-4-11, Accessed 7-11-11, AH)

 So the big question is this......How many objects larger than 2 kilometers are in orbits that bring them into the vicinity of the Earth?  The astronomers I work with internationally have concluded that about 160 objects this size exist in that category. The low hanging fruit has already been found, but it will take at least another decade to find the smaller asteroids that are capable of destroying a city. An iron asteroid 100+ feet in diameter left a crater in Arizona that is nearly 1 mile across and about 600 feet deep, but that was about 50,000 years ago. Imagine if this hit Atlanta today. That would be 10 megaton explosion, but with no radiation effects other than a firestorm that would become legendary to the people who survived. We will probably never find them all, as their numbers skyrocket as their size diminishes. There are millions of these asteroids, but they are in orbits that pose no threat to Earth.  Watching for comets that come in from the far reaches of the solar system is a big priority with astronomers in my field. These objects are actually potentially more dangerous than the asteroids, because we will probably have less warning time if a rogue comet is on a collision course, and we currently do not possess the technology to do anything about it if we see that a collision is immanent.

# Can’t Find All Asteroids

Even advanced warning is not enough-there is too much uncertainty in determining the properties of an asteroid, and there is no mitigation strategy that can solve

IRWIN I. SHAPIRO et al in 10,( Harvard-Smithsonian Center for Astrophysics, Chair FAITH VILAS, MMT Observatory at Mt. Hopkins, Arizona, Vice Chair MICHAEL A’HEARN, University of Maryland, College Park, Vice Chair ANDREW F. CHENG, Johns Hopkins University Applied Physics Laboratory FRANK CULBERTSON, JR., Orbital Sciences Corporation DAVID C. JEWITT, University of California, Los Angeles STEPHEN MACKWELL, Lunar and Planetary Institute H. JAY MELOSH, Purdue University JOSEPH H. ROTHENBERG, Universal Space Network, *Committee to Review Near-Earth Object Surveys and Hazard Mitigation Strategies Space Studies Board Aeronautics and Space Engineering Board Division on Engineering and Physical Sciences*, THE NATIONAL ACADEMIES PRESS, [http://www.fas.harvard.edu/~planets/sstewart/reprints/other/4\_NEOReportDefending%20Planet%20Earth%20Prepub%202010.pdf)\](http://www.fas.harvard.edu/~planets/sstewart/reprints/other/4_NEOReportDefending%20Planet%20Earth%20Prepub%202010.pdf%29%5C)

Although all of these methods are conceptually valid, none is now ready to implement on short notice. Civil defense and kinetic impactors are probably the closest to deployable but even these require additional study prior to reliance on them. In all cases, the decision to initiate mitigation is a socio-political decision, not a technical decision. This decision is implicit in earlier socio-political decisions about which methods of mitigation to develop and also depends on the level of probability considered to require mitigation. The committee’s recommendations regarding the minimum approach to mitigation and more aggressive approaches are discussed later. The discussion of mitigation is rife with uncertainty. The effect on Earth of a given NEO depends critically on the velocity at which the NEO impacts Earth, a factor that is traditionally ignored in studies of the hazard. The decisions on mitigation must be based on the mass of the NEO, rather than the diameter, because mass is the quantity that most affects the effectiveness of any mitigation and the diameter for a given mass can vary by roughly a factor two. This factor implies a factor of two variation, depending on its density, of the size of an NEO that can be moved far enough to miss Earth. Clearly an earlier warning allows a smaller action to be sufficient but quantifying this is very uncertain. The effectiveness of most, but not all, methods also depends critically on the physical properties of the NEO. Our ability to mitigate depends critically on the details of the intercepting trajectory. There are also significant differences depending on whether we limit ourselves to current technology or include likely future technology such as the next generation of heavy-lift launch vehicles. Thus our discussion of the range of applicability will show overlapping and uncertain ranges.

# Tech Doesn’t Exist

Deflection technology is not currently available

O'Neill 10(Analysis by Ian O'Neill Tue Jul 27, 2010 02:33 PM ET, VERY EARLY WARNING: 1-IN-1,000 CHANCE OF ASTEROID IMPACT IN 2182, <http://news.discovery.com/space/future-hazard-1-in-1000-chance-of-asteroid-impact-in-2182.html>, G.L)

Of course, a lot can happen to an errant space rock in 172 years, hence the odds of one-in-a-thousand. Although gravitational influences on the asteroid's trajectory can be fairly accurately calculated, other mechanisms acting on the rock are not so easily modeled.\* The message to come out of this study is that potentially hazardous asteroids are out there and we are getting better at identifying which known asteroids pose the greater risk. But at what point do we decide to take action? 172 years into the future is a long time, and humans aren't exactly well-known for preparing for future events over those kinds of time scales. But time is one thing we'll need if we are to protect future generations from a potentially catastrophic impact event. "If this object had been discovered after 2080, the deflection would require a technology that is not currently available," said Sansaturio. "Therefore, this example suggests that impact monitoring, which up to date does not cover more than 80 or 100 years, may need to encompass more than one century." "Thus, the efforts to deviate this type of objects could be conducted with moderate resources, from a technological and financial point of view."

\*\*Asteroid Mining Adv\*\*

# **Asteroid Mining is expensive**

Asteroid mining’s expensive and infeasible

Doughan 11(Colin Doughan is a space entrepreneur, “ *Mining Asteroids is Hard*,” January 18 2011, http://spacebusinessblog.blogspot.com/2011/01/mining-asteroids-is-hard.html)

With the costs of rare earth metals on the rise, why can’t space entrepreneurs mine asteroids for platinum and other REM’s and return the materials to earth? Shouldn’t finding so many near earth asteroids make the problem even easier to solve (less delta-v to reach these nearby asteroids)? Usually this blog focuses on the positive – on the how you could make this happen. Today we are going to look at how hard it actually would be to close such a business case. Assumptions: Mission: Mine platinum on NEOs and return the processed ore to earth for sale and consumption. Sale of platinum sole revenue source for the mission. Mining Efficiency: for every one kilogram of mining equipment launched, the machinery could mine 100 times that amount of NEO material (2500kg mining device could mine 250,000kg of NEO material) Mining Device mass: 2500 kg Platinum concentrations on the NEO: 0.3% Price of Platinum per kilogram: $58,500 Mission Cost: $600M Based on these assumptions, the sale of the platinum mined on the asteroid would cover 7% of the mission costs. This business plan stinks. Not 7%, that seems too small. Really? Only 7% of mission costs could be covered with the assumptions above? Well how elastic are these assumptions? How far would we have to modify the assumptions to get more satisfying results? Below I explored five what-if’s: What if platinum was found in higher concentrations? What if the mining device could mine more? What if the price of platinum were higher? What if mission costs were reduced? A Hybrid what-if. What if platinum was found in higher concentrations. The table below shows platinum concentrations would have to exceed 4% to cover mission costs. What if the mining device could mine more. The table below shows the mining device would need to mine over 1300x its own mass to cover mission costs. What if the price of platinum were higher. The table below shows the price of platinum would need to balloon to $800,000 per kg to cover mission costs. What if mission costs were reduced. The table below shows mission costs would need to be reduced to $44M. Baseline Conclusions. Mining asteroids is hard Platinum mining to serve terrestrial applications is ridiculously hard to justify using these baseline assumptions Entrepreneurs may have to seek business plans that fundamentally change these assumptions or offer their product to non-terrestrial customers

\*\*Asteroid Adv\*\*

# 2036 asteroid =/= happening

**The 2036 Apophis asteroid is all hype to win funding, the actual chance of it hitting earth is 1 in 233,000.**

Foust 10 [Jeff, Aerospace analyst journalist and publisher of The Space Review, The Space Review, “Death from the skies? Ho- Hum,” January 25, 2010, SM, accessed: 7/11/11, <http://www.thespacereview.com/article/1550/1>]

Then there are the curious comments of Anatoly Perminov, head of Roskosmos, the Russian space agency. Interviewed on Russian radio in late December, Perminov said that he would convene a meeting of Russian space researchers to study what to do about the asteroid Apophis. The asteroid poses a tiny chance—1 in 233,000—of colliding with the Earth in 2036, after making a close pass by the planet in 2029. Perminov, though, claimed that an unnamed scientist told him the asteroid “will surely collide with the Earth in the 2030s” and thus it was time to begin planning a project to alter the asteroid’s trajectory to prevent that impact. Why Perminov would pay so much attention to an asteroid that poses so little near-term risk to the Earth isn’t clear; some speculate it might be an effort to gain attention to Roskosmos, particularly within Russia, and win additional funding.

The Russian Space Agency will take care of the 2036 Asteroid.

