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### Warming Advantage

#### It’s real and is anthropogenic---contrary evidence is unqualified and funded by fossil fuel hacks

Prothero 12 [Donald R. Prothero, Professor of Geology at Occidental College and Lecturer in Geobiology at the California Institute of Technology, 3-1-2012, "How We Know Global Warming is Real and Human Caused," Skeptic, 17.2, EBSCO]

How do we know that global warming is real and primarily human caused? There are numerous lines of evidence that converge toward this conclusion. 1. Carbon Dioxide Increase Carbon dioxide in our atmosphere has increased at an unprecedented rate in the past 200 years. Not one data set collected over a long enough span of time shows otherwise. Mann et al. (1999) compiled the past 900 years' worth of temperature data from tree rings, ice cores, corals, and direct measurements in the past few centuries, and the sudden increase of temperature of the past century stands out like a sore thumb. This famous graph is now known as the "hockey stick" because it is long and straight through most of its length, then bends sharply upward at the end like the blade of a hockey stick. Other graphs show that climate was very stable within a narrow range of variation through the past 1000, 2000, or even 10,000 years since the end of the last Ice Age. There were minor warming events during the Climatic Optimum about 7000 years ago, the Medieval Warm Period, and the slight cooling of the Litde Ice Age in the 1700s and 1800s. But the magnitude and rapidity of the warming represented by the last 200 years is simply unmatched in all of human history. More revealing, the timing of this warming coincides with the Industrial Revolution, when humans first began massive deforestation and released carbon dioxide into the atmosphere by burning an unprecedented amount of coal, gas, and oil. 2. Melting Polar Ice Caps The polar icecaps are thinning and breaking up at an alarming rate. In 2000, my former graduate advisor Malcolm McKenna was one of the first humans to fly over the North Pole in summer time and see no ice, just open water. The Arctic ice cap has been frozen solid for at least the past 3 million years (and maybe longer),[ 4] but now the entire ice sheet is breaking up so fast that by 2030 (and possibly sooner) less than half of the Arctic will be ice covered in the summer.[ 5] As one can see from watching the news, this is an ecological disaster for everything that lives up there, from the polar bears to the seals and walruses to the animals they feed upon, to the 4 million people whose world is melting beneath their feet. The Antarctic is thawing even faster. In February-March 2002, the Larsen B ice shelf -- over 3000 square km (the size of Rhode Island) and 220 m (700 feet) thick -- broke up in just a few months, a story -typical of nearly all the ice shelves in Antarctica. The Larsen B shelf had survived all the previous ice ages and interglacial warming episodes over the past 3 million years, and even the warmest periods of the last 10,000 years -- yet it and nearly all the other thick ice sheets on the Arctic, Greenland, and Antarctic are vanishing at a rate never before seen in geologic history. 3. Melting Glaciers Glaciers are all retreating at the highest rates ever documented. Many of those glaciers, along with snow melt, especially in the Himalayas, Andes, Alps, and Sierras, provide most of the freshwater that the populations below the mountains depend upon -- yet this fresh water supply is vanishing. Just think about the percentage of world's population in southern Asia (especially India) that depend on Himalayan snowmelt for their fresh water. The implications are staggering. The permafrost that once remained solidly frozen even in the summer has now thawed, damaging the Inuit villages on the Arctic coast and threatening all our pipelines to the North Slope of Alaska. This is catastrophic not only for life on the permafrost, but as it thaws, the permafrost releases huge amounts of greenhouse gases which are one of the major contributors to global warming. Not only is the ice vanishing, but we have seen record heat waves over and over again, killing thousands of people, as each year joins the list of the hottest years on record. (2010 just topped that list as the hottest year, surpassing the previous record in 2009, and we shall know about 2011 soon enough). Natural animal and plant populations are being devastated all over the globe as their environments change.[ 6] Many animals respond by moving their ranges to formerly cold climates, so now places that once did not have to worry about disease-bearing mosquitoes are infested as the climate warms and allows them to breed further north. 4. Sea Level Rise All that melted ice eventually ends up in the ocean, causing sea levels to rise, as it has many times in the geologic past. At present, the sea level is rising about 3-4 mm per year, more than ten times the rate of 0.1-0.2 mm/year that has occurred over the past 3000 years. Geological data show that the sea level was virtually unchanged over the past 10,000 years since the present interglacial began. A few mm here or there doesn't impress people, until you consider that the rate is accelerating and that most scientists predict sea levels will rise 80-130 cm in just the next century. A sea level rise of 1.3 m (almost 4 feet) would drown many of the world's low-elevation cities, such as Venice and New Orleans, and low-lying countries such as the Netherlands or Bangladesh. A number of tiny island nations such as Vanuatu and the Maldives, which barely poke out above the ocean now, are already vanishing beneath the waves. Eventually their entire population will have to move someplace else.[ 7] Even a small sea level rise might not drown all these areas, but they are much more vulnerable to the large waves of a storm surge (as happened with Hurricane Katrina), which could do much more damage than sea level rise alone. If sea level rose by 6 m (20 feet), most of the world's coastal plains and low-lying areas (such as the Louisiana bayous, Florida, and most of the world's river deltas) would be drowned. Most of the world's population lives in low-elevation coastal cities such as New York, Boston, Philadelphia, Baltimore, Washington, D.C., Miami, and Shanghai. All of those cities would be partially or completely under water with such a sea level rise. If all the glacial ice caps melted completely (as they have several times before during past greenhouse episodes in the geologic past), sea level would rise by 65 m (215 feet)! The entire Mississippi Valley would flood, so you could dock an ocean liner in Cairo, Illinois. Such a sea level rise would drown nearly every coastal region under hundreds of feet of water, and inundate New York City, London and Paris. All that would remain would be the tall landmarks such as the Empire State Building, Big Ben, and the Eiffel Tower. You could tie your boats to these pinnacles, but the rest of these drowned cities would lie deep underwater. Climate Change Critic's Arguments and Scientists' Rebuttals Despite the overwhelming evidence there are many people who remain skeptical. One reason is that they have been fed distortions and misstatements by the global warming denialists who cloud or confuse the issue. Let's examine some of these claims in detail: \* "It's just natural climatic variability." No, it is not. As I detailed in my 2009 book, Greenhouse of the Dinosaurs, geologists and paleoclimatologists know a lot about past greenhouse worlds, and the icehouse planet that has existed for the past 33 million years. We have a good understanding of how and why the Antarctic ice sheet first appeared at that time, and how the Arctic froze over about 3.5 million years ago, beginning the 24 glacial and interglacial episodes of the "Ice Ages" that have occurred since then. We know how variations in the earth's orbit (the Milankovitch cycles) controls the amount of solar radiation the earth receives, triggering the shifts between glacial and interglacial periods. Our current warm interglacial has already lasted 10,000 years, the duration of most previous interglacials, so if it were not for global warming, we would be headed into the next glacial in the next 1000 years or so. Instead, our pumping greenhouse gases into our atmosphere after they were long trapped in the earth's crust has pushed the planet into a "super-interglacial," already warmer than any previous warming period. We can see the "big picture" of climate variability most clearly in ice cores from the EPICA (European Project for Ice Coring in Antarctica), which show the details of the last 650,000 years of glacial-inters glacial cycles (Fig. 2). At no time during any previous interglacial did the carbon dioxide levels exceed 300 ppm, even at their very warmest. Our atmospheric carbon dioxide levels are already close to 400 ppm today. The atmosphere is headed to 600 ppm within a few decades, even if we stopped releasing greenhouse gases immediately. This is decidedly not within the normal range of "climatic variability," but clearly unprecedented in human history. Anyone who says this is "normal variability" has never seen the huge amount of paleoclimatic data that show otherwise. \* "It's just another warming episode, like the Medieval Warm Period, or the Holocene Climatic Optimum or the end of the Little Ice Age." Untrue. There were numerous small fluctuations of warming and cooling over the last 10,000 years of the Holocene. But in the case of the Medieval Warm Period (about 950-1250 A.D.), the temperatures increased only 1°C, much less than we have seen in the current episode of global warming (Fig. 1). This episode was also only a local warming in the North Atlantic and northern Europe. Global temperatures over this interval did not warm at all, and actually cooled by more than 1°C. Likewise, the warmest period of the last 10,000 years was the Holocene Climatic Optimum ( 5,000-9,000 B.C.E.) when warmer and wetter conditions in Eurasia contributed to the rise of the first great civilizations in Egypt, Mesopotamia, the Indus Valley, and China. This was largely a Northern Hemisphere-Eurasian phenomenon, with 2-3°C warming in the Arctic and northern Europe. But there was almost no warming in the tropics, and cooling or no change in the Southern Hemisphere.[ 8] From a Eurocentric viewpoint, these warming events seemed important, but on a global scale the effect was negligible. In addition, neither of these warming episodes is related to increasing greenhouse gases. The Holocene Climatic Optimum, in fact, is predicted by the Milankovitch cycles, since at that time the axial tilt of the earth was 24°, its steepest value, meaning the Northern Hemisphere got more solar radiation than normal -- but the Southern Hemisphere less, so the two balanced. By contrast, not only is the warming observed in the last 200 years much greater than during these previous episodes, but it is also global and bipolar, so it is not a purely local effect. The warming that ended the Little Ice Age (from the mid-1700s to the late 1800s) was due to increased solar radiation prior to 1940. Since 1940, however, the amount of solar radiation has been dropping, so the only candidate remaining for the post-1940 warming is carbon dioxide.[ 9] "It's just the sun, or cosmic rays, or volcanic activity or methane." Nope, sorry. The amount of heat that the sun provides has been decreasing since 1940,[ 10] just the opposite of the critics' claims (Fig. 3). There is no evidence of an increase in cosmic ray particles during the past century.[ 11] Nor is there any clear evidence that large-scale volcanic events (such as the 1815 eruption of Tambora in Indonesia, which changed global climate for about a year) have any long-term effects that would explain 200 years of warming and carbon dioxide increase. Volcanoes erupt only 0.3 billion tonnes of carbon dioxide each year, but humans emit over 29 billion tonnes a year,[ 12] roughly 100 times as much. Clearly, we have a bigger effect. Methane is a more powerful greenhouse gas, but there is 200 times more carbon dioxide than methane, so carbon dioxide is still the most important agent.[ 13] Every other alternative has been looked at and can be ruled out. The only clear-cut relationship is between human-caused carbon dioxide increase and global warming. \* "The climate records since 1995 (or 1998) show cooling." That's simply untrue. The only way to support this argument is to cherry-pick the data.[ 14] Over the short term, there was a slight cooling trend from 1998-2000, but only because 1998 was a record-breaking El Nino year, so the next few years look cooler by comparison (Fig. 4). But since 2002, the overall long-term trend of warming is unequivocal. All of the 16 hottest years ever recorded on a global scale have occurred in the last 20 years. They are (in order of hottest first): 2010, 2009, 1998, 2005, 2003, 2002, 2004, 2006, 2007, 2001, 1997, 2008, 1995, 1999, 1990, and 2000.[ 15] In other words, every year since 2000 has been on the Top Ten hottest years list. The rest of the top 16 include 1995, 1997, 1998, 1999, and 2000. Only 1996 failed to make the list (because of the short-term cooling mentioned already). \* "We had record snows in the winter of 2009-2010, and also in 2010-2011." So what? This is nothing more than the difference between weather (short-term seasonal changes) and climate (the long-term average of weather over decades and centuries and longer). Our local weather tells us nothing about another continent, or the global average; it is only a local effect, determined by short-term atmospheric and oceano-graphic conditions.[ 16] In fact, warmer global temperatures mean more moisture in the atmosphere, which increases the intensity of normal winter snowstorms. In this particular case, the climate change critics forget that the early winter of November-December 2009 was actually very mild and warm, and then only later in January and February did it get cold and snow heavily. That warm spell in early winter helped bring more moisture into the system, so that when cold weather occurred, the snows were worse. In addition, the snows were unusually heavy only in North America; the rest of the world had different weather, and the global climate was warmer than average. Also, the summer of 2010 was the hottest on record, breaking the previous record set in 2009. \* "Carbon dioxide is good for plants, so the world will be better off." Who do they think they're kidding? The Competitive Enterprise Institute (funded by oil and coal companies and conservative foundations[ 17]) has run a series of shockingly stupid ads concluding with the tag line "Carbon dioxide: they call it pollution, we call it life." Anyone who knows the basic science of earth's atmosphere can spot the gross inaccuracies in this ad.[ 18] True, plants take in carbon dioxide that animals exhale, as they have for millions of years. But the whole point of the global warming evidence (as shown from ice cores) is that the delicate natural balance of carbon dioxide has been thrown off balance by our production of too much of it, way in excess of what plants or the oceans can handle. As a consequence, the oceans are warming[ 19, 20] and absorbing excess carbon dioxide making them more acidic. Already we are seeing a shocking decline in coral reefs ("bleaching") and extinctions in many marine ecosystems that can't handle too much of a good thing. Meanwhile, humans are busy cutting down huge areas of temperate and tropical forests, which not only means there are fewer plants to absorb the gas, but the slash and burn practices are releasing more carbon dioxide than plants can keep up with. There is much debate as to whether increased carbon dioxide might help agriculture in some parts of the world, but that has to be measured against the fact that other traditional "breadbasket" regions (such as the American Great Plains) are expected to get too hot to be as productive as they are today. The latest research[ 21] actually shows that increased carbon dioxide inhibits the absorption of nitrogen into plants, so plants (at least those that we depend upon today) are not going to flourish in a greenhouse world. It is difficult to know if those who tell the public otherwise are ignorant of basic atmospheric science and global geochemistry, or if they are being cynically disingenuous. \* "I agree that climate is changing, but I'm skeptical that humans are the main cause, so we shouldn't do anything." This is just fence sitting. A lot of reasonable skeptics deplore the right wing's rejection of the reality of climate change, but still want to be skeptical about the cause. If they want proof, they can examine the huge array of data that points directly to human caused global warming.