Atkinson 09 [Nancy, Space Science Journalist, Universe Today, “Russia May Head Mission to Deflect Asteroid Apophis,” December 30, 2009, SM, Accessed: 7/11/11, <http://www.universetoday.com/48912/russia-may-head-mission-to-deflect-asteroid-apophis/>]

Russia is considering sending a spacecraft to deflect a large asteroid and prevent a possible collision with Earth, according to a radio interview by the head of the country’s space agency. Anatoly Perminov said the space agency will hold a meeting soon to assess a mission to asteroid Apophis, and said NASA, ESA, the Chinese space agency and others would be invited to join the project. Apophis is a 270-meter (885-foot) asteroid that was spotted in 2004. It is projected to come within 29,450 kilometers (18,300 miles) of Earth in 2029, and currently has an estimated 1-in-250,000 chance of hitting Earth in 2036. A panel at the recent American Geophysical Union conference stressed that asteroid deflection is a international issue. “There is a geopolitical misconception that NASA is taking care of it,” said former Apollo astronaut Rusty Schweickart, who is part of the B612 Foundation, which hopes to prove the technology to significantly alter the orbit of an asteroid by 2015. “They aren’t and this is an international issue. The decisions have to be world decisions.” Perminov seemed unaware that NASA’s Near Earth Object program recently downgraded the possibility of a 2036 asteroid impact and also for a subsequent pass in 2068. Perminov said that he heard from a scientist that Apophis asteroid is getting closer and may hit the planet. “I don’t remember exactly, but it seems to me it could hit the Earth by 2032,” Perminov said. “People’s lives are at stake. We should pay several hundred million dollars and build a system that would allow to prevent a collision, rather than sit and wait for it to happen and kill hundreds of thousands of people.” Perminov wouldn’t disclose any details of the project, saying they still need to be worked out. But he said the mission wouldn’t require any nuclear explosions. “Calculations show that it’s possible to create a special purpose spacecraft within the time we have, which would help avoid the collision without destroying it (the asteroid) and without detonating any nuclear charges,” Perminov said. “The threat of collision can be averted.” Boris Shustov, the director of the Institute of Astronomy under the Russian Academy of Sciences, hailed Perminov’s statement as a signal that officials had come to recognize the danger posed by asteroids like 2036 Apophis. “Apophis is just a symbolic example, there are many other dangerous objects we know little about,” he said, according to RIA Novosti news agency.

# Asteroid Impact =/= Extinction

**Most mass extinctions were caused by drastic climate change – not asteroids.**

Merali 2006 (New Scientist, Climate blamed for mass extinctions, 4/1/2006, EBSCO, znf)

MOST mass extinctions were caused by gradual climate change rather than catastrophic asteroid impacts. That's the controversial view of one palaeontologist, who says it could mean we are in the midst of a mass extinction now. Other palaeontologists disagree, and the dispute is turning into a full-scale academic brawl. "It's a shoot-out at the OK Corral," says Peter Ward of the University of Washington in Seattle, who aired his climate change theory at NASA's Astrobiology Science Conference (AbSciCon) in Washington DC last week. Five major extinctions have occurred in the past 500 million years: the Ordovician, the Devonian, the Permian, the Triassic and the Cretaceous. There is widespread agreement that the Cretaceous extinction, which wiped out the dinosaurs 65 million years ago, was triggered by an asteroid impact. "It's such a simple idea that for 20 years we just assumed the same was true for all extinctions," says Ward. However, there is mounting evidence that the Permian extinction around 250 million years ago was caused by huge volcanic eruptions in Siberia, which led to catastrophic climate change (New Scientist, 10 December 2005, p 23). Ward thinks that such "greenhouse extinctions" are the rule and asteroid impacts the exception. He and his colleagues studied carbon isotopes in rocks dating from the Triassic extinction event some 200 million years ago. These indicated that the amount of carbon dioxide in the atmosphere was up to 100 times what it is today, and that the levels fluctuated wildly over tens of thousands of years. In contrast, the climate recovered relatively rapidly after the Cretaceous event. "The Triassic event isn't something that happened overnight," says Ward. Not everyone agrees with his interpretation. "On geological timescales, tens of thousands of years are still just an instant," says Luann Becker, a geophysicist at the University of California, Santa Barbara, who also spoke at the AbSciCon meeting. She supports the impact theory and points out that while large-scale volcanic eruptions happened throughout geological history, they didn't always cause mass extinctions. Becker has an idea for breaking the deadlock. She and her colleagues are studying the more recent Younger-Dryas event some 13,000 years ago, when glacial conditions wiped out the woolly mammoths. As yet there is no evidence of volcanic activity in the period, she says. If she can find signs of an asteroid impact dating from around this time, it will help silence the doubters. The two sides may have to agree to disagree. There is a large margin of error in dating older impact events, so it is almost impossible to determine whether they were the cause of the earliest mass extinctions. For Ward there's a lot riding on the debate. "We are heading down the same road, but we've traded volcanoes as the agents of destruction for SUVs."

No reasonable way to assess the impact of an asteroid-data is incomplete and there are too many variables

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**Even were** these **data accurate**, **the determination of impact hazard would remain challenging** for the following reasons: • **The** direct and indirect **effects produced when an asteroid** or comet **strikes** the land or ocean **are only poorly understood** at present; • **The population** of our planet **is not uniformly distributed**. For example, there is a higher population density near coastlines, where people may be susceptible to impact-driven tsunamis (whose damage potential is very uncertain); • Until the population of small NEOs is understood, we can only characterize impact effects of undiscovered objects statistically. As noted above, most impact simulations indicate the likelihood that human life will be significantly affected by impacts over short timescales (i.e., under 1,000 years) is low. However, as we have not yet detected and characterized all NEOs, it is possible (but very unlikely) that an NEO will “beat the odds” and devastate a city or a coastline in the near future; • While actuarial studies provide an assessment of property values, and may be used to place a value on a human life, it is very challenging to measure, for example, the value of religious, historical, ecological, cultural, and political sites, as well as of entire societal entities (such as ethnic groups, cities, and nations). These **values may vary greatly across communities**, regions, **and nations**; • **Beyond very crude estimates, we do not know the size threshold for impacts that would lead to a global catastrophe and kill a significant fraction of Earth’s population due to firestorms or climate change and the associated collapse of ecosystems, agriculture, and infrastructure**. **There may not even be a well-defined threshold, because global effects probably depend critically on impact location and surface material properties** (**e**.g., land, sea, ice sheet), season, and so on.

# Asteroid Impact =/= extinction

There is little data to support size estimates for “earth killing” asteroids-no guarantee they cause planetary catastrophe

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The motivation for the original Spaceguard Survey was to find all of the larger than 1-kilometer in diameter NEOs capable of striking Earth. According to Toon et al. (1997), 2- to 3-kilometer-diameter asteroid impacts may be capable of causing global damage due to the firestorm generated by infall of impact debris or indirectly by affecting the climate and producing a so-called “asteroid winter.” Given the uncertainties in these calculations, Stokes et al. (2003), like other groups before them, decided to be conservative, and assumed that all objects with diameters greater than 1.5 kilometers rather than 2 to 3 km would cause a global catastrophe. Nonetheless, the true hazard represented by multi-kilometer impactors is only modestly understood at present. Other than Toon et al. (1997) and a few other groups, little modeling has been done on the worldwide environmental effects produced by such impactors other than the one associated with the now-famous impact of a ~10 km object 65 million years ago that apparently resulted in the extinction of the dinosaurs. More work in this area is clearly needed

# Asteroid Impact =/= extinction

determines volcanoes and climate change caused extinction – not asteroids.

USA Today 2003 (No dino bones about it: Debate alive and kicking, NOV 05, 2003, EBSCO, znf)

The killer asteroid that may have doomed the dinosaurs 65 million years ago is still making a lot of noise, at least among scientists. The reason: renewed debate about evidence that widespread volcanic activity helped bring down the curtain on the age of dinosaurs through long-term climate change. This theory holds that any asteroid impacts were a secondary occurrence. The question matters to more than just scientists. The demise of the dinosaur draws special interest because of the public's fascination with the vanished giant creatures. Meanwhile, the world looks for lessons from the past about the effects of global climate change or asteroids striking Earth. The normally polite academic debates over such matters have turned as messy as a prehistoric bog. In a yearlong verbal brawl, now featured in an online debate sponsored by the Geological Society of London, Princeton researcher Gerta Keller has charged another scientist with sabotaging her efforts to prove the overriding importance of volcanoes in the demise of dinosaurs. Clues from a crater Mass extinction events appear in the fossil record repeatedly. At least five such widespread kill-offs of entire species have occurred over the last 550 million years. The current dispute revolves around core samples from the Gulf of Mexico's Chicxulub (CHICK zuloob) crater, off the Yucatan Peninsula. A comet or asteroid impact there 65 million years ago is widely thought to have triggered tidal waves and a brief ice age that killed off about 50% of all species. Scientists call this point in time between the age of the dinosaurs and the current age of mammals the "K-T boundary." It was only last year, after a decade of wrangling, that a core sample from the crater became available to scientists. In April 2002, the 3-inch-wide drilling core was given to micropaleontologist Jan Smit of Holland's Vrije Universiteit, an expert on microscopic fossils left by tiny sea creatures over hundreds of millions of years. Smit was to divvy up slices of the sample to about two dozen researchers. Keller suggests that Smit, a supporter of the impact-extinction theory, purposely delayed getting core samples to other scientists. To present analyses at the American Geophysical Union meeting in France in April, researchers needed to send in findings by mid-January. But Smit didn't deliver the core samples until November, leaving little time for analysis by other researchers. Keller says Smit would have been alone at the podium, presenting his results ahead of everyone else with no one to challenge him. The Sept. 7 Nature magazine report that first aired her charges included complaints from two other researchers about the samples they received. Smit says no one complained about the delivery schedule when he first proposed it. Keller says she hustled to do her analysis. Contradicting Smit's results, she reported that Chicxulub couldn't be the K-T boundary because microfossils from the site show now-extinct sea creatures lived for 300,000 years after the crater's formation. Volcanoes are the true cause of the mass extinction, she suggests. As the Indian subcontinent headed for its collision with Asia 55 million years ago, the crunch that created the Himalayas, an era of intense volcanic activity occurred in the region, causing worldwide climate change leading to mass extinction. The Chicxulub impact, followed by another asteroid strike several hundred thousand years later, simply added to the mass extinction woes of the times, she says. "It's a more complex story than we've been told." Smit calls the sabotage suggestion "ridiculous." In an e-mail to USA TODAY, he said, "I was the organizer and convener of the (meeting) symposium about the crater drilling, and I would be really stupid to delay her findings, if I were to have a successful symposium!" The post-impact microfossil layer that Keller describes is simply the remnants of mud thrown up by the tidal waves after the strike, he says. Each team's analysis will be published in coming months. K-T boundary issues gained steam in 1980 when Nobel-prize-winning University of California physicist Luis Alvarez and colleagues first proposed in a Science magazine report that an asteroid impact led to a fallout cloud blanketing the Earth, blocking sunlight, which with tidal waves, global forest fires and a host of other apocalyptic events caused mass extinction. Until then, the cause of the K-T boundary had been the subject of more speculation than evidence. In the fossil record, microscopic sea creatures appear to flourish right up to the boundary, but dinosaur species started dwindling millions of years earlier, a discrepancy that still stymies many experts. Geologists noted that oceans had been shrinking, volcanoes had been active and the climate likely changing 65 million years ago. But geologists say no one had put together all those factors into a rigorous explanation that made more sense than the asteroid-impact theory. Less likely theories about nearby exploding stars blanketing the Earth with deadly radiation or early mammals eating all the dinosaurs' eggs also were proposed. Most scientists hoped for more evidence. Alvarez's team analyzed a layer of iridium-laced clay in 65-million-year-old Italian soil. Iridium is rare on Earth but common in space; the researchers calculated a comet or asteroid 6 miles wide likely laid down the layer worldwide. By 1990, two years after Alvarez's death, the 186-mile-wide Chicxulub crater had emerged as the likely impact site, and the theory had gained wide acceptance among geologists and many paleontologists. They expected to see conclusive traces of iridium and microscopic fossil deaths in a Chicxulub sample. 'A double whammy' Current thinking is that although volcanoes were very active 65 million years ago, most researchers, except for dinosaur experts, believe the impact theory explains K-T boundary extinction, says Peter Ward of the University of Washington in Seattle, a paleontologist and geologist who has looked at the extinction of sea creatures at the K-T boundary. Keller's explanation seems unlikely, he says, given that intense volcanism had been occurring for millions of years before the impact with no apparent effect on fossils or geologic records. Keller plans to continue looking for evidence of a second asteroid impact crater in the Indian Ocean. Her research suggests that volcanoes did trigger intense climate change, showing that temperatures zoomed up and then down over the 300,000 years before the Chicxulub impact. That was followed, she believes, by another impact several hundred thousand years later that led to the mass extinction. "A double whammy knocked them out," she insists. "If we could have watched the planet from somewhere else, it surely must have been an amazing time." (c) USA TODAY, 2003

# Asteroid Impact =/= threat

The only likely asteroids to hit us would break up in the atmosphere and not harm anyone

Leifert 08 (Harvey, freelance science writer, “Asteroid impacts and climate change: which is the greater threat?”, December 19th, 2008, accessed 7/3/11, AH)

What do Boston, London, New York, Frankfurt, San Francisco, and Paris have in common? They have all been destroyed by asteroid impacts—in the movies. The death toll was enormous in every case. Understandably, people are worried that such a catastrophe might actually occur within their lifetime. Actually, says climate scientist Mark B. Boslough, “if you’re going to stay up late at night worrying about something, worry about climate.” Boslough, a researcher at the Sandia National Laboratories in Albuquerque, New Mexico, US, says, “you are much more likely to die from climate change than from an asteroid impact by a factor of something like a thousand.” He presented his findings at the Fall Meeting of the American Geophysical Union in San Francisco, California. Boslough cannot put a precise number on that ratio, because climate science is still replete with gaps in the relevant data. He is much more confident about the asteroid threat, though. He says that there is no evidence that anyone has died from an asteroid or meteorite impact—ever. He does not make a distinction between asteroids and meteors, saying the latter are basically fragments of the former and there is no size boundary to distinguish one from the other. Looking at worst case scenarios for asteroid impacts and climate change over the next 100 years, Boslough estimates that the largest asteroid to impact Earth would be around 50 metres in diameter. It would explode in the atmosphere and not make an impact crater, he says, and it would kill no one. Asteroids larger than 50 metres across and likely to cross Earth’s orbit are rare, and the larger they are, the rarer they are. They are also well tracked. Smaller ones are more numerous, but even less likely to cause death and destruction on Earth. Scientists can make the same kind of probability study with regard to climate change, Boslough says, “but the nature of the problem is very different.” Climate modelers do not have sufficient data to construct high resolution models, he says, including such key questions as: what are the relevant feedbacks? And how do aerosols (fine particles) affect the formation of clouds? The best approach at present, he says, is to use an ensemble of models to produce an estimate of the consequences, including fatalities, for a given degree of climate change. Still, even with the present uncertainties, Boslough says, the World Health Organisation estimates that 150,000 people per year will die from warming at the current rate, compared with none from asteroid impacts. Boslough acknowledges a perception gap among the general public, thanks to the media, which he says commonly focuses on “exceptionally unlikely impact scenarios.” When climate scientists talk about worst case scenarios, he says, “often times they are portrayed as alarmist. When we in the asteroid impact business talk about big impacts, like the ones depicted in the movies, no one ever accuses us of being alarmist.” He hopes his analysis of the relative threats of both impact and climate will help put both threats into perspective.

**Asteroids kill, at most, 91 people a year. 85% of all asteroids capable of causing global catastrophe have been tracked and none are going to hit Earth within 100 years.**

Foust 10 [Jeff, Aerospace analyst journalist and publisher of The Space Review, The Space Review, “Death from the skies? Ho- Hum,” January 25, 2010, SM, accessed: 7/11/11, <http://www.thespacereview.com/article/1550/1>]

Even if those risks were effectively communicated to the public in some manner, though, it’s not clear it would increase support for more active NEO searches. A table in the report notes that the expected average annual deaths from asteroids worldwide is just 91. (That doesn’t mean that 91 people are killed every year by asteroid impacts—there have been no “significant” deaths in recorded history, the report notes—but that is the average when the potential deaths from infrequent but catastrophic impacts are taken into account.) That is orders of magnitude lower than other causes of death that many people rarely think about on a daily basis, from firearms accidents (25,000 per year) to malaria (1 million) to air pollution (2 million). Much of that estimated death rate comes not from smaller objects but instead larger NEOs greater than one kilometer across, big enough to cause a global catastrophe. So far about 85 percent of the predicted population of such larger NEOs has been detected, and none of them pose an impact threat to the Earth for at least the next century. (When that isn’t taken into account, the average annual death toll jumps to over 1,000.) The other bump in the mortality curve comes from very small objects, less than 100 meters across: less energetic but more frequent, and whose populations hasn’t been well characterized.

# Asteroid Impact =/= threat

Asteroids don’t matter - Impacts are too small or too improbable

Bennett 10 (James Bennett is an 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, 164-166. TDA)

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

# Asteroid Impact =/= threat

The risk of a threatening impact is incredibly low – any dangerous objects are the ones that we can already track.

Schweickart & Graham ‘8 (Thomas, Council of American Ambarssadors, and Russell L., Chairman of the B612 Foundation. “NASA's Flimsy Argument for Nuclear Weapons” Scientific American Magazine, <http://www.scientificamerican.com/article.cfm?id=nasas-flimsy-argument-for-nuclear-weapons> February 08, 2007) JM

Nuclear explosives would be needed only for deflecting the largest NEOs, which are the least common and most easily detectable objects. Scientists are not concerned about a collision with an extremely large NEO—say, 10 kilometers in diameter—because all these objects have been discovered and none currently threatens Earth. Big things are easy for astronomers to find; the smaller objects are what we have to worry about./Of the estimated 4,000 NEOs with diameters of 400 meters or more—which includes all objects that might conceivably require nuclear explosives to divert them—researchers have so far identified about 1,500. And if NASA meets the search goals mandated by Congress, it will locate 98 percent of these objects and calculate 100-year projections of their orbits by 2020. 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.

**Even exaggerated asteroid impacts are too low-risk to merit any panic or investment**

Bennett 10 (James T., Eminent Scholar @ George Mason University, Chair of Political Economy and Public Policy in the Department of Economics, “The Chicken Littles of Big Science: Here come the Big Asteroids!”) JM

Chapman and Morrison have pondered NEOs for many years now, and they admit the inherent ambiguities. Clark Chapman concedes that “there is deep disagreement over whether we should also protect against the impacts that happen every decade or so, like Tunguska” — though the last Tunguska happened not a decade but a century-plus ago. “Even these small events can kill people, but they are a thousand times less likely to do so than are quakes, floods and the other things that kill people all the time.”123 David Morrison says, “It’s truly an apocalyptic vision that you have here,” but he concedes that “there are very human reactions as to whether this one-in-a-million-per-year risk [which may be an exaggerated number itself] is worth worrying about or not.”124 Clark Chapman adds that “such once in 100 million year events are so rare that, despite their apocalyptic horror, they need be of no concern to public officials.”125 (Note the sharp difference in estimates of the chances of a civilization-ending collision.) If a one-in-a-million — or 65 million, or one trillion — year doomsday comet suddenly raced in from the Oort Cloud, there is simply no defense known or even contemplated against it. We would be out of luck. Yet as a team of researchers wrote in Reviews of Geophysics, asteroid and comet collisions “are so infrequent that they are normally disregarded on the timescale of human evolution.”126 Prudence dictates that we not entirely ignore the incredibly remote possibility that such a collision could happen at any time during the next 40 million years, but that same prudence should keep us from panic, and prevent us from public expenditures that cannot be justified by any wisdom this side of sheer Hollywood-sized hysteria. Even without a rogue asteroid banging into the Earth, life as we know it will be impossible on the planet in a billion or more years, when the Sun swells 250 times its current size, into a “red giant” star that will swallow our home planet.127 If you wish to worry about that, fine. Same for those who stay up nights pulling out their hair over the prospect of an Armageddon asteroid. But the rest of us — at least those of us who do not make our living in the NEO detection field — have quite enough else to worry about, including a swelling budget deficit whose size may soon dwarf the rockiest chunks in the Asteroid Belt.