[ 22] We can directly measure the amount of carbon dioxide humans are producing, and it tracks exactly with the amount of increase in atmospheric carbon dioxide. Through carbon isotope analysis, we can show that this carbon dioxide in the atmosphere is coming directly from our burning of fossil fuels, not from natural sources. We can also measure the drop in oxygen as it combines with the increased carbon levels to produce carbon dioxide. We have satellites in space that are measuring the heat released from the planet and can actually see the atmosphere getting warmer. The most crucial evidence emerged only within the past few years: climate models of the greenhouse effect predict that there should be cooling in the stratosphere (the upper layer of the atmosphere above 10 km or 6 miles in elevation), but warming in the troposphere (the bottom layer below 10 km or 6 miles), and that's exactly what our space probes have measured. Finally, we can rule out any other suspects (see above): solar heat is decreasing since 1940, not increasing, and there are no measurable increases in cosmic rays, methane, volcanic gases, or any other potential cause. Face it -- it's our problem. Why Do People Continue to Question the Reality of Climate Change? Thanks to all the noise and confusion over climate change, the general public has only a vague idea of what the debate is really about, and only about half of Americans think global warming is real or that we are to blame.[ 23] As in the evolution/creationism debate, the scientific community is virtually unanimous on what the data demonstrate about anthropogenic global warming. This has been true for over a decade. When science historian Naomi Oreskes[ 24] surveyed all peer-reviewed papers on climate change published between 1993 and 2003 in the world's leading scientific journal, Science, she found that there were 980 supporting the idea of human-induced global warming and none opposing it. In 2009, Doran and Kendall Zimmerman[ 25] surveyed all the climate scientists who were familiar with the data. They found that 95-99% agreed that global warming is real and human caused. In 2010, the prestigious Proceedings of the National Academy of Sciences published a study that showed that 98% of the scientists who actually do research in climate change are in agreement over anthropogenic global warming.[ 26] Every major scientific organization in the world has endorsed the conclusion of anthropogenic climate change as well. This is a rare degree of agreement within such an independent and cantankerous group as the world's top scientists. This is the same degree of scientific consensus that scientists have achieved over most major ideas, including gravity, evolution, and relativity. These and only a few other topics in science can claim this degree of agreement among nearly all the world's leading scientists, especially among everyone who is close to the scientific data and knows the problem intimately. If it were not such a controversial topic politically, there would be almost no interest in debating it since the evidence is so clear-cut. If the climate science community speaks with one voice (as in the 2007 IPCC report, and every report since then), why is there still any debate at all? The answer has been revealed by a number of investigations by diligent reporters who got past the PR machinery denying global warming, and uncovered the money trail. Originally, there were no real "dissenters" to the idea of global warming by scientists who are actually involved with climate research. Instead, the forces with vested interests in denying global climate change (the energy companies, and the "free-market" advocates) followed the strategy of tobacco companies: create a smokescreen of confusion and prevent the American public from recognizing scientific consensus. As the famous memo[ 27] from the tobacco lobbyists said "Doubt is our product." The denialists generated an anti-science movement entirely out of thin air and PR. The evidence for this PR conspiracy has been well documented in numerous sources. For example, Oreskes and Conway revealed from memos leaked to the press that in April 1998 the right-wing Marshall Institute, SEPP (Fred Seitz's lobby that aids tobacco companies and polluters), and ExxonMobil, met in secret at the American Petroleum Institute's headquarters in Washington, D.C. There they planned a $20 million campaign to get "respected scientists" to cast doubt on climate change, get major PR efforts going, and lobby Congress that global warming isn't real and is not a threat. The right-wing institutes and the energy lobby beat the bushes to find scientists -- any scientists -- who might disagree with the scientific consensus. As investigative journalists and scientists have documented over and over again,[ 28] the denialist conspiracy essentially paid for the testimony of anyone who could be useful to them. The day that the 2007 IPCC report was released (Feb. 2, 2007), the British newspaper The Guardian reported that the conservative American Enterprise Institute (funded largely by oil companies and conservative think tanks) had offered $10,000 plus travel expenses to scientists who would write negatively about the IPCC report.[ 29] In February 2012, leaks of documents from the denialist Heartland Institute revealed that they were trying to influence science education, suppress the work of scientists, and had paid off many prominent climate deniers, such as Anthony Watts, all in an effort to circumvent the scientific consensus by doing an "end run" of PR and political pressure. Other leaks have shown 9 out of 10 major climate deniers are paid by ExxonMobil.[ 30] We are accustomed to hired-gun "experts" paid by lawyers to muddy up the evidence in the case they are fighting, but this is extraordinary -- buying scientists outright to act as shills for organizations trying to deny scientific reality. With this kind of money, however, you can always find a fringe scientist or crank or someone with no relevant credentials who will do what they're paid to do. Fishing around to find anyone with some science background who will agree with you and dispute a scientific consensus is a tactic employed by the creationists to sound "scientific". The NCSE created a satirical "Project Steve,"[ 31] which demonstrated that there were more scientists who accept evolution named "Steve" than the total number of "scientists who dispute evolution". It may generate lots of PR and a smokescreen to confuse the public, but it doesn't change the fact that scientists who actually do research in climate change are unanimous in their insistence that anthropogenic global warming is a real threat. Most scientists I know and respect work very hard for little pay, yet they still cannot be paid to endorse some scientific idea they know to be false. The climate deniers have a lot of other things in common with creationists and other anti-science movements. They too like to quote someone out of context ("quote mining"), finding a short phrase in the work of legitimate scientists that seems to support their position. But when you read the full quote in context, it is obvious that they have used the quote inappropriately. The original author meant something that does not support their goals. The "Climategate scandal" is a classic case of this. It started with a few stolen emails from the Climate Research Unit of the University of East Anglia. If you read the complete text of the actual emails[ 32] and comprehend the scientific shorthand of climate scientists who are talking casually to each other, it is clear that there was no great "conspiracy" or that they were faking data. All six subsequent investigations have cleared Philip Jones and the other scientists of the University of East Anglia of any wrongdoing or conspiracy.[ 33] Even if there had been some conspiracy on the part of these few scientists, there is no reason to believe that the entire climate science community is secretly working together to generate false information and mislead the public. If there's one thing that is clear about science, it's about competition and criticism, not conspiracy and collusion. Most labs are competing with each other, not conspiring together. If one lab publishes a result that is not clearly defensible, other labs will quickly correct it. As James Lawrence Powell wrote: Scientists…show no evidence of being more interested in politics or ideology than the average American. Does it make sense to believe that tens of thousands of scientists would be so deeply and secretly committed to bringing down capitalism and the American way of life that they would spend years beyond their undergraduate degrees working to receive master's and Ph.D. degrees, then go to work in a government laboratory or university, plying the deep oceans, forbidding deserts, icy poles, and torrid jungles, all for far less money than they could have made in industry, all the while biding their time like a Russian sleeper agent in an old spy novel? Scientists tend to be independent and resist authority. That is why you are apt to find them in the laboratory or in the field, as far as possible from the prying eyes of a supervisor. Anyone who believes he could organize thousands of scientists into a conspiracy has never attended a single faculty meeting.[ 34] There are many more traits that the climate deniers share with the creationists and Holocaust deniers and others who distort the truth. They pick on small disagreements between different labs as if scientists can't get their story straight, when in reality there is always a fair amount of give and take between competing labs as they try to get the answer right before the other lab can do so. The key point here is that when all these competing labs around the world have reached a consensus and get the same answer, there is no longer any reason to doubt their common conclusion. The anti-scientists of climate denialism will also point to small errors by individuals in an effort to argue that the entire enterprise cannot be trusted. It is true that scientists are human, and do make mistakes, but the great power of the scientific method is that peer review weeds these out, so that when scientists speak with consensus, there is no doubt that their data are checked carefully Finally, a powerful line of evidence that this is a purely political controversy, rather than a scientific debate, is that the membership lists of the creationists and the climate deniers are highly overlapping. Both anti-scientific dogmas are fed to their overlapping audiences through right-wing media such as Fox News, Glenn Beck, and Rush Limbaugh. Just take a look at the "intelligent-design" cre-ationism website for the Discovery Institute. Most of the daily news items lately have nothing to do with creationism at all, but are focused on climate denial and other right-wing causes.[ 35] If the data about global climate change are indeed valid and robust, any qualified scientist should be able to look at them and see if the prevailing scientific interpretation holds up. Indeed, such a test took place. Starting in 2010, a group led by U.C. Berkeley physicist Richard Muller re-examined all the temperature data from the NOAA, East Anglia Hadley Climate Research Unit, and the Goddard Institute of Space Science sources. Even though Muller started out as a skeptic of the temperature data, and was funded by the Koch brothers and other oil company sources, he carefully checked and re-checked the research himself. When the GOP leaders called him to testify before the House Science and Technology Committee in spring 2011, they were expecting him to discredit the temperature data. Instead, Muller shocked his GOP sponsors by demonstrating his scientific integrity and telling the truth: the temperature increase is real, and the scientists who have demonstrated that the climate is changing are right (Fig. 5). In the fall of 2011, his study was published, and the conclusions were clear: global warming is real, even to a right-wing skeptical scientist. Unlike the hired-gun scientists who play political games, Muller did what a true scientist should do: if the data go against your biases and preconceptions, then do the right thing and admit it -- even if you've been paid by sponsors who want to discredit global warming. Muller is a shining example of a scientist whose integrity and honesty came first, and did not sell out to the highest bidder.[ 36] \* Science and Anti-Science The conclusion is clear: there's science, and then there's the anti-science of global warming denial. As we have seen, there is a nearly unanimous consensus among climate scientists that anthropogenic global warming is real and that we must do something about it. Yet the smokescreen, bluster and lies of the deniers has created enough doubt so that only half of the American public is convinced the problem requires action. Ironically, the U.S. is almost alone in questioning its scientific reality. International polls taken of 33,000 people in 33 nations in 2006 and 2007 show that 90% of their citizens regard climate change as a serious problem[ 37] and 80% realize that humans are the cause of it.[ 38] Just as in the case of creationism, the U.S. is out of step with much of the rest of the world in accepting scientific reality. It is not just the liberals and environmentalists who are taking climate change seriously. Historically conservative institutions (big corporations such as General Electric and many others such as insurance companies and the military) are already planning on how to deal with global warming. Many of my friends high in the oil companies tell me of the efforts by those companies to get into other forms of energy, because they know that cheap oil will be running out soon and that the effects of burning oil will make their business less popular. BP officially stands for "British Petroleum," but in one of their ad campaigns about 5 years ago, it stood for "Beyond Petroleum."[ 39] Although they still spend relatively little of their total budgets on alternative forms of energy, the oil companies still see the handwriting on the wall about the eventual exhaustion of oil -- and they are acting like any company that wants to survive by getting into a new business when the old one is dying. The Pentagon (normally not a left-wing institution) is also making contingency plans for how to fight wars in an era of global climate change, and analyzing what kinds of strategic threats might occur when climate change alters the kinds of enemies we might be fighting, and water becomes a scarce commodity. The New York Times reported[ 40] that in December 2008, the National Defense University outlined plans for military strategy in a greenhouse world. To the Pentagon, the big issue is global chaos and the potential of even nuclear conflict. The world must "prepare for the inevitable effects of abrupt climate change -- which will likely come [the only question is when] regardless of human activity." Insurance companies have no political axe to grind. If anything, they tend to be on the conservative side. They are simply in the business of assessing risk in a realistic fashion so they can accurately gauge their future insurance policies and what to charge for them. Yet they are all investing heavily in research on the disasters and risks posed by climatic change. In 2005, a study commissioned by the re-insurer Swiss Re said, "Climate change will significantly affect the health of humans and ecosystems and these impacts will have economic consequences."[ 41] Some people may still try to deny scientific reality, but big businesses like oil and insurance and conservative institutions like the military cannot afford to be blinded or deluded by ideology. They must plan for the real world that we will be seeing in the next few decades. They do not want to be caught unprepared and harmed by global climatic change when it threatens their survival. Neither can we as a society.