# Asteroid Impact =/= threat

**Asteroid impacts are highly improbable and should not be considered a threat.**

Gazeta 08 [Nezavisimaya, Reporter for Pravda, Pravada, “Giant asteroids unlikely to ram into Earth in foreseeable future,” April 25, 2008, SM, Accessed: 7/11/11, <http://english.pravda.ru/science/mysteries/25-04-2008/105003-giant_asteroid-0/>]

According to LiveScience.com, stories about asteroids approaching Earth appear on a regular basis. At least once a year news stories about an imminent catastrophe spreads worldwide, but then it is refuted or the possibility of a catastrophe lowers to some thousandths of percent. Late summer Apophis flew near our planet. Studies showed that the 1 to 45,000 chance of its getting into the “keyhole”, a dot in the space where gravity forces can turn it to the Earth. “It is quite an undertaking to estimate the danger with a low possibility,” said Michael DeKay from the Center for Risk Perception and Communication at Carnegie Mellon University. “Some people think that if the possibility is low, there is nothing to think about; others take into consideration the serious aftermath of the catastrophe and believe that even the lowest possibility is inadmissible.” According to calculations made by Stephen Chesley, who works on Near Earth Project at the Jet Propulsion Laboratory (JPL) in Pasadena, California, we are not supposed not worry until 2013. The scientist said that Apophis will not approach satellites close enough for the risk of collision to appear. In his interview with New Scientist Chesley said: “We confirm our calculations and the idea that they were corrected is inadequate.” Aldo Vitagliano from the University of Naples Federico II made his individual calculations of asteroids’ orbits and estimated possible risks. He agrees with NASA experts that corrections are inadequate. “The news is certainly a newspaper hoax,” said the scientist. “My calculations coincide with those of NASA Propulsion Laboratory.” It is only to be added that Chesley himself admitted that his laboratory constantly compares its calculations with those from other sources.

# Impacts Exaggerated

Their authors exaggerate – Err rationality

Bennett 10 (James Bennett is an 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, 164-166. TDA)

 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

# Impacts Exaggerated

Most fears of asteroid impacts are not based off facts—rather, they are the hype of a sensationalized media. Asteroid 2003 QQ47 empirically proves.

Brit, 03 [Space. Com, “ASTEROID DOOMSDAY 'RISK' EVAPORATES AFTER MEDIA FANS FLAMES” pg. 2, <http://www.lawrencehallofscience.org/pass/TargetEarth/asteroid-scare.html> mjf]

A newly discovered asteroid that generated doomsday headlines around the world yesterday morning was, by the end of the day, reduced to innocuous status as additional observations showed it would not hit Earth. Meanwhile, a whirlwind of media hype has astronomers and asteroid analysts arguing among themselves -- again -- about how they should disseminate information to the public. By one expert account, it was business as usual in the Near Earth Object (NEO) community, a loose-knit group of global researchers who find, catalogue, analyze and frequently spout off about asteroids that might one day slam into our planet. Virtual impact Asteroid 2003 QQ47 was discovered Aug. 24 by the Lincoln Near Earth Asteroid Research Program (LINEAR). Based on limited data collected during just a few days in late August, astronomers at first could not rule out the possibility that the giant rock would hit Earth. They gave it 1-in-909,000 odds of impact in 2014 and catalogued it as a 1 on the Torino hazard scale, a designation that merits "careful monitoring." Its size -- three-quarters of a mile wide (1.2 kilometers) -- explains some of the attention 2003 QQ47 received. Were a rock that big to hit Earth, the climatic consequences would be global and it would cause, at the least, widespread regional devastation. Most experts do not believe the mainstream press should waste time reporting on such an object. Several other newfound asteroids receiving similar designation in recent years have fallen off the list within days, as more observations allowed for refined orbital projections. Nonetheless, a press release issued early Tuesday by the British government's Near Earth Object Information Center fueled widespread media coverage, including a wire story by Reuters that many asteroid experts saw as inflammatory. Headlines were over-the-top, most researchers felt. They included "Armageddon set for March 21, 2014" and "Earth is Doomed." By late yesterday, however, more observations allowed astronomers to conclude there was no chance for impact in 2014.

Asteroid impacts are significantly unlikely; fear of asteroid impacts undermines the NEO community and is treated with sarcasm by a disbelieving media.

Brit, 03 [Space. Com, “ASTEROID DOOMSDAY 'RISK' EVAPORATES AFTER MEDIA FANS FLAMES” pg. 2, <http://www.lawrencehallofscience.org/pass/TargetEarth/asteroid-scare.html> mjf]

 Peiser did not share the center's rosy view for how the whole thing unfolded. He runs an electronic newsletter called CCNet, a forum for discussing the research and risks associated with NEOs, as well as the impact of media coverage on the public view of asteroid research and the credibility of the researchers. "I'm afraid that any attempt to justify an ill-timed and unnecessary media campaign doesn't bode well for the NEO community's efforts to avoid false asteroid alarms that only risk undermining our integrity," Peiser wrote in the latest edition of CCNet today. Peiser leveled this accusation at the center: "Crying wolf becomes official policy." The first and most notorious false asteroid alarm dates back to 1998. Then an astronomer went public with data showing that asteroid 1997 XF11 had a chance of hitting Earth in the year 2028. Once the asteroid was rendered harmless by more observations, a debate began as to if, when and how to release preliminary asteroid data to the media and the public. Though new agencies, institutions and programs have since been set up to better manage the situation, little has changed. A similar scare developed last summer, when British media hyped the potential danger of 2002 NT7. In that situation, astronomers were candid and vocal in their criticism of the British press. Like the return of Elvis One thing has changed of late: There is an increasing sense of sarcasm in the media with each new asteroid scare. Some reporters and editors are getting wise to the long odds -- or perhaps tired of having to report on them -- and doing more than just sensationalizing the data. One story yesterday made light of the initial chances of 2003 QQ47 hitting Earth. Sky News, a British publisher, said a bookmaker was taking bets on the prospect. A spokesman for William Hill bookmakers likened the 1-in-909,000 odds of doom to the chance that a manned expedition to Mars would arrive and discover the Loch Ness Monster there, or the equally probable scenario that Elvis Presley would reappear and marry Madonna. We now know that the latter two scenarios are far more likely than the world ending in 2014 due to an impact by asteroid 2003 QQ47.

# Impacts Exaggerated

Over sensationalism forces the media to create devastating impacts out of asteroids that will never hit the Earth.

Morrison, Steel, and Binzel, 03 [IMPACTS AND THE PUBLIC: COMMUNICATING THE NATURE OF THE IMPACT HAZARD, “LEARNING FROM EXPERIENCE: FIVE NEAS THAT MADE THE EVENING NEWS” pg. 3, <http://www.lawrencehallofscience.org/pass/TargetEarth/asteroid-scare.html> mjf]

Asteroid 2002 NT7, with the relatively large diameter of 2 km, was discovered in July 2002. By this time the calculation of impact probabilities was fully automated, and on July 18, NT7 was posted on the 'risk page' of both the Pisa NEODys and JPL Sentry systems, showing a possible but very unlikely (of order one in 100,000) impact just 17 years in the future. Because new data were coming in and NT7 remained a zero on the Torino Scale (although very close to Torino Scale = 1), it was decided not to call for a formal IAU technical review or to make any public statements, pending improvements in the orbit. On July 24 this remote chance of impact became an international media story when the BBC picked the information up from the Internet and reported that the asteroid was "on a collision course with Earth". As expected, however, additional observations quickly eliminated the possibility of an impact. The 'all clear' for any impact in 2019 was released on July 26, and by August 1 continuing orbital improvements also eliminated a lower-probability impact in 2060 -- a progression of events that reflects the normal working of the Spaceguard system. So why all the media fuss about NT7, especially in the UK press? This is unclear. Especially provocative was the BBC story that called NT7 "the most threatening object yet detected in space." As the asteroid itself receded from interest, the media story focused on the sensationalist reporting. Science journalist Robert Britt concluded in a story in Space.com that "The whole affair, over an asteroid that is almost certainly harmless, illustrates the stylistic ocean that separates American and British media and scientists' tactics in dealing with them". The following quotes are from his report. Duncan Steel suggested that asteroid stories have become so common that in his country they either make headlines or they're not used at all. Unless a reporter "makes it sensational, the editor will nix it. Ditto (especially) for the printed media." Don Yeomans said that he was unprepared when "the media blitz struck." "Most of the six interviews I did with BBC reporters Tuesday night began with their assumption that there would be a collision," Yeomans said "One is then forced to back up and try to explain the real situation and the fact that there is not really a story here. They didn't wish to hear that." Yeomans later concluded that journalists and scientists both need to strengthen efforts to help the public understand how asteroid risks are determined. "There is plenty of blame to go around," he said.

Asteroid impacts are both low magnitude and low probability.