#### Reducing emissions now is critical to prevent catastrophic warming

Nuccitelli 12 – Dana, environmental scientist at a private environmental consulting firm in Sacramento and has a Bachelor's Degree in astrophysics from the University of California at Berkeley, and a Master's Degree in physics from the University of California at Davis, 2012, “Realistically What Might The Future Climate Look Like?”, http://thinkprogress.org/climate/2012/09/01/784931/realistically-what-might-the-future-climate-look-like/

This is Why Reducing Emissions is Critical¶ We’re not yet committed to surpassing 2°C global warming, but as Watson noted, we are quickly running out of time to realistically give ourselves a chance to stay below that ‘danger limit’. However, 2°C is not a do-or-die threshold. Every bit of CO2 emissions we can reduce means that much avoided future warming, which means that much avoided climate change impacts. As Lonnie Thompson noted, the more global warming we manage to mitigate, the less adaption and suffering we will be forced to cope with in the future.¶ Realistically, based on the current political climate (which we will explore in another post next week), limiting global warming to 2°C is probably the best we can do. However, there is a big difference between 2°C and 3°C, between 3°C and 4°C, and anything greater than 4°C can probably accurately be described as catastrophic, since various tipping points are expected to be triggered at this level. Right now, we are on track for the catastrophic consequences (widespread coral mortality, mass extinctions, hundreds of millions of people adversely impacted by droughts, floods, heat waves, etc.). But we’re not stuck on that track just yet, and we need to move ourselves as far off of it as possible by reducing our greenhouse gas emissions as soon and as much as possible.¶ There are of course many people who believe that the planet will not warm as much, or that the impacts of the associated climate change will be as bad as the body of scientific evidence suggests. That is certainly a possiblity, and we very much hope that their optimistic view is correct. However, what we have presented here is the best summary of scientific evidence available, and it paints a very bleak picture if we fail to rapidly reduce our greenhouse gas emissions.¶ If we continue forward on our current path, catastrophe is not just a possible outcome, it is the most probable outcome. And an intelligent risk management approach would involve taking steps to prevent a catastrophic scenario if it were a mere possibility, let alone the most probable outcome. This is especially true since the most important component of the solution – carbon pricing – can be implemented at a relatively low cost, and a far lower cost than trying to adapt to the climate change consequences we have discussed here (Figure 4).¶ Climate contrarians will often mock ‘CAGW’ (catastrophic anthropogenic global warming), but the sad reality is that CAGW is looking more and more likely every day. But it’s critical that we don’t give up, that we keep doing everything we can do to reduce our emissions as much as possible in order to avoid as many catastrophic consequences as possible, for the sake of future generations and all species on Earth. The future climate will probably be much more challenging for life on Earth than today’s, but we still can and must limit the damage.

#### Extinction

Flournoy 12 –Dan Flournoy, PhD and MA from the University of Texas, Former Dean of the University College at Ohio University, Former Associate Dean at State University of New York and Case Institute of Technology, Project Manager for University/Industry Experiments for the NASA ACTS Satellite, Currently Professor of Telecommunications at Scripps College of Communications @ Ohio University, January 2012, "Solar Power Satellites," Springer Briefs in Space Development

In the Online Journal of Space Communication , Dr. Feng Hsu, a NASA scientist at Goddard Space Flight Center, a research center in the forefront of science of space and Earth, writes, “The **evidence of global warming is alarming**,” noting the potential for a catastrophic planetary climate change is real and troubling (Hsu 2010 ) . Hsu and his NASA colleagues were engaged in monitoring and analyzing climate changes on a global scale, through which they received first-hand scientific information and data relating to global warming issues, including the dynamics of polar ice cap melting. After discussing this research with colleagues who were world experts on the subject, he wrote: I now have no doubt global temperatures are rising, and that global warming is a serious problem confronting all of humanity. No matter whether these trends are due to human interference or to the cosmic cycling of our solar system, there are two basic facts that are crystal clear: (a) there is overwhelming scientific evidence showing **positive correlations between the level of CO2 concentrations** in Earth’s atmosphere **with respect to** the historical **fluctuations of global temperature** changes; and (b) the overwhelming majority of the world’s scientific community is in agreement about the risks of a potential catastrophic global climate change. That is, if we humans continue to ignore this problem and do nothing, if we continue dumping huge quantities of greenhouse gases into Earth’s biosphere, humanity will be at dire risk (Hsu 2010 ) . As a technology risk assessment expert, Hsu says he can show with some confidence that the planet will face more risk doing nothing to curb its fossil-based energy addictions than it will in making a fundamental shift in its energy supply. “This,” he writes, “is because the risks of a catastrophic anthropogenic climate change can be potentially the **extinction of human species**, a risk that is simply too high for us to take any chances” (Hsu 2010 ) . It was this NASA scientist’s conclusion that humankind must now embark on the next era of “sustainable energy consumption and re-supply, the most obvious source of which is the mighty energy resource of our Sun” (Hsu 2010 ) (Fig . 2.1 ).

#### CO2 emissions will destroy the ocean---extinction

Sify, Citing Professors @ University of Queensland and North Carolina, 10 (Sify News, Citing Ove Hoegh-Gulberg, Professor @ University of Queensland and Director of the Global Change Institute AND Citing John Bruno, Associate Professor of Marine Science @ UNC, “Could unbridled climate changes lead to human extinction?,” June 19th, <http://www.sify.com/news/could-unbridled-climate-changes-lead-to-human-extinction-news-international-kgtrOhdaahc.html>)

Sydney: Scientists have sounded alarm bells about how growing concentrations of greenhouse gases are driving irreversible and dramatic changes in the way the oceans function, providing evidence that humankind could well be on the way to the next great extinction. The findings of the comprehensive report: 'The impact of climate change on the world's marine ecosystems' emerged from a synthesis of recent research on the world's oceans, carried out by two of the world's leading marine scientists. One of the authors of the report is Ove Hoegh-Guldberg, professor at The University of Queensland and the director of its Global Change Institute (GCI). 'We may see sudden, unexpected changes that have serious ramifications for the overall well-being of humans, including the capacity of the planet to support people. This is further evidence that we are well on the way to the next great extinction event,' says Hoegh-Guldberg. 'The findings have enormous implications for mankind, particularly if the trend continues. The earth's ocean, which produces half of the oxygen we breathe and absorbs 30 per cent of human-generated carbon dioxide, is equivalent to its heart and lungs. This study shows worrying signs of ill-health. It's as if the earth has been smoking two packs of cigarettes a day!,' he added. 'We are entering a period in which the ocean services upon which humanity depends are undergoing massive change and in some cases beginning to fail', he added.

#### Warming magnifies all impacts and makes global conflicts inevitable

Ginsborg et al. 12 – Mikkel Funder, Signe Marie Cold-Ravnkilde and Ida Peters Ginsborg - in collaboration with Nanna Callisen Bang, Denmark Institute for International Studies, 2012, "ADDRESSING CLIMATE CHANGE AND CONFLICT IN DEVELOPMENT COOPERATION EXPERIENCES FROM NATURAL RESOURCE MANAGEMENT" www.diis.dk/graphics/Publications/Reports2012/RP2012-04-Addressing-climate-change\_web.jpg.pdf

2.2 Climate change as a conﬂict multiplier¶ Climate change is therefore best seen as a conﬂict multiplier, rather than as a major direct cause of conﬂict in itself. **Climate change may aggravate and extend the scope of existing conﬂicts, or trigger underlying and latent conﬂicts to break out into the open**. ¶ Previous studies have identiﬁed a number of areas in which **climate change may contribute to a worsening of conﬂicts** (Brown & Crawford 2009). These include:¶ • Land and water access. Access and use rights to land are a key feature in most situations where climate change has contributed to natural resource conﬂicts so far. Climate change can **intensify existing conﬂicts over land**, as land becomes less fertile or is ﬂooded, or if existing resource sharing arrangements between diﬀerent users and land use practices are disrupted. **In some parts of Africa, climate change may lead to a decline in available water resources of some 10–20% by the end of the century** (op cit.). This may **intensify existing competition** for access to water at intra-state and/or subnational levels. ¶ • Food security. Reduced rainfall and rising sea levels may lead to a decline in agricultural production and a substantial loss of arable land in some parts of Africa. Reduced yields for own consumption and increasing domestic food prices may in some cases lead to **civil unrest, and competition over access to land may intensify**.¶ • Migration and displacement. In some cases, increased scarcity of and competition over access to water and arable land may contribute to internal or regional migration, and disasters such as ﬂoods may lead to temporary or long-term local displacement. This may in turn **strengthen conﬂicts between host societies/communities and migrants** looking for access to new land and resources. ¶ • Increasing inequality and injustice. Through processes such as the above, some population groups may be particularly hard hit, leading to increased inequality and a sense of injustice. This may **intensify existing grievances and disputes** between natural resource users and/or between resource users and outside actors such as governments – thereby increasing the risk and intensity of conﬂict.

#### SPS facilitates transition away from fossil fuels

Flournoy 12 – Don Flournoy, PhD and MA from the University of Texas, Former Dean of the University College at Ohio University, Former Associate Dean at State University of New York and Case Institute of Technology, Project Manager for University/Industry Experiments for the NASA ACTS Satellite, Currently Professor of Telecommunications at Scripps College of Communications at Ohio University, "Solar Power Satellites," January, Springer Briefs in Space Development, Book

One of the obvious opportunities for solar power satellites is to become an **on-demand source of electric power for terrestrial utilities.** Once Sunsat providers can demonstrate the capability to direct continuous radio or light frequency power beams to production sites, the owners of coal-fired generation stations will quickly discover the value of this service. The same will also be true of **nuclear, gas-fired, biomass** and other such plants. With electrical power production ratings of 1 gw or more, solar satellite systems can be designed to meet the short- and long-term **needs of the terrestrial power plants at their** existing locations, at first to complement but eventually to replace their current fuel feedstocks. An attractive feature of this approach for space solar power investors is that the utilities have a predictable need for energy in great quantities. Since the power utilities are already connected to an electrical power grid, often covering regions larger than a single state or nation, the Sunsat people won’t have to also be in the terrestrial distribution business. Whether producing power from coal, nuclear, gas, biomass or other sources, **power utilities can be expected to step forward as early users** of this new space asset to begin reducing their mining and transportation costs. The use of scrubbers and filters will be greatly reduced, if needed at all. Problems related to spent fuel disposal and toxic waste management should be fewer. But mainly the utilities will become clients (and possibly investors) in the Sunsat business to guarantee a **sustainable night-and-day fuel source.**

#### Fossil fuel dependence is unsustainable---only SPS solves world energy needs and can be exported globally

Dvorsky 11-28 – George Dvorsky, writer for Io9, a daily science and technology publication, November 28th, 2012, "How space-based solar power will solve all our energy needs" io9.com/5963955/how-space+based-solar-power-will-solve-all-our-energy-needs

Humanity's demand for energy is growing at an astonishing rate. Combine this with an ever-dwindling supply of fossil fuels, and it becomes painfully clear that something innovative and powerful is required. There's one high-tech proposal that holds tremendous promise — an idea that has been around since the late 1960s. Here's how space-based solar power will **eventually** solve all our energy needs.¶ Humans needs more power¶ Assuming that economic progress and globalization continues at its current pace, **we'll need to produce twice the amount of energy that's consumed today by the 2030s — what will reach a monumental 220 trillion kiloWatt hours per year. And by the end of the century, we'll need four times the current rate of consumption.**¶ **Just as importantly, we're also going to have to kick the fossil fuel habit — and not only because** it'll eventually run out**. Rising CO2 emissions are wreaking havoc on the Earth's atmosphere, what's creating environmentally deleterious side-effects at a rate faster than expected.**¶ Moreover, if greenhouse gases are to be brought under control over the course of the next several decades, we'll need to get upwards of 90% of all our energy from either renewable or nuclear sources.¶ While there are a number of proposals on the table for how we might be able to meet these challenges, **none** really **appear to be truly viable**.¶ Except for solar powered satellites.¶ Obvious benefits¶ A closer look at a space-based solution yields a lengthy list of advantages.¶ Solar powered satellites **don't produce any greenhouse gases**, nor do they take up valuable real estate on Earth. Once the initial costs are met, they would be relatively cheap to maintain; the solar modules used for generating solar energy have a long service life, not to mention the astounding ROI that would come from a virtually unlimited energy source.¶ Additionally, they're not constrained by night/day cycles, the weather, or the changing seasons. And indeed, they would be much more efficient than any kind of ground-based station. The collection of solar energy in space is seven times greater per unit area than on the surface of the planet. Moreover, **the amount of solar energy available up there is staggering — on the order of** billions **of times greater than what we draw today; the Earth receives only one part in 2.3 billion of the Sun's output**. The potential for scalability is enormous, to say the least.¶ Solar powered satellites won't be prone to terrorist attacks and they'll **reduce geopolitical pressure for oil.** According to futurist Keith Henson, space-based solar could be used to power vehicles, like electric cars, or by enabling the production of synthetic fuels — which at a penny per kiloWatt hour would result in gasoline that costs one dollar a gallon.¶ At the same time, space-based solar would provide true energy independence for those nations who choose to implement it. And on top of that, the energy could be exported to virtually anywhere in the world; it would be especially valuable for isolated areas of the globe, including Africa and India.¶ Lastly, **space-based solar power would also yield** tremendous benefits to human and robotic space exploration**, including the powering of off-planet colonies on the Moon, Mars, and space stations.** It could also serve as the first seed in the development of a Dyson Sphere — a massive array of solar collectors that would completely envelope the sun at a distance of about 1 AU.¶ How it's going to work¶ Back in the late 1960s, Peter Glaser proposed the idea of solar powered satellites (SPS), what he envisioned as space-based photovoltaics that could transfer energy wirelessly back down to Earth. His design called for a large platform positioned in space in a high Earth orbit that would continuously collect and convert solar energy into electricity. In turn, that power would be used to drive a wireless power transmission (WPT) that beams the solar energy to receiving stations on Earth — what would be comprised of massive receiving dishes.¶ A number of visionaries have updated Glaser's vision to include the use of a microwave wireless power transmitter. This would involve large discrete structures (like a solar array and transmitter) that would have to be assembled in space. SPS systems could also include a modular electric/diode array laser WPT concept, involving self-assembling solar power-laser-thermal modules. Other designs call for an extremely modular microwave WPT SPS "sandwich structure" concept, requiring a significant number of small solar power-microwave-thermal modules that would be robotically assembled on orbit.¶ But to make it happen, we'll need to develop low-cost, environmentally-friendly launch vehicles. Eventually we'll send the materials up in a space elevator, but until then we'll have to come up with something more efficient. Thankfully, SpaceX and other private firms are already working on more efficient launch solutions.¶ Additionally, we'll require large scale construction and operations stations in orbit — space-based workplaces that would be more complex, larger, and more energy-demanding than the ISS. They would allow for the production of large, simple panels, that are easy to assemble and consist of many identical parts. Eventually, it may be possible to construct an entire flotilla of these solar collectors using materials extracted from asteroids.¶ Design proposals¶ As word gets out about the potential for SPS, and as the technology catches up to the idea, a number of design proposals have been put forth; this isn't just idle speculation anymore — it's something that's just about ready for prime-time.¶ For example, there's SPS-ALPHA (Solar Power Satellite via Arbitrarily Large PHased Array) which is being developed by NASA's John Mankins. Using a "biomimetic" approach, the project calls for huge platforms constructed from tens of thousands of small elements that could deliver tens to thousands of megawatts via wireless power transmission.¶ It would do this by using a large array of individually controlled thin-film mirrors outfitted on the curved surface of a satellite. These adjustable mirrors would intercept and redirect incoming sunlight toward photovoltaic cells affixed to the backside of the solar power satellite's large array. The Earth-pointing side of the array would be tiled with a collection of microwave-power transmission panels that generate the coherent, low-intensity beam of radio frequency energy and transmits that energy to Earth.¶ And what's particularly cool about this concept is that **it would enable the construction of a solar-power satellite that can be assembled entirely from individual system elements that weigh no more than 110 to 440 pounds (**50 **to 200** kilograms**), allowing all pieces to be** mass produced at low cost.