Binzel 02, [The Planetary Society, “Local Versus Global” <http://www.planetary.org/explore/topics/near_earth_objects/threat.html> mjf]

Scientifically, it is useful to divide the impact hazard into two types of events: those with local consequences and those with global consequences. On the low end of the local scale is the fall of meteorites that seem to have a propensity for conking cars (for example, the October 9, 1992 fall in Peekskill, New York, that demolished an old Chevrolet). These impacts are not known to have caused any serious human injuries in modern times. Progenitors for such meteorite falls are probably bodies only a few meters across. Bodies 50 meters across having modest strengths are likely to strike the ground intact, creating a crater and a local explosion. The 1908 airburst over the Tunguska River in Siberia was probably due to the atmospheric entry of a comet or weak asteroid about 50 meters across. Had the Tunguska blast, which leveled 1,000 square kilometers (400 square miles) of forest, occurred over a populated area, the result would have been a devastating disaster with a death toll equivalent to or exceeding such other natural disasters as floods, hurricanes, and tsunamis. A Tunguska-like event probably occurs somewhere on Earth's surface once every 1,000 years or so. Estimating that only 10 percent of Earth's surface is lightly or densely populated, a threat to humans from such an impact is likely to occur once every 10,000 years. Looking at it another way, the risk for a Tunguska-sized impact on a lightly or densely populated area is about 1 percent per century.

# Asteroid ! - Improbable

Even if an asteroid did impact Earth – it’s more likely to hit the ocean or unpopulated areas.

Witze (Alexandra, The Dallas Morning News, Asteroids rank low on list of things to worry about, Feb 16, 1997, Lexis, znf)

You've seen the television promos for months, and you may be starting to wonder whether Dallas really is destined for the Big One. But don't start worrying about a huge asteroid slamming into Reunion Tower yet. The chances of an asteroid hitting downtown Dallas in a given year are something like 1 in 68 billion, according to space physicist Marc Hairston of the University of Texas at Dallas. "Don't cancel your Saturday dinner plans," he says. Astronomers say that, in general, the odds of dying in an asteroid impact are about 1 in 25,000 - roughly equal to the odds of dying in an airplane crash. But these numbers can be misleading; there is no record of anyone ever having been killed by an asteroid, although plane crashes have killed plenty of people. "Of all the things you have to worry about as you go to bed every night, I wouldn't put dying from an asteroid impact up there," says asteroid expert William Bottke of the California Institute of Technology in Pasadena, Calif. Several plane crashes occur every year, killing a relatively small number of people each time. In contrast, a really big asteroid hits Earth only once every several hundred thousand years - but just one could kill millions of people, astronomers say. No such impact of global proportions has occurred in human history. But scientists know from geologic evidence that many have occurred in the past, on Earth and throughout the solar system. For example, anyone who looks at the moon can see that it is pockmarked with craters, says impact expert Eugene Shoemaker of the U.S. Geological Survey in Flagstaff, Ariz. Earth must also have been similarly hit by space rocks. The resulting craters have been worn away by wind and water. One of the biggest impacts on Earth took place 65 million years ago and killed off the dinosaurs, Dr. Shoemaker says. At that time, an extraterrestrial rock slammed into the Yucatan Peninsula of Mexico, creating an enormous tidal wave and kicking up enough debris into the atmosphere to shroud the planet for months. Most scientists believe that this impact indirectly killed off 65 percent of all species living at the time, including the dinosaurs. Fortunately for those of us living today, the chances of such an impact happening in the near future are pretty slim. And the chances for Dallas are even slimmer. If an asteroid were to strike Earth, it would probably hit the ocean, because three-quarters of the planet's surface is covered by water. (This wouldn't necessarily mean that nobody would be killed; an impact in the ocean could generate a mighty tsunami that would kill thousands of people in coastal areas.) If an asteroid were to hit land, it would probably hit in a remote area, because cities cover a tiny fraction of Earth's land surface, Dr. Hairston says./

An asteroid hit is not very probable an impact probability of very nearly zero.

Gerakines 05(What is the chance of an asteroid hitting Earth and how do astronomers calculate it?, Perry A. Gerakines, an assistant professor in the department of physics at the University of Alabama at Birmingham, explains., June 6, 2005, <http://www.scientificamerican.com/article.cfm?id=what-is-the-chance-of-an>, G.L)

Although scientists can calculate a most-likely orbit from these early observations, each single observation of the asteroid's position contains some uncertainty. Most asteroids are small objects, a few meters to a few tens of meters across, and even the resolving power of a large telescope cannot determine their positions exactly. The uncertainties in an asteroid's position lead to uncertainties in how well we can determine its speed and direction of travel. As a result, a large number of possible orbits for an asteroid can be predicted within these windows of uncertainty. Careful computer simulations are used to calculate the future orbital path of the asteroid, with randomly chosen initial positions and velocities that fall within the margin of error of the telescopic observations to date. A large number of these simulations are generated for each asteroid. The probability that any particular one will actually hit Earth is given by the fraction of the extrapolated paths that leads to an impact. For example, if one million different possible orbits are calculated, and one of those leads to an impact, then we say that the odds of the asteroid hitting our world are one million to one. The uncertainties in an asteroid's orbit are greatest in the hours just after its discovery, and thus the calculated probability of an impact also tends to be the highest at these times. As we monitor an asteroid over the course of the weeks or months that follow, its orbit becomes more and more certain, and we become more knowledgeable about its position at a given date in the future. We can then rule out many possible paths it may take. In most cases, monitoring the asteroid over a few weeks quickly leads to an impact probability of very nearly zero.

# Asteroid Impact - Long Timeframe

Now isn’t key –focus on credible extinction scenarios

Bennett 10 (James Bennett is an 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, pg 155. TDA)

Given that there “is no known incident of a major crater-forming impact in recorded human history,” argues P.R. Weissman of the Jet Propulsion Laboratory, and since “the credibility of the impact hazard” is justifiably low with the public and governmental decision-makers, we ought to defer the development of a defensive system until such time as technological advances permit us to do so at a reasonable cost.55 There is also, he points out — at the risk of being called chauvinist, no doubt, by the more feverish Earth-savers — the “pragmatic and/or parochial” fact that the United States accounts for 6.4 percent of the total land mass of the Earth, and only 1.9 percent of the total area, including water.56 Thus anything short of a civilization-ending asteroid would be exceedingly unlikely to hit the U.S. By contrast, such threats as infectious diseases and nuclear war present a more real and immediate danger to Americans, and to earthlings in general. Perhaps money would be better spent addressing those matters?

Timeframe for an asteroid hitting earth is 25 years

O'Neill 10(Analysis by Ian O'Neill Tue Jul 27, 2010 02:33 PM ET, VERY EARLY WARNING: 1-IN-1,000 CHANCE OF ASTEROID IMPACT IN 2182, <http://news.discovery.com/space/future-hazard-1-in-1000-chance-of-asteroid-impact-in-2182.html>, G.L)

The not-so-romantically named (101955) 1999 RQ36 -- discovered in 1999 -- measures approximately 510 meters in diameter and is classified as an Apollo asteroid. Apollo asteroids pose a threat to our planet as they routinely cross Earth's orbit. With a one-in-a-thousand chance of 1999 RQ36 hitting Earth -- with half of this probability indicating a 2182 impact -- the threat might not sound too acute. But compare this with the panic that ensued with the discovery of 99942 Apophis in 2004. Initially, it was thought there was a 1-in-233 chance of Apophis hitting us in 2029. This estimate was alarming; it was the first time an asteroid had been promoted to "Level 4" on the Torino Scale -- a near-Earth object (NEO) impact hazard categorization method. After further observations, the threat of an Apophis impact was lowered, and now the chance of the 270 meter space rock hitting us in 2029 is zero. The probability of impact during the next fly-by, in 2036, has recently been downgraded to a 1-in-250,000, and a third pass in 2068 has a tiny one-in-three million chance.

# NW o/w Asteroid

**Nuclear War outweighs – nukes target civilization for certain death**

Bennett 10 (James Bennett is an 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, 155-157. TDA)

For a near-impossible scenario, an awful lot of laser ink has gone into studies of the consequences of an impact. Let’s face it: The topic is sexy. The effects of an Earth-space rock collision with energies below 10 Megatons would be “negligible,” write Owen B. Toon, Kevin Zahnle, and David Morrison of the NASA Ames Research Center, Richard P. Turco of UCLA, and Curt Covey of the Lawrence Livermore National Laboratory, in Reviews of Geophysics. Impacts measuring between 10 Megatons and 10 to the 4th power Megatons — say, comets and asteroids with diameters of less than 400 meters and 650 meters, respectively — would be equivalent “to many natural disasters of recent history.” In other words, death-dealing but manageable in a global sense. Those with an energy range in the 10 to the 5th–6th power Megatons are “transitional” — the fires, earthquakes, and tsunamis would unleash devastation, though the authors do not believe a “global catastrophe” would occur at less than an energy level of 10 to the 6th power Megatons. They do admit to “considerable uncertainty,” noting that previous estimates may have overstated the damage at certain levels of impact, though they say, with great wisdom, that “it is to be hoped that no large-scale terrestrial experiments occur to shed light on our theoretical oversights.”59 They can say that again. The impact upon the Earth of an object of more than 400 meters in diameter crashing into an ocean would be a tsunami, an enormous wave created by the impact of the asteroid or comet upon the ocean floor, which could cause massive numbers of deaths due to drowning, though it would be highly unlikely to cause extinction of the human species. A wall of water — a wave over 60 meters high — would sweep over the impacted ocean’s coasts. The huge and widespread fires would claim uncounted lives, too, and the “opacity of the smoke generated by the fires” would contribute to the sharply reduced level of sunlight upon the Earth. The consequences of an impact with an energy of 10 to the 7th power Megatons could be K–T like, as 100-meters-high tsunamis swamp coastal zones, fires rage around the world, and “Light levels may drop so low from the smoke, dust, and sulfate as to make vision impossible.”60 Photosynthesis, too, becomes impossible, and food supplies disappear. Dwellers in sea and on land perish of fire, starvation, or flood. In the aftermath, survivors would compete with rodents for the available food. (As paleontologists Peter M. Sheehan and Dale A. Russell note, “In the short term domestic cats might play a useful role in protecting food supplies.”61 Humans, they believe, would survive such a catastrophe, though in greatly reduced numbers and for millennia they would be vegetarians practicing subsistence agriculture. No doubt, that sounds appealing to some of the greener readers.) If an impact with a smaller body is sometimes compared to the aftermath of a nuclear war, the fact that in a war the civilian infrastructure is specifically targeted means that it is “much more likely that society could cope with the problems following a small impact better than it could adjust to the problems following a nuclear war,” according to Toon, Zahnle, et al.62 Interestingly, the authors say that acid rain — very much a fashionable environmental cause in the 1980s, though it has since receded before global warming — would not be a widespread problem, although the rain may well be acidified due to the nitric oxide resulting from impact-induced shock waves.