#### Terrestrial alternatives fail---only SPS can meet global demand

Flournoy 12 – Don Flournoy, PhD and MA from the University of Texas, Former Dean of the University College at Ohio University, Former Associate Dean at State University of New York and Case Institute of Technology, Project Manager for University/Industry Experiments for the NASA ACTS Satellite, Currently Professor of Telecommunications at Scripps College of Communications at Ohio University, "Solar Power Satellites," January, Springer Briefs in Space Development, Book

Alternative terrestrial energy is not the complete answer, either. According to Woodcock, the limitation of Earth-based renewable energy sources is that they are not “demand” sources; that is, **they are only intermittently available.** Terrestrial solar power works when the Sun shines. Terrestrial wind power works when the wind blows. Terrestrial hydroelectric power is a way of storing water energy until users demand it. This process can include hydroelectric pumped storage, which is the lifting of water uphill where it is held until released to create electricity as it flows through turbines. But there is little capacity remaining on the planet for hydroelectric installations. Geothermal energy is also way to tap stored energy in the Earth itself. Batteries, water electrolysis and hydrogen storage in fuel cells are other ways to provide storage. But to run a **modern power grid** exclusively (or even largely) on terrestrial renewable energy, he says, would **require enormous amounts of storage**, and **storage is expensive**. Woodcock concludes that [SPS] solar power satellites are a potential solution because they can be positioned in space over a particular location to which they can stream continuous sunlight. Supplying power around the clock, such an energy system can serve as a demand source with very little storage required. He also suggests, given constant solar pointing, the photovoltaic area could probably be reduced by a factor of 10–100 by using concentrators. Land designated for receiving sites might also serve dual or multiple purposes. The National Space Society (NSS) hosts annual conferences that include sessions on space solar power. The organization’s website includes one of the most complete archives on space solar research. It also has taken positions of advocacy, stating that “all viable energy options should be pursued with vigor, [but that] Sun/ Sat power (**SSP) has a number of** substantial advantages over other energy sources.” The NSS lists several of these advantages: • Unlike oil, gas, ethanol and coal, SSP does not emit greenhouse gases. • Unlike nuclear power plants, SSP does not **produce hazardous waste** that needs to be stored and guarded for hundreds of years. • **Unlike terrestrial solar and wind** power plants, **SSP can be available in huge quantities 24-hours-a-day, 7 days a week. It produces regardless of cloud cover, daylight, or wind speed.** • Unlike coal and nuclear fuels, SSP does not require environmentally problematic mining operations. • Unlike nuclear power plants, SSP doesnot **provide** potential **targets for terrorists** (National Space Society 2008 ).

#### The plan solves for global emissions

Kammen 7 – Professor of Public Policy @ UC Berkeley (Daniel, "Green Jobs Created by Global Warming Initiative," September 25th, http://www.unep.org/civil\_society/GCSF9/pdfs/karmen-senate.pdf)

In addition to supporting domestic job creation, clean energy is an important and fastest growing international sector, and one where overseas policy can be used to support poor developing regions – such as Africa (Jacobsen and Kammen, 2007) and Central America – as well as regaining market share in solar, fuel cell and wind technologies, where European nations and Japan have invested heavily and are reaping the benefits of month to year backlogs in clean energy orders. Some of those orders are for U. S. installations, but many more could be if we choose to make clean and green energy a national priority for both domestic installation and overseas export. Technology exports have impacts well beyond domestic job creation. In fact, if properly managed, the development of a thriving ‘cleantech’ sector can address a vital global issues, namely the emissions trajectories of major developing nations. China and India are often singled out for attention as major, emerging global emitters. China, in fact, will become the world’s largest greenhouse emitter in the near future, if it has not already. This fact, is often used – mistakenly in my view – to argue against unilateral climate protection efforts by nations such as the United States.  This view is shortsighted in two vital respects. First, China is demonstrably already suffering from the impacts of fossil fuel use. Crop yields in many parts of China are significantly lower than they would be without the significant sulfur and particulate burden that results from domestic coal combustion. (In fact, coal combustions emissions from China have significant air quality impacts on Japan, and can be measured in the U. S. as well.) Crop losses of over 20% have been reported in part of China, with the decrease unambiguously linked to air pollution. China also experiences significant human health impacts from this pollution burden as well. Second, China has committed, on paper, to a ‘circular economy’ where waste is reduced and overall productivity is enhanced. If the United States were to become a major exporter, or even a partner, in the production of low-emissions technologies – from truly carbon-capture coal-fired power plants, to increased numbers of solar, wind, and biofuel technologies – China would be an eager trading partner, so that they could install increasing numbers of low-emissions technologies. This would directly help the Chinese economy and their environmental and public health situation**.** On both of these grounds, U. S. domestic expansion of the clean energy sector will likely positively impact the ability and the actions of a number of emerging economies to ‘go green’.

### Space Radar Advantage

#### Energy shortages in the Air Force prevent space radar development---SPS is key

David 12 – Leonard David has been reporting on the space industry for more than five decades. He is a winner of last year's National Space Club Press Award and a past editor-in-chief of the National Space Society's Ad Astra and Space World magazines. He has written for SPACE.com since 1999. February 22nd, 2012, "Air Force Eyes Nuclear Reactors, Beamed Power for Spacecraft," [www.space.com/14643-air-force-space-nuclear-reactors-power-beaming.html](http://www.space.com/14643-air-force-space-nuclear-reactors-power-beaming.html)

For example, the Air Force is currently limited to 27 kilowatt (kW) arrays for satellite power. But more power is required for some future space missions, the report states, such as flights currently being eyed by the Air Force, national security organizations and NASA. "Employing larger and more efficient arrays will enable missions that require very high power, **such as** space-based radaror space-based laser missions," the report states.¶ In the long term, the report says, **increased solar cell efficiencies and revolutionary materials foreshadow the potential of 500 kW on-orbit power generation technologies**, "which would be transformational for performing missions from space-based systems."¶ Furthermore, there are other breakthrough space energy technologies that have the potential of achieving up to 70 percent efficiency, the report adds. Examples include quantum dots and dilute nitrides in solar cells. But there are also totally new technologies such as space tethers that could harvest energy from the Earth's geomagnetic field.

#### SPS solves for space radar motive and capability --- key to ISR and space situational awareness

Dinerman 7 – Taylor Dinerman, DoD Consultant, senior editor at the Gatestone Institute in New York. He specializes in the areas of space, missile defense and geopolitics affairs, July 16th, 2007, “Solar power satellites and space radar” <http://integrator.hanscom.af.mil/2007/July/07262007/07262007-16.htm>

One of **the great showstoppers for** the **Space Radar** (SR) program, formerly known as Space Based Radar, **is** **power**. It takes a lot of energy to transmit radar beams powerful enough to track a moving target on Earth from space. What is called the Ground Moving Target Indicator (GMTI) is what makes SR so much better than other space radar systems, such as the recently-launched German SAR-Lupe or the NRO’s Lacrosse system. While many of the details are classified, **the power problem seems to be the main reason that the US Congress, on a bipartisan basis, has been extremely reluctant to fund this program.**¶In order to achieve the power levels needed for an effective GMTI system using current technology, very large solar arrays would be needed. Even if these were to use the new Boeing solar cells that, according to the company, are more than 30% efficient, the arrays would still be much bigger than anything on any operational satellite. Such large arrays would make the SR spacecraft easy targets for enemy antisatellite weapons and would also produce so much drag while in LEO that their lifespan would be shorter—perhaps much shorter—than current-generation reconnaissance satellites.¶ Why, then, does such a system need to rely 100% on its own power? If solar power satellites (SPS) were available in geosynchronous orbit and could beam electricity to the SR satellites in LEO, this might **allow the radar satellites to have as much power as their power control systems and heat radiators could handle**. Power could be transmitted by a tightly focused laser or microwave beam to one or two receptors, integrated into the spacecraft’s bus. If the radar antenna were integrated into the skin of the satellite the way it is on a B-2 bomber, such satellite would be difficult to detect and track.¶ **Using power from an SPS, such a satellite would be able to liberally use its ion engines to change its orbit**. These engines would never be powerful enough to make the kind of quick responsive maneuvers that some space operations commanders would like to see in future LEO-based spacecraft, but they would be a step in the right direction.¶ The demise of the E-10 program that had been intended to replace the Air Force’s JSTARS and AWACS surveillance aircraft has left a hole in future US situational awareness capabilities that neither unmanned aerial vehicles (UAVs), such as the Predator and Global Hawk, **nor existing satellite programs can possibly fill**. Space Radar could do so, but only if the program is restructured to make it at once more ambitious in terms of future capability and less ambitious in terms of near-term operations.

#### Space radar is key to the navy and effective ballistic missile defense

National Research Council 5 – Committee on the Navy's Needs in Space for Providing Future Capabilites, National Research Council. 2005. "The Navy's Needs in Space for Providing Future Capabilities" [www.nap.edu/catalog.php?record\_id=11299](http://www.nap.edu/catalog.php?record_id=11299)

[NSS = Naval Support System]