# No Tsunami

It’s impossible to calculate the impact of an impact driven tsunami-there are too many variables

IRWIN I. SHAPIRO et al in 10,( Harvard-Smithsonian Center for Astrophysics, Chair FAITH VILAS, MMT Observatory at Mt. Hopkins, Arizona, Vice Chair MICHAEL A’HEARN, University of Maryland, College Park, Vice Chair ANDREW F. CHENG, Johns Hopkins University Applied Physics Laboratory FRANK CULBERTSON, JR., Orbital Sciences Corporation DAVID C. JEWITT, University of California, Los Angeles STEPHEN MACKWELL, Lunar and Planetary Institute H. JAY MELOSH, Purdue University JOSEPH H. ROTHENBERG, Universal Space Network, *Committee to Review Near-Earth Object Surveys and Hazard Mitigation Strategies Space Studies Board Aeronautics and Space Engineering Board Division on Engineering and Physical Sciences*, THE NATIONAL ACADEMIES PRESS, <http://www.fas.harvard.edu/~planets/sstewart/reprints/other/4_NEOReportDefending%20Planet%20Earth%20Prepub%202010.pdf>)

**There is considerable uncertainty about the nature and damage produced by impact-driven tsunamis**, in large part **because** (1) **we cannot easily do** direct **experiments**, (2) impact-driven tsunamis present a difficult non-linear modeling problem; computer simulations need extremely high resolution and fidelity to treat important factors such as breaking waves, and runup along a specific coastline, (3) **the precise nature of the coast and sea floor near population centers strongly affects the results (**e.g., consider the Pacific coast versus the shallow Gulf coast), **and** (4) **loss of life may be avoided by early warnings of an incoming tsunami**.

There is no conclusive data on the likelihood of asteroids causing tsunamis

IRWIN I. SHAPIRO et al in 10,( Harvard-Smithsonian Center for Astrophysics, Chair FAITH VILAS, MMT Observatory at Mt. Hopkins, Arizona, Vice Chair MICHAEL A’HEARN, University of Maryland, College Park, Vice Chair ANDREW F. CHENG, Johns Hopkins University Applied Physics Laboratory FRANK CULBERTSON, JR., Orbital Sciences Corporation DAVID C. JEWITT, University of California, Los Angeles STEPHEN MACKWELL, Lunar and Planetary Institute H. JAY MELOSH, Purdue University JOSEPH H. ROTHENBERG, Universal Space Network, *Committee to Review Near-Earth Object Surveys and Hazard Mitigation Strategies Space Studies Board Aeronautics and Space Engineering Board Division on Engineering and Physical Sciences*, THE NATIONAL ACADEMIES PRESS, [http://www.fas.harvard.edu/~planets/sstewart/reprints/other/4\_NEOReportDefending%20Planet%20Earth%20Prepub%202010.pdf)\](http://www.fas.harvard.edu/~planets/sstewart/reprints/other/4_NEOReportDefending%20Planet%20Earth%20Prepub%202010.pdf%29%5C)

**One of the least understood aspects of the airburst phenomenon is whether** and how **these** events **play a role in the formation of tsunamis**. There has been significant debate on the effects of ocean impacts, both by direct impact into, and by airbursts above, the water. Some investigators suspect that an airburst over an ocean may be much more devastating than a similar-sized impact event directly into the water. **Modeling of direct oceanic impacts suggests that the impact splash is significant and will be detrimental to those nearby, but that the wavelength of the resultant waves generated is not of sufficient length to cause a tsunami.** Other studies, suggest on the contrary that even this type of impact may be enough to generate a tsunami-like phenomenon depending on the terrain that such impact-generated waves may encounter. **Still others have found that, based on numerical simulations and data from nuclear oceanic tests, tsunamis are not generated by impact events**.

# At: Starvation D-Rule

No moral obligation – aiding poor nations produce suffering instead of alleviating it through population growth and land degradation

Andre and Velasquez in 92 [Claire Andre and Manuel Velasquez, “World Hunger: A Moral Response” Issues in Ethics - V. 5, N. 1 Spring 1992, Santa Clara University Abstract, http://www.scu.edu/ethics/publications/iie/v5n1/hunger.html PN]

Some ethicists argue that rich nations have no obligation to aid poor nations. Our moral duty, they claim, is always to act in ways that will maximize human happiness and minimize human suffering. In the long run, aiding poor nations will produce far more suffering than it will alleviate. Nations with the highest incidence of poverty also have the highest birthrates. One report estimates that more than 90% of the world's total population growth between now and the year 2025 will occur in developing countries. Providing aid to people in such countries will only allow more of them to survive and reproduce, placing ever greater demands on the world's limited food supply. And as the populations of these countries swell, more people will be forced onto marginal and environmentally fragile lands, leading to widespread land degradation, further reducing the land available for food production. The increase in demands on the limited food supply combined with a decrease in the production of food will threaten the survival of future generations of all peoples, rich and poor.

No moral obligation – no benefit to people who need it, only government wastes it – empirical evidence proves

Andre and Velasquez in 92 [Claire Andre and Manuel Velasquez, “World Hunger: A Moral Response” Issues in Ethics - V. 5, N. 1 Spring 1992, Santa Clara University Abstract, http://www.scu.edu/ethics/publications/iie/v5n1/hunger.html PN]

Others claim that, even in the short-run, little benefit is derived from aiding poor nations. Aid sent to developing countries rarely reaches the people it was intended to benefit. Instead, it is used by oppressive governments to subsidize their military or spent on projects that benefit local elites, or ends up on the black market. Between 1978 and 1984, more than 80% of 596 million of food aid sent to Somalia went to the military and other public institutions. In El Salvador, 80% of U.S. aid in dry milk ended up on the black market. Furthermore, giving aid to poor countries undermines any incentive on the part of these countries to become self-sufficient through programs that would benefit the poor, such as those that would increase food production or control population growth. Food aid, for example, depresses local food prices, discouraging local food production and agricultural development. Poor dairy farmers in El Salvador have found themselves competing against free milk from the U.S. As a result of aid, many countries, such as Haiti, Sudan, and Zaire, have become aid dependent.

# At: Starvation D-Rule

Concept of justice should be practiced – Irresponsibility shouldn’t be obligatory when they made the wrong choices to begin with

Andre and Velasquez in 92 [Claire Andre and Manuel Velasquez, “World Hunger: A Moral Response” Issues in Ethics - V. 5, N. 1 Spring 1992, Santa Clara University Abstract, http://www.scu.edu/ethics/publications/iie/v5n1/hunger.html PN]

Some ethicists maintain that the principle of justice also dictates against aiding poor nations. Justice requires that benefits and burdens be distributed fairly among peoples. Nations that have planned for the needs of their citizens by regulating food production to ensure an adequate food supply for the present, as well as a surplus for emergencies, and nations that have implemented programs to limit population growth, should enjoy the benefits of their foresight. Many poor nations have irresponsibly failed to adopt policies that would stimulate food production and development. Instead, resources are spent on lavish projects or military regimes. Consider the $200 million air-conditioned cathedral recently constructed in the impoverished country of Cote D'Ivoire. Or consider that, in 1986, developing countries spent six times what they received in aid on their armed forces. Such nations that have failed to act responsibly should bear the consequences. It is unjust to ask nations that have acted responsibly to now assume the burdens of those nations that have not.

Finally, it is argued, all persons have a basic right to freedom, which includes the right to use the resources they have legitimately acquired as they freely choose. To oblige people in wealthy nations to give aid to poor nations violates this right. Aiding poor nations may be praiseworthy, but not obligatory.