Today, strike targets are identified, classified, tracked, and geolocated through a combination of sensors on NSS systems, airborne platforms, and naval platforms. NSS and airborne systems are generally used cooperatively to support time-sensitive requirements of strikes. The requirements of the Navy for overland targeting are essentially identical to those of the other Services; however, the Navy will need to carefully manage and guide the course of progress on its requirements for over-water targeting to ensure that they are included in future programs. In particular, many satellite systems do not operate over the open ocean (this includes early plans for the SBR described above)—pointing out the Navy’s need to track even its most basic requirements on availability. During a system’s development and operational phases, technical and funding support is typically needed to improve performance and adapt the system to changing threat and target conditions. Additionally, **the Navy will need to explore the potential of other new** space ISR capabilities, such as hyperspectral imaging to assist in separating targets from background and camouflage, especially in the open-ocean and littoral areas unique to the operations of Navy and Marine Corps forces. In general, the future FIA and SBR systems could greatly enhance NSS support **for Sea Strike by— Improving persistence through increased numbers of satellites, and Improving image resolution, thereby strengthening the ability of naval forces to identify, track, and target terrorist and other small-unit threats.**¶ Sea Shield¶ To maintain littoral superiority for naval and joint force components, ISR resources must be able to support protection against conventional and unconventional (i.e., chemical, biological, radiological, nuclear, and environmental) threats from special operations and terrorist forces. Information from space-, ground-, and sea-based and airborne ISR resources need to be used, where possible, to identify and locate near-horizon and over-the-horizon threats, to enable afloat operations by supporting self-defense against and/or neutralization of undersea threats (including those from submarines, mines, submerged barriers, and obstacles), and to provide defense over land and over sea against theater air and ballistic missile threats. **The support of all of these defensive operations currently challenges NSS ISR resources and will continue to do so for the foreseeable future.** One of the limitations of current NSS systems in contributing significantly to defensive antisubmarine warfare (ASW) and countermine operations is the lack of persistence in making observations of offensive enemy operations. It is possible to observe enemy submarines at shallow depth from space, and also to observe the laying of mine fields or the navigation by enemy combatants through mine fields they have laid. However, **the long time lapses between overhead satellite observations by** current **NSS systems do not support the near-continuous observations needed**.3 As described above, the future FIA and SBR systems, if fielded, should significantly improve overall observational persistence.¶ Today, most operations rely largely on theater assets (the SPY-1D radar system on the Navy’s Aegis ships, sensors on E-2C and E-3 aircraft, and so on) to provide the ISR information necessary to support Sea Shield operations effectively. For surface warfare, **Sea Shield requires that ISR capability provide near-horizon and over-the-horizon warning, tracking, and targeting information against surface targets; these requirements are similar in many regards to the Sea Strike capability needs.** In addition to the improvements noted above that would enhance NSS support for Sea Strike, the future FIA and **SBR systems should greatly improve NSS support for Sea Shield by— Increasing coverage areas, thereby extending the engagement distance to distances beyond the threat range from enemy combatants; and Establishing a space-based GMTI capability (with SBR), thereby enabling space-based, near-continuous tracking of moving surface vessels**. Similarly, undersea warfare support can be extended in area by improved persistence of SBR and FIA, provided that these systems are designed and operated specifically to address the special needs of large-area search in ocean areas. These forms of support are just the beginning, however, and long-term S&T is needed in support of effective naval specification and use of SBR. As an example, further S&T funding could be provided to support a comparison of the expected performance of radars with which the Navy is familiar (such as the E-2C aircraft radar and its upgrades) with the various options for SBR. Such analysis would help establish and maintain the connection between specialized maritime radar experts, the operational Navy, and sthe SBR office.

#### Collapse of the naval effectiveness causes great power wars

Conway et al. 7 [James T., General, U.S. Marine Corps, Gary Roughead, Admiral, U.S. Navy, Thad W. Allen, Admiral, U.S. Coast Guard, “A Cooperative Strategy for 21st Century Seapower,” October, http://www.navy.mil/maritime/MaritimeStrategy.pdf]

No other disruption is as potentially disastrous to global stability as war among major powers. Maintenance and extension of this Nation’s comparative seapower advantage is a key component of deterring major power war. While war with another great power strikes many as improbable, the near-certainty of its ruinous effects demands that it be actively deterred using all elements of national power. The expeditionary character of maritime forces—our lethality, global reach, speed, endurance, ability to overcome barriers to access, and operational agility—provide the joint commander with a range of deterrent options. We will pursue an approach to deterrence that includes a credible and scalable ability to retaliate against aggressors conventionally, unconventionally, and with nuclear forces. Win our Nation’s wars. In times of war, our ability to impose local sea control, overcome challenges to access, force entry, and project and sustain power ashore, makes our maritime forces an indispensable element of the joint or combined force. This expeditionary advantage must be maintained because it provides joint and combined force commanders with freedom of maneuver. Reinforced by a robust sealift capability that can concentrate and sustain forces, sea control and power projection enable extended campaigns ashore.

#### Naval power is key to hegemony---no defense applies

Cropsey 12 – Seth Cropsey, Senior Fellow at the Hudson Institute, 4/18/12, “The U.S. Navy Shipbuilding Plan: Assumptions and Associated Risks to National Security,” http://www.hudson.org/files/publications/SethCropsey--USNavyShipbuildingPlan--Testimony041812.pdf

Unlike the U.S. whose **seapower has protected global sea lanes** that other states have used to their benefit China has a different set of values. It views with suspicion a liberal trading system notwithstanding the benefits received from it. China’s friends include Iran and North Korea. Beijing is a poor candidate to support the international order that has been the keel of U.S. foreign and security policy for a century. Waning U.S. seapower is an invitation that China will regard as a complement to its rising military and navy in particular. It foreshadows a coercive resolution of territorial disputes in the South China Sea, the likelihood of an increased regional arms race, and the troubling international perception that the U.S. is—or has—abandoned its role as a great power. ¶ American seapower is the strategic keel of our foreign and security policy. Reducing it would be an exercise of history-making shortsightedness. Restoring it would be an act of statesmanship from which Americans and all who cherish political liberty would benefit for the remainder of this century. Thank you.

#### Hegemony prevents global nuclear war

Barnett 11 – Thomas P.M. Barnett is Former Senior Strategic Researcher and Professor in the Warfare Analysis & Research Department, Center for Naval Warfare Studies, U.S. Naval War College American military geostrategist and Chief Analyst at Wikistrat., worked as the Assistant for Strategic Futures in the Office of Force Transformation in the Department of Defense, March 7th, 2011, “The New Rules: Leadership Fatigue Puts U.S., and Globalization, at Crossroads,” http://www.worldpoliticsreview.com/articles/8099/the-new-rules-leadership-fatigue-puts-u-s-and-globalization-at-crossroads

It is worth first examining the larger picture: We live in a time of arguably the greatest structural change in the global order yet endured, with this historical moment's most amazing feature being its relative and absolute lack of mass violence. That is something to consider when Americans contemplate military intervention in Libya, because if we do take the step to prevent larger-scale killing by engaging in some killing of our own, we will not be adding to some fantastically imagined global death count stemming from the ongoing "megalomania" and "evil" of American "empire." We'll be engaging in the same sort of system-administering activity that has marked our stunningly successful stewardship of global order since World War II. Let me be more blunt: As the guardian of globalization, the U.S. military has been the greatest force for peace the world has ever known. Had America been removed from the global dynamics that governed the 20th century, the mass murder never would have ended. Indeed, it's entirely conceivable there would now be no identifiable human civilization left, once nuclear weapons entered the killing equation. But the world did not keep sliding down that path of perpetual war. Instead, America stepped up and changed everything by ushering in our now-perpetual great-power peace. We introduced the international liberal trade order known as **globalization** and played loyal Leviathan over its spread. What resulted was the collapse of empires, an explosion of **democracy,** the persistent spread of **human rights**, the liberation of women, the doubling of life expectancy, a roughly 10-fold increase in adjusted global GDP and a **profound** and persistent **reduction in** battle deaths from state-based **conflicts**. That is what American "hubris" actually delivered. Please remember that the next time some TV pundit sells you the image of "unbridled" American military power as the cause of global disorder instead of its cure. With self-deprecation bordering on self-loathing, we now imagine a post-American world that is anything but. Just watch who scatters and who steps up as the Facebook revolutions erupt across the Arab world. While we might imagine ourselves the status quo power, we remain the world's most vigorously revisionist force. ¶ As for the sheer "evil" that is our military-industrial complex, again, let's examine what the world looked like before that establishment reared its ugly head. The last great period of global structural change was the first half of the 20th century, a period that saw a death toll of about 100 million across two world wars. That comes to an average of 2 million deaths a year in a world of approximately 2 billion souls. Today, with far more comprehensive worldwide reporting, researchers report an average of less than 100,000 battle deaths annually in a world fast approaching 7 billion people. Though admittedly crude, these calculations suggest a 90 percent absolute drop and a 99 percent relative drop in deaths due to war. We are clearly headed for a world order characterized by multipolarity, something the American-birthed system was designed to both encourage and accommodate. But given how things turned out the last time we collectively faced such a fluid structure, we would do well to keep U.S. power, in all of its forms, deeply embedded in the geometry to come.

#### Perception of decline causes US lashout---triggers hegemonic wars

Goldstein 7 – Professor of Global Politics and International Relations @ University of Pennsylvania “Power transitions, institutions, and China's rise in East Asia: Theoretical expectations and evidence,” Journal of Strategic Studies, Volume 30, Issue 4 & 5 August 2007, pages 639 – 682

Two closely related, though distinct, theoretical arguments focus explicitly on the consequences for international politics of a shift in power between a dominant state and a rising power. In War and Change in World Politics, Robert Gilpin suggested that peace prevails when a dominant state’s capabilities enable it to ‘govern’ an international order that it has shaped. Over time, however, as economic and technological diffusion proceeds during eras of peace and development, other states are empowered. Moreover, the burdens of international governance drain and distract the reigning hegemon, and challengers eventually emerge who seek to rewrite the rules of governance. As the power advantage of the erstwhile hegemon ebbs, it may become desperate enough to resort to the ultima ratio of international politics, force**,** to forestall the increasingly urgent demands of a rising challenger. Or as the power of the challenger rises, it may be tempted to press its case with threats to use force. It is the rise and fall of the great powers that creates the circumstances under which major wars, what Gilpin labels ‘hegemonic wars’, break out.13 Gilpin’s argument logically encourages pessimism about the implications of a rising China. It leads to the expectation that international trade, investment, and technology transfer will result in a steady diffusion of American economic power, benefiting the rapidly developing states of the world, including China. As the US simultaneously scurries to put out the many brushfires that threaten its far-flung global interests (i.e., the classic problem of overextension), it will be unable to devote sufficient resources to maintain or restore its former advantage over emerging competitors like China. While the erosion of the once clear American advantage plays itself out, the US will find it ever more difficult to preserve the order in Asia that it created during its era of preponderance. The expectation is an increase in the likelihood for the use of force – either by a Chinese challenger able to field a stronger military in support of its demands for greater influence over international arrangements in Asia, or by a besieged American hegemon desperate to head off further decline. Among the trends that alarm those who would look at Asia through the lens of Gilpin’s theory are China’s expanding share of world trade and wealth (much of it resulting from the gains made possible by the international economic order a dominant US established); its acquisition of technology in key sectors that have both civilian and military applications (e.g., information, communications, and electronics linked with to forestall, and the challenger becomes increasingly determined to realize the transition to a new international order whose contours it will define. the ‘revolution in military affairs’); and an expanding military burden for the US (as it copes with the challenges of its global war on terrorism and especially its struggle in Iraq) that limits the resources it can devote to preserving its interests in East Asia.14 Although similar to Gilpin’s work insofar as it emphasizes the importance of shifts in the capabilities of a dominant state and a rising challenger, the power-transition theory A. F. K. Organski and Jacek Kugler present in The War Ledger focuses more closely on the allegedly dangerous phenomenon of ‘crossover’– the point at which a dissatisfied challenger is about to overtake the established leading state.15 In such cases, when the power gap narrows, the dominant state becomes increasingly desperate. Though suggesting why a rising China may ultimately present grave dangers for international peace when its capabilities make it a peer competitor of America, Organski and Kugler’s power-transition theory is less clear about the dangers while a potential challenger still lags far behind and faces a difficult struggle to catch up. This clarification is important in thinking about the theory’s relevance to interpreting China’s rise because a broad consensus prevails among analysts that Chinese military capabilities are at a minimum two decades from putting it in a league with the US in Asia.16 Their theory, then, points with alarm to trends in China’s growing wealth and power relative to the United States, but especially looks ahead to what it sees as the period of maximum danger – that time when a dissatisfied China could be in a position to overtake the US on dimensions believed crucial for assessing power. Reports beginning in the mid-1990s that offered extrapolations suggesting China’s growth would give it the world’s largest gross domestic product (GDP aggregate, not per capita) sometime in the first few decades of the twentieth century fed these sorts of concerns about a potentially dangerous challenge to American leadership in Asia.17 The huge gap between Chinese and American military capabilities (especially in terms of technological sophistication) has so far discouraged prediction of comparably disquieting trends on this dimension, but inklings of similar concerns may be reflected in occasionally alarmist reports about purchases of advanced Russian air and naval equipment, as well as concern that Chinese espionage may have undermined the American advantage in nuclear and missile technology, and speculation about the potential military purposes of China’s manned space program.18 Moreover, because a dominant state may react to the prospect of a crossover and believe that it is wiser to embrace the logic of preventive war and act early to delay a transition while the task is more manageable, Organski and Kugler’s power-transition theory also provides grounds for concern about the period prior to the possible crossover.19 pg. 647-650

#### **Space radar is key to make missile defense effective---prevents Taiwan War and Russia aggression**

Pappalardo 8 – Joe Pappalardo, Popular Mechanics, January 28th, 2008, "From Space to Sea, New Radar Tech Could Shift Military Might" www.popularmechanics.com/technology/military/navy-ships/4246901

This month Lockheed Martin released a 280-word statement from its radar research headquarters in New Jersey announcing a breakthrough test of an advanced radar platform. And while the tech world shrugged, people **watching the evolution of radar** saw another step for a **system that could have a dramatic effect on future world affairs**, from American missile-tracking platforms in the Czech Republic to the ship-based defense of the Taiwan Straits.¶ The new radar system, called digital beamforming, could become a game-changing technology that may help defeat an overwhelming attack on U.S. warships by missiles. It could also **answer one of the chief complaints about ballistic missile defense systems--that decoys or other countermeasures could easily hide a warhead and spoof interceptors**. If placed on satellites**, new spy and environmental monitoring missions become possible from orbit.**¶ All this comes as an improvement to an existing system called phased-array radar. While traditional radars spin their faces to seek targets, phased-array radars guide a reflective beam electronically from a stationary panel. They can track things by moving the main beam very quickly, within microseconds, at numerous targets. But the phased array systems cannot seamlessly track multiple targets at the same time without losing resolution. Lockheed's improvement on these radars allows true simultaneous tracking, with each target followed by a dedicated radar beam.¶ Digital beamforming, then, combines the cutting edges of antenna and digital technologies: A radar array digitizes the signals it receives, preserving all the incoming information. This data is then used to form as many radar beams as necessary to track as many objects as appear. The crucial advantage to this approach is the ability to confidently cover a vast area with a single system.¶ Lockheed for the first time has been testing a digital beam array to locate and track live targets--in this case, commercial and military aircraft coming in and out of the Philadelphia area. "The hard part was how we combined all the data ... to form the individual beams," Scott Smith, program manager for the radar system at Lockheed, tells PM. Commercially available high-speed digital electronics and advanced signal processors have become advanced enough to allow this data processing to occur, and that in turn has enabled digital beamforming to become practical for use outside a lab.¶ One key component to all phased-array radars is transmit/receive modules. These inch-long modules increase the power of the transmitted signal, ready the system to receive responses and steer the beam to find targets. Lockheed engineers have used new materials in digital beamforming t/r modules that make them tough enough to hold up to harsh use. By using heat-tolerant silicon carbide in the modules, more power can be pumped through them, giving the radar a longer range and a very precise targeting ability.¶ Digital beamforming radars will likely find their first homes on ships that track missile threats to U.S. fleets. **Those threats will come from** ballistic launches **hundreds of miles away or from high-speed missiles launched from submarines or warplanes.** The Russian government has been busy selling sea-skimming, antiship missiles to China that are designed to overwhelm the U.S. fleet's radars, so the **ability to track multiple, fast-moving threats could become** vital in the Taiwan Straits. But a digitized phased array radar can handle many incoming signals at once, and should be able to discern real threats from bits of metal or shaped decoy balloons.So somewhere a Chinese admiral is frowning at Lockheed's news, and a Taiwanese general is smirking.¶ The development could even fuel Russian paranoia over its nuclear deterrent and make its leadership more intransigent about U.S. radar bases, ostensibly established to protect Europe from Iranian missiles, on its border in Eastern Europe. One way to beat radar systems is to overwhelm them with signals, including decoys.¶ Therefore, **beamforming can change missile defense equations in favor of the defenders**. "Russian analysts examining the [missile defense] system would conclude that, at some unforeseen future time ... it might be able to engage many hundreds of targets," a 2007 Arms Control Association report noted. "Such possibilities, however remote they would seem, would certainly conjure up apocalyptic threats to Russia's national survival."¶ Maybe not so remote: If the radar ground stations that the U.S. wants to establish in the Czech Republic are upgraded with beamforming technology, **they could spot Russian missiles just after launch,** follow as many missiles as could be put into the air, track inbound warheads amid intentionally scattered decoys and shoot down the real threats**.** The balance of power in Europe could shift as Russia loses its deterrent edge.¶ You can well imagine Russian attachés writing grim reports that include the comments of Carl Bannar, vice president and general manager of Lockheed Martin's Radar Systems, who promised in a recent statement to "bring a huge radar technology leap to next generation multi-mission radars." Lockheed's Smith said that the use of this radar in ground-based missile defense platforms is one of many targets for sales to the U.S. military.¶ Another great place for a powerful radar is on a satellite. **Space-based radar** can be used in a wide variety of ways--to track moving military or intelligence targets, to determine subtle shifts that precede earthquakes or landslides, or to form the backbone of space navigation systems using GPS satellites as reference points from high orbits.

#### Taiwan escalates and goes nuclear---no defense

William Lowther 3-16, Taipei Times, citing a report by the Center for Strategic and International Studies, 3/16/13, “Taiwan could spark nuclear war: report,” <http://www.taipeitimes.com/News/taiwan/archives/2013/03/16/2003557211>

Taiwan is the most likely potential crisis that could trigger a nuclear war between China and the US, a new academic report concludes.

“Taiwan remains the single most plausible and dangerous source of tension and conflict between the US and China,” says the 42-page report by the Washington-based Center for Strategic and International Studies (CSIS).

Prepared by the CSIS’ Project on Nuclear Issues and resulting from a year-long study, the report emphasizes that Beijing continues to be set on a policy to prevent Taiwan’s independence, while at the same time the US maintains the capability to come to Taiwan’s defense.

“Although tensions across the Taiwan Strait have subsided since both Taipei and Beijing embraced a policy of engagement in 2008, the situation remains combustible, complicated by rapidly diverging cross-strait military capabilities and persistent political disagreements,” the report says.

In a footnote, it quotes senior fellow at the US Council on Foreign Relations Richard Betts describing Taiwan as “the main potential flashpoint for the US in East Asia.”

The report also quotes Betts as saying that neither Beijing nor Washington can fully control developments that might ignite a Taiwan crisis.

“This is a classic recipe for surprise, miscalculation and uncontrolled escalation,” Betts wrote in a separate study of his own.

The CSIS study says: “For the foreseeable future Taiwan is the contingency in which nuclear weapons would most likely become a major factor, because the fate of the island is intertwined both with the legitimacy of the Chinese Communist Party and the reliability of US defense commitments in the Asia-Pacific region.”

Titled Nuclear Weapons and US-China Relations, the study says disputes in the East and South China seas appear unlikely to lead to major conflict between China and the US, but they do “provide kindling” for potential conflict between the two nations because the disputes implicate a number of important regional interests, including the interests of treaty allies of the US.

The danger posed by flashpoints such as Taiwan, the Korean Peninsula and maritime demarcation disputes is magnified by the potential for mistakes, the study says.

“Although Beijing and Washington have agreed to a range of crisis management mechanisms, such as the Military Maritime Consultative Agreement and the establishment of a direct hotline between the Pentagon and the Ministry of Defense, the bases for miscommunication and misunderstanding remain and draw on deep historical reservoirs of suspicion,” the report says.

For example, it says, it is unclear whether either side understands what kinds of actions would result in a military or even nuclear response by the other party.

To make things worse, “neither side seems to believe the other’s declared policies and intentions, suggesting that escalation management, already a very uncertain endeavor, could be especially difficult in any conflict,” it says.

Although conflict “mercifully” seems unlikely at this point, the report concludes that “it cannot be ruled out and may become increasingly likely if we are unwise or unlucky.”

The report says: “With both sides possessing and looking set to retain formidable nuclear weapons arsenals, such a conflict would be tremendously dangerous and quite possibly devastating.”