# No Climate Change

No climate change – not enough dust and empirically disproven

Marusek 07 (James A. Marusek is a retired Nuclear Physicist and Engineer for the US Navy. “*Comet and Asteroid Threat Impact Analysis*,” American Institute of Aeronautics and Astronautics, Presented on March 7 at the 2007 Planetary Defense Conference. pg 12, http://www.aero.org/conferences/planetarydefense/2007papers/P4-3--Marusek-Paper.pdf, TDA)

It has been theorized that the impact of a large comet or asteroid and the resulting fires would throw up so much dust and ash in the stratosphere that it would shut off sunlight from the surface of the planet. This would plunge the Earth into a period of darkness lasting many months and even years. In the absence of sunlight, solar heating of the Earth’s surface would come to a halt. This will lead to a severe cooling of the continents approximately 70°F (39°C) below normal and lead to an "impact winter". 2 An "impact winter" is similar to a "nuclear winter" but more severe, and could lead to a new Ice Age. I feel that the threat of a dust generated "impact winter" is vastly overstated and that any dust generated "impact winter" will not be anywhere near as severe nor last as long as some predict. According to research from geologist, Kevin Pope, the K/T impact did not generate the quantities of fine dust needed to block the Sun completely and choke off photosynthesis. Approximately 99% of the debris produced was in the form of spherules, which are too coarse and heavy to remain suspended in the upper atmosphere for very long. Only 1% of the debris is fine dust generated from pulverized rock. If this fine dust were spread out across the entire globe, it would represent a thickness of ~ 0.001 inches (0.03 mm). Therefore the hypothesis of an "impact winter" is vastly overstated. 24 Just as dust that is kicked up into the atmosphere will block sunlight from hitting the earth, the dust will also act as an insulator trapping heat at the Earth’s surface. This includes the heat from (1) the impact and fireball, (2) firestorms, (3) fuel fires – oil, natural gas, coal, timber, methane hydrate, and (4) lava flows and volcanoes. This trapping effect will slow the decent of the temperature fall, and retard the onset of the "impact winter". Some of my reasoning comes from reverse logic. The dust cloud is a global threat. It shuts off light from the entire surface of the Earth. It brings photosynthesis to a grinding halt. Several mammals and reptiles survived the asteroid that slammed into Mexico’s Yucatan Peninsula 65 million years ago. We know this because the event did not result in total and complete extinction of all complex life forms. How long could these creatures survive without food? Several years seems like a very, very long time to go without food. The oldest tropical honeybees, Cretotrigona prisca, were studied by Jacqueline M. Kozisek. These honeybees survived the Cretaceous/Tertiary (K/T) extinction. The bees share a common ancestry tree with modern tropical honeybees making them an ideal subject for study. These bees rely on pollen for their energy source and do not store honey. They must have a constant source of blooming angiosperms to survive. They also require a temperature of 88-93°F (31-34°C) to maintain their metabolism. These insects are very sensitive to the environment changes. Covering the outer atmosphere with a dust layer, blocking off photosynthesis, and dropping tropical temperatures by 13°F (7°C) to 22°F (12°C) would have meant certain death for this species. If a global “impact winter” occurred, these honeybees could not survive years in the dark and cold without the flowering plants which they need to survive. But they did survive! 25 I feel the entire world will be dark within one hour after a large impact. The impact debris flung high into the stratosphere will cause this darkness. It will take several days for the majority of this debris to fall back to Earth’s surface. I believe at about the third day after impact, some light will start to get through.

# No Miscalc

There is no risk of an accidental launch—it is empirically proven that alert procedures are stable

Perry et al ‘9 (former secretary of defense, and a shitload of other qualified people, “America’s Strategic Posture, The Final Report of the Congressional Commission on the Strategic Posture of the United States”, <http://media.usip.org/reports/strat_posture_report.pdf>, )

The second is de-alerting. Some in the arms control community have pressed enthusiastically for new types of agreements that take U.S. and Russian forces off of so-called “hair trigger” alert. This is simply an erroneous characterization of the issue. The alert postures of both countries are in fact highly stable. They are subject to multiple layers of control, ensuring clear civilian and indeed presidential decision-making. The proper focus really should be on increasing the decision time and information available to the U.S. president—and also to the Russian president—before he might authorize a retaliatory strike. There were a number of incidents during the Cold War when we or the Russians received misleading indications that could have triggered an accidental nuclear war. With the greatly reduced tensions of today, such risks now seem relatively low. The obvious way to further reduce such risks is to increase decision time for the two presidents. The President should ask the Commander of U.S. Strategic Command to give him an analysis of factors affecting the decision time available to him as well as recommendations on how to avoid being put in a position where he has to make hasty decisions. It is important that any changes in the decision process preserve and indeed enhance crisis stability.

Improved communication makes inadvertent launch unlikely

Ford ‘8 (Senior Fellow and Director of the Center for Technology and Global Security at the Hudson Institute in Washington. D.C. He previously served as U.S. Special Representative for Nuclear Nonproliferation, and as a Principal Deputy Assistant Secretary of Stat; Dilemmas of Nuclear Force ‘De-Alerting’” Presented to the International Peace Institute Policy Forum  New York  October 7; [www.hudson.org/files/documents/**De-Alerting**%20FINAL2%20(2).pdf](http://www.hudson.org/files/documents/De-Alerting%20FINAL2%20%282%29.pdf), )

The United States and Russia have also worked for years to improve communications, reduce misunderstandings, and develop ways to lessen the risk of inadvertent launch or other errors in their strategic relationship. Most readers will be familiar with the Direct Communications Link (the famous “hotline”) established in 1963.27 In 1971, however, Washington and Moscow also signed an agreement establishing basic procedures to increase mutual consultation and notification regarding relatively innocent but potentially alarming activities – thereby reducing the risk of accidental nuclear war.28 Since 1987, the two parties have also operated securely- linked 24-hour communications centers – the U.S. node of which is the Nuclear Risk Reduction Center (NRRC) operated by the State Department29 – which specialize in transmitting such things as the notifications required under arms control treaties. Pursuant to a 1988 memorandum, NRRC transmittals, which go directly to the Russian Ministry of Defense, include ballistic missile launch notifications. This link also proved useful to help prevent strategic tensions after the terrorist assault of September 11, 2001 – at which point U.S. officials used the NRRC to reassure their Russian counterparts that the sudden American security alert in the wake of the Manhattan and Pentagon attacks was not in any way an indication of impending U.S. belligerence vis-à-vis Russia. Nor have such efforts been limited to improved communications. For a while, in fact, the United States and Russia pursued the development of a joint reconnaissance satellite program to track potential ballistic missile launches and feed data directly to both governments in order to help ensure prevent errors and misunderstandings. This Russian-American Observation Satellite (RAMOS) project originated in discussions between the first President Bush and Russian President Boris Yeltsin and led to an agreement between the two governments in 1997 to create two satellites for the provision of shared warning data on ballistic missile attacks. The RAMOS program had collapsed by 2004, but its failure seems to have been the result merely of such things as cost overruns, friction between counterpart organizations, and a failure by the two governments to prioritize the effort.30 The demise of the satellite project did not come about on account of any kind of fundamental strategic unwisdom or technical unfeasibility. If a firm commitment were made further to reduce accident risks, there would seem no reason, in principle, why something generally along such lines could not actually be implemented in the future.31

# No Miscalc

The US is not on hair-trigger alert.

Ford ‘8 (Senior Fellow and Director of the Center for Technology and Global Security at the Hudson Institute in Washington. D.C. He previously served as U.S. Special Representative for Nuclear Nonproliferation, and as a Principal Deputy Assistant Secretary of Stat; Dilemmas of Nuclear Force ‘De-Alerting’” Presented to the International Peace Institute Policy Forum  New York  October 7; [www.hudson.org/files/documents/**De-Alerting**%20FINAL2%20(2).pdf](http://www.hudson.org/files/documents/De-Alerting%20FINAL2%20%282%29.pdf), )

This argument seems somewhat less compelling, however, when one realizes that it is based upon a confusion: U.S. and Russian nuclear postures apparently do not actually assume that launch orders will be given upon warning of attack. In fact, though the United States has always refused absolutely to rule out a launch-on- warning posture, apparently believing that ambiguity on this score complicates Russian planning scenarios and enhances thus deterrence10 – and although U.S. alert forces could launch on such short notice if the President actually gave the order – U.S. strategic planners appear never to have adopted such a position. Indeed, the United States has spent many billions of dollars to build and maintain an extremely capable ballistic missile submarine (SSBN) force as the backbone of its deterrent posture, precisely because of the presumed invulnerability to preemptive attack of deployed U.S. submarines on “deterrent patrol.”11 Having such a survivable force available for retaliatory strikes necessarily means that when confronted with what appears to be an incoming Russian attack, U.S. leaders would not necessarily face irresistible “use it or lose it” pressures to launch immediately. Since the end of the Cold War, moreover, the U.S. force posture has evolved further away from maintaining a rapid reaction capability and high alert levels, and today few of the operationally deployed U.S. nuclear forces are maintained on a ready alert status capable of immediate launch even if this were American policy. The United States carefully maintains the ability to respond promptly to any attack in order to complicate any adversary’s planning and thereby enhance deterrence, but it does not assume LOW. (Nor, however, does it ever discuss precisely what its actual alert status is. No nuclear weapons state does.12) As the U.S. Ambassador to the CD quipped at one point, in response to a request that the United States abandon its “hair- trigger” alert policy, “Frankly, in order to take action to comply with this request, we would first have to put our weapons on ‘hair-trigger alert,’ so we could then de-alert them. The fact is that U.S. nuclear forces are not and have never been on ‘hair-trigger alert.’”13

\*\*Counterplans\*\*

# Multilat CP - International Cooperation Key

**International cooperation is key to the detection of asteroids**

Parris 2000 (Matthew, The London Times, “Asteroids could shut down Earth plc”, September 19, 200, Lexis, znf)

 Urgent international action is needed to reduce the risk of a large asteroid striking the Earth, a government panel of experts said yesterday. The danger of a catastrophic impact is so great that any private company incurring comparable risks would fail British safety standards, the Near Earth Objects Task Force said. A collision with even a medium-size asteroid would put hundreds of thousands of lives at risk from the initial energy blast, tidal waves and a "nuclear winter" effect, the task force found. At worst, an impact could destroy all human life: a similar event 65million years ago is believed to have led to the extinction of the dinosaurs. International co-operation to track potentially hazardous asteroids and comets, and research into ways of deflecting them from the Earth, is the only answer to the threat, the report concluded. Britain should take the lead in the construction of a powerful new telescope as a key component of a "spaceguard" early-warning system, it advised. The panel, which was chaired by Harry Atkinson, a former chairman of the European Space Agency, was set up in January by Lord Sainsbury of Turville, the Science Minister. Other members were Sir Crispin Tickell, a former British Ambassador to the United Nations, and David Williams, Professor of Astronomy at University College London. Lord Sainsbury is expected to respond to the findings by the end of the year. Estimates of the total cost of the recommendations range from Pounds 15million to Pounds 70million. None of the asteroids and comets that are known to astronomers will pose a threat in the next 50 years but new objects are being discovered every day, leaving the Earth at a definite risk. The probability of a devastating collision is low, Dr Atkinson said, but the effects of a medium-size asteroid made present levels of risk "intolerable". An asteroid 0.6 miles across, which strikes the Earth every 100,000 to 200,000 years, would cause a "nuclear winter" effect, killing up to 1.5 billion people. Smaller objects, which strike at an interval of 70,000 years, could kill as many as 500,000 people.Under the panel's proposals, a 9ft telescope would be built in the southern hemisphere in partnership with other countries to search for medium-size objects to complement a Nasa initiative. A second European telescope should then be dedicated to tracking the orbits of objects found by both projects. A national centre should also be established to co-ordinate British research into near Earth objects, the report said. Lembit Opik, the Liberal Democrat MP who has campaigned for action to counter the threat from asteroids, urged swift implementation of the recommendations.He said: "The risk of dying from an asteroid impact is 750 times higher than the chance of winning the Lottery. I'm determined to change that." Matthew Parris, page 10

The Asteroids threat is global-the problem should be addressed with international institutions and coordination

IRWIN I. SHAPIRO et al in 10,( Harvard-Smithsonian Center for Astrophysics, Chair FAITH VILAS, MMT Observatory at Mt. Hopkins, Arizona, Vice Chair MICHAEL A’HEARN, University of Maryland, College Park, Vice Chair ANDREW F. CHENG, Johns Hopkins University Applied Physics Laboratory FRANK CULBERTSON, JR., Orbital Sciences Corporation DAVID C. JEWITT, University of California, Los Angeles STEPHEN MACKWELL, Lunar and Planetary Institute H. JAY MELOSH, Purdue University JOSEPH H. ROTHENBERG, Universal Space Network, *Committee to Review Near-Earth Object Surveys and Hazard Mitigation Strategies Space Studies Board Aeronautics and Space Engineering Board Division on Engineering and Physical Sciences*, THE NATIONAL ACADEMIES PRESS, <http://www.fas.harvard.edu/~planets/sstewart/reprints/other/4_NEOReportDefending%20Planet%20Earth%20Prepub%202010.pdf>)

**Responding effectively to** hazards posed by **NEOs requires the joint efforts of diverse institutions** and individuals. Thus organization plays a key role. **Because NEOs are a global threat, efforts to deal with them could involve international cooperation** from the outset. (However, this is one area where one nation, acting alone, could address such a global threat.) The report discusses possible means to organize, both nationally and internationally, responses to those hazards. **Arrangements at present are largely ad hoc and informal** here and abroad, **and involve both government and private entities. The committee** discussed ways to organize the national community to deal with the hazards of NEOs and also **recommends an approach to international cooperation**. Recommendation: **The United States should take the lead in organizing and empowering a suitable international entity to participate in developing a detailed plan for dealing with the NEO hazard**.

# Privitization CP - Asteroid Mining = $$$

Asteroid mining would be very profitable – and feasible - for private companies.

The Straits Times (Space missions to search moon for precious materials, January 16, 1998, Lexis, znf)

BOSTON -Lunar scientist Alan Binder's Lunar Prospector spacecraft is today settling into a polar orbit around the moon, and he is already sketching plans for 10 more moon missions. Unlike this mission in partnership with the National Aeronautics and Space Administration (Nasa), any follow-up flights will not tap the United States Treasury, The Christian Science Monitor reported. The paper on Tuesday quoted him as saying: "I want to continue commercially." He is not alone in his dream of private-sector space exploration. Mr James Benson, a former software executive, has a similar launch schedule for his Near-Earth Asteroid Prospector mission. There are indications that cosmic rocks might contain treasure troves of water, cobalt, platinum and gold. One of the goals of this mission is to establish the legal principle that asteroids and their resources can be claimed by private companies. According to a report in the newspaper's Internet edition, the notion of mining asteroids or the moon is now closer to reality as low-cost technology brings space travel into the province of entrepreneurs. These projects represented the first halting steps towards building a commercial space-exploration industry. If water is found on the moon, for example, that would mean that space missions would cost less than they would if everything had to be launched from Earth. The moon could supply the basic gases for rocket fuel, oxygen for life support, and construction materials for colonies. One of the Lunar Prospector's aims is to build a global map of the moon's composition. Scientists would like to know whether frozen water exists in deep craters at the moon's poles. Water contains the elements for making rocket fuel. The Lunar Prospector is also expected to provide information about surface deposits of such materials as titanium, aluminium and silicon. Meanwhile, Nasa administrator Daniel Goldin has been pushing for more opportunities to involve the private sector in space-science efforts. Under the Discovery programme which supports smaller, more-frequent, less-expensive space-science missions, scientists who propose missions can either tap Nasa facilities to build their spacecraft or private-aerospace companies such as Lockheed Martin, which built the Lunar Prospector. Recently, Nasa reportedly clarified that its Discovery policy would include science missions which would piggyback on purely-commercial launches.

# Europe Can Do Plan

Europe has already planned asteroid deflection tests

European Space Agency in 9 (ESA website, *ESA: NEO Space Mission Preparation (overview of the mission)*, July 3, 2011, http://www.esa.int/SPECIALS/NEO/SEMZRZNVGJE\_0.html)

The final internal study to define the baseline specifications of the Don Quijote mission concept were completed in July 2005 at ESA's Concurrent Design Facility (CDF). This study was carried out in preparation for the industrial work to commence in early 2006. Several feasible cost-effective yet compelling mission scenarios were identified for the two selected targets.

ESA's Don Quijote is an asteroid deflection precursor mission concept, designed to assess and validate the technology that one day could be used to deflect an asteroid threatening the Earth...

\*\*Politics\*\*

# Politics – Congress Don’t Curr

After demanding NASA detect 90% of NEOs in 2005, Congress has largely forgotten about asteroid detection.

Atkinson, 10 [Universe Today, “Asteroid Detection, Deflection Needs More Money, Report Says” 1/31/10, <http://www.universetoday.com/51811/asteroid-detection-deflection-needs-more-money-report-says/> mjf]

Congress mandated in 2005 that NASA discover 90 percent of NEOs whose diameter is 140 meters or greater by 2020, and asked the National Research Council in 2008 to form a committee to determine the optimum approach to doing so. In an interim report released last year, the committee concluded that it was impossible for NASA to meet that goal, since Congress has not appropriated new funds for the survey nor has the administration asked for them. But this issue isn’t and shouldn’t be strictly left to NASA, said former astronaut Rusty Schweickart, also speaking at the AGU conference. “There’s the geopolitical misconception that NASA is taking care of it,” he said. “They aren’t and this is an international issue.” Schweickart said making decisions on how to mitigate the threat once a space rock already on the way is too late, and that all the decisions of what will be done, and how, need to be made now. “The real issue here is getting international cooperation, so we can — in a coordinated way — decide what to do and act before it is too late,” he said. “If we procrastinate and argue about this, we’ll argue our way past the point of where it too late and we’ll take the hit.” But this report deals with NASA, and committee from the NRC lays out two approaches that would allow NASA to complete its goal soon after the 2020 deadline; the approach chosen would depend on the priority policymakers attach to spotting NEOs. If finishing NASA’s survey as close as possible to the original 2020 deadline is considered most important, a mission using a space-based telescope conducted in concert with observations from a suitable ground-based telescope is the best approach, the report says. If conserving costs is deemed most important, the use of a ground-based telescope only is preferable.

Politics – Obama Pushes Plan

Obama pushing detection increase now

Lawler and Reardon 11 (Andrew Lawler and Sara Reardon on 14 February 2011, 5:11 PM, Climate Science, Asteroid Detection Big Winners in NASA Budget; Accessed 6/30/2011, AH)

NASA will have to live with a stagnant budget—again. The [$18.7 billion proposed](http://www.nasa.gov/pdf/516674main_FY12Budget_Estimates_Overview.pdf) by the Administration is the same amount as 2010 and 2011, and science funding would continue to hover at about $5 billion. But in the details are significant winners and losers. Earth science would grow from $1.439 billion to $1.797 billion in 2012, though House of Representatives Republicans are sure to attack a program focused on understanding global change. Meanwhile, Mars exploration—which this year stands at $438 million—would spike at $602 million next year, but plummet to less than half that amount by 2016. Funds for near-Earth object observations would quadruple to $20.4 million. And NASA Chief Financial Officer Elizabeth Robinson said the agency will kill a dark-energy mission in the hope that it can collaborate more cheaply with the European Space Agency. She added that details on how the agency will fund a massive cost overrun in the James Webb Space Telescope won't be ready until this summer. NASA Administrator Charles Bolden acknowledged that "tough choices had to be made," adding that these are "really difficult fiscal times." The priority in such times, he said, was safe and efficient transportation of crew and equipment into low earth orbit. The budget for human exploration was kept at $2.81 billion to fund development of a Multi-Purpose Crew Vehicle to carry humans and a Heavy Lift Launch Vehicle to launch it. An enhanced reliance on commercial industry to provide these vehicles for human spaceflight, Bolden said, was "the frugal thing for us to do and the prudent thing for us to do. … We can't do everything." Pressed on human landings on Mars and asteroids, Bolden said it was too early to give definitive dates. Perhaps Mars in the 2030s and asteroids by 2025, but "if we can do things better, some of those dates may accelerate. We're going to have to make small steps."