#### Russia aggression goes nuclear

Blank 9 – Dr. Stephen Blank is a Research Professor of National Security Affairs at the Strategic Studies Institute of the U.S. Army War College, March 2009, “Russia And Arms Control: Are There Opportunities For The Obama Administration?” http://www.strategicstudiesinstitute.army.mil/pdffiles/pub908.pdf

Proliferators or nuclear states like China and Russia can then deter regional or intercontinental attacks either by denial or by threat of retaliation.168 Given a multipolar world structure with little ideological rivalry among major powers, it is unlikely that they will go to war with each other. Rather, like Russia, they will strive for exclusive hegemony in their own “sphere of influence” and use nuclear instruments towards that end. However, wars may well break out between major powers and weaker “peripheral” states or between peripheral and semiperipheral states given their lack of domestic legitimacy, the absence of the means of crisis prevention, the visible absence of crisis management mechanisms, and their strategic calculation that asymmetric wars might give them the victory or respite they need.169 Simultaneously,¶ The states of periphery and semiperiphery have far more opportunities for political maneuvering. Since war remains a political option, these states may find it convenient to exercise their military power as a means for achieving political objectives. Thus international crises may increase in number. This has two important implications for the use of WMD**.** First, they may be used deliberately to offer a decisive victory (or in Russia’s case, to achieve “intra-war escalation control”—author170) to the striker, or for defensive purposes when imbalances in military capabilities are significant; and second, crises increase the possibilities of inadvertent or accidental wars involving WMD.171¶ Obviously nuclear proliferators or states that are expanding their nuclear arsenals like Russia can exercise a great influence upon world politics if they chose to defy the prevailing consensus and use their weapons not as defensive weapons, as has been commonly thought, but as offensive weapons to threaten other states and deter nuclear powers. Their decision to go either for cooperative security and strengthened international military-political norms of action, or for individual national “egotism” will critically affect world politics. For, as Roberts observes,¶ But if they drift away from those efforts [to bring about more cooperative security], the consequences could be profound. At the very least, the effective functioning of inherited mechanisms of world order, such as the special responsibility of the “great powers” in the management of the interstate system, especially problems of armed aggression, under the aegis of collective security, could be significantly impaired. Armed with the ability to defeat an intervention, or impose substantial costs in blood or money on an intervening force or the populaces of the nations marshaling that force, the newly empowered tier could bring an end to collective security operations, undermine the credibility of alliance commitments by the great powers, [undermine guarantees of extended deterrence by them to threatened nations and states] extend alliances of their own, and perhaps make wars of aggression on their neighbors or their own people.172

#### Missile defense deployment is inevitable but ineffective now---new upgrades are key to counter global threats including North Korea

Huessy 3/8 – Peter R. Huessy, Senior Defense Consultant Associate at the National Defense University Foundation (NDUF) and President of GeoStrategic Analysis, March 8th, 2013, "Missile Defense Now More Important Than Ever" www.breitbart.com/Big-Peace/2013/03/08/missile-defense-now-more-important-than-ever

Missile defense approaches its 30th anniversary with both great accomplishments behind it and great challenges before it. President Reagan’s vision of a defense sufficient to **blunt the use of ballistic missiles and their nuclear warheads as instruments of coercion, blackmail, and terror** **has made great progress** and is in place to protect against Iranian and North Korean threats, but is not yet fully achieved.¶ Since March 1983, the United States and its allies have built a layered network of over 1,500 missile interceptors and associated sensors that truly has become the basis of a global, integrated missile defense capability that can indeed defend the free world from the threats of rockets and ballistic missiles of all ranges.¶ Unappreciated is the fact that the research prior to the initial deployment of America’s first missile defenses helped make them possible. And in just the past year, America has successfully tested: **a Navy sea-based interceptor guided to a successful intercept by a space-based sensor**; a new version of a sea-based interceptor against a separating target; an improved kill vehicle on its long-range missile interceptor; a Patriot PAC-3; a very complex test using both sea and land-based interceptors against five targets simultaneously—the most in history; and a joint U.S.-Israeli Arrow-3 and David Sling inaugural test.¶ These systems are deployed only for defensive purposes and must deal with a threat which is one part intent and one part capability. **We have seen the capability of hostile nations like North Korea and Iran. They are deploying multiple missile systems as they seek to** blackmail and coerce the U.S. **and its allies to achieve their geopolitical objectives**. Late last year Hamas, a terrorist group, launched hundreds of rockets, many made in Iran and shipped through the Sudan, against Israel. And we saw the new Israel Iron Dome defense shoot down nearly 85 percent of rockets it engaged, an extraordinary achievement.¶ Just think if we had adopted the view of some of the critics of missile defense, that North Korea and Iran are building better and more deadly missiles but their intent is benign because they seek only to defend themselves. Their intent can change overnight but our defensive capability cannot.¶ A 1998 report on ballistic missile threats to the United States warned that **rogue state missile capabilities could be significantly augmented with help from other nations**. In the recent launch of North Korean and Iranian rockets we have discovered connections to Chinese technology and Russian propellant, giving added weight to the proposition that Tehran and Pyongyang are seeking in their nuclear programs grave threats to the free world.¶ Years ago, the Pakistani-based A.Q. Khan network sold its nuclear weapons wares to clients in Iran, North Korea and Libya. North Korea in turn built a nuclear reactor in Syria and assisted Iran with both its ballistic missiles and nuclear weapons, while building rockets for Pakistan, as well. We ignored these original signs of a poisonous coalition of rogue “Nukes ‘R Us” states to our detriment. Now America faces more serious threats as nuclear arms are being matched with ballistic missile capabilities.¶ While we do not know what “axis of threats” will emerge down the road, we cannot rest on our current successes **or capabilities**. Even as we shared the peace dividend at the end of the Cold War, we did invest in future precision technologies that allowed us, for example, to greatly expand the capability of our aircraft and precision guided munitions.¶ Thus, **whatever the eventual size of the reduction in defense spending over the next decade, we will place the U.S. in grave danger if we do not make the** necessary future investments in new missile defense technologies **to keep us safe.**¶ **The U.S. first must jettison the idea that space-based systems are prohibited. They are not**. Our military needs to undertake fact-based experiments and tests to determine what future systems to deploy, especially as we see threats emerge from Hezbollah to China.

#### There’s a high risk of North Korean strikes now

Cornwell 3-26 – Rupert Cornwell, won two British Press Awards as a journalist, previously foreign correspondent for the Financial Times and Reuters, has also been a diplomatic correspondent, served as Washington Bureau Editor. March 26th, 2013, "North Korean missiles 'on highest alert' to attack US bases on mainland America, Hawaii and Guam " www.independent.co.uk/news/uk/home-news/north-korean-missiles-on-highest-alert-to-attack-us-bases-on-mainland-america-hawaii-and-guam-8549318.html

Tensions on the Korean peninsula escalated further today as North Korea announced it had placed its missile and artillery forces “on the highest alert”, while South Korea’s new President warned that the communist regime in Pyongyang could survive only if it abandoned nuclear weapons and ceased to provoke and threaten its neighbours.¶ This latest sabre-rattling came on the third anniversary of the deadliest recent incident between the two Koreas, the sinking in March 2010 of a South Korean corvette, the Cheonan – apparently by North Korean torpedo – in which 46 sailors died.¶ The South’s President Park Guen-hye, who took office only a month ago, used the occasion to urge the North to end its isolation. But the **North Korean military responded with the alert, declaring** it was ready to hit the bases of “US **imperialist aggressor troops” on the US mainland and on Hawaii and Guam, as well as targets in South Korea and its vicinity**.¶ The verbal exchanges are the latest in a series of incidents since the regime of Kim Jong-un carried out the country’s third nuclear test on 12 February – the most technologically impressive yet. That drew renewed United Nations sanctions against North Korea, followed by more threats from Pyongyang. Earlier **this month the US announced that it was beefing up its defences in Alaska with 14 new interceptor units, to defend against a North Korean missile attack.**¶ At the same time US and South Korean military exercises are currently taking place – the statement from the North Korean military singled out the use of B-52 bombers, capable of delivering nuclear weapons, as justification for its vow to take “practical military action” to protect the country’s national sovereignty.¶ Despite its northern neighbour’s increasingly violent language, the defence ministry in Seoul said it had detected no suspicious North Korean military activity, adding that its officials were “analysing” Pyongyang’s warning. **A direct attack right now appears highly unlikely – though that could change once the joint US-South Korean drills finish at the end of April**.¶ As usual no one is sure exactly what lies behind the latest bellicosity in Pyongyang. One reason, almost certainly, is genuine anger at the UN sanctions, and the absence of promises from the US and its allies that North Korea will be rewarded if it ceases its provocations.¶ The **threats may also be intended to prove the mettle of Kim – himself in office barely a year – and to boost his military credentials.** The fear however is that, sooner or later, he will have to do something to show there is real menace behind the bluster.

#### Extinction

Chol 11 Kim Myong Chol is author of a number of books and papers in Korean, Japanese and English on North Korea, including Kim Jong-il's Strategy for Reunification. He has a PhD from the Democratic People's Republic of Korea's Academy of Social Sciences "Dangerous games" Aug 20 www.atimes.com/atimes/Korea/MH20Dg01.html

The divided and heavily armed Korean Peninsula remains the most inflammable global flashpoint, with any conflict sparked there likely to become a full-blown thermonuclear war involving the world's fourth-most powerful nuclear weapons state and its most powerful. ¶ Any incident in Korea by design, accident, or miscalculation could erupt into a devastating DPRK-US war, with the Metropolitan US serving as a main war theater. ¶ Rodong Sinmun warned on August 16: "The Korean Peninsula is faced with the worst crisis ever. An all-out war can be triggered by any accident." ¶ Recent incidents illustrate the real danger of miscalculation leading to a total shooting war, given the volatile situation on the Land of Morning Calm. ¶ 1. The most recent case in point is the August 10 shelling of North Korea by the South. Frightened South Korea marines on Yeonpyeong Island mistook three noises from a North Korean construction site across the narrow channel for artillery rounds, taking an hour to respond with three to five artillery rounds. ¶ The episode serves as a potent reminder to the world that the slightest incident can lead to war. A reportedly malfunctioning firefinder counter-artillery radar system seems to partly account for the panicky South Korean reaction. ¶ South Korean conservative newspaper the Joong Ang Daily reported August 17: ¶ "A military source said that radar installed to detect hostile fire did not work last week when North Korea fired five shots toward the Northern Limit Line (NLL), the disputed maritime border, on Aug 10. ¶ "'We must confirm the location of the source of the firing through the ARTHUR (Artillery Hunting Radar) and HALO (hostile artillery location) systems, but ARTHUR failed to operate, resulting in a failure to determine the source of the fire,' said the source." ¶ BBC reported on November 25 last year the aggressive nature of troops on the South Korea-held five islands in North Korean waters. ¶ "Seen in this sense, they (five islands including Yeonpyeong Island) could provide staging bases for flanking amphibious attacks into North Korea if South Korea ever takes the offensive." ¶ 2. An almost catastrophic incident took place at dawn on June 17 near Inchon. South Korean marines stationed on Gyodong Island near Inchon Airport fired rifles at a civilian South Korean jetliner Airbus A320 with 119 people aboard as it was descending to land, after mistaking it for a North Korean military aircraft. ¶ The Asiana Airlines flight was carrying 119 people from the Chinese city of Chengdu. ¶ About 600 civilian aircraft fly near the island every day, including those flying across the NLL, but they face a perennial risk of being misidentified as a hostile warplane. ¶ It is nothing short of a miracle that the Airbus A320 was not hit and nobody harmed. ¶ 3. On March 26, 2010, the high-tech South Korean corvette Sokcho fired 130 rounds at flocks of birds, mistaking them for a hostile flying object. The innocent birds looked like a North Korean warplane just at a time when an alleged North Korean midget submarine had managed to escape with impunity after torpedoing the hapless Cheonan deep inside security-tight South Korean waters. ¶ The South Korean military's habit of firing at the wrong target increases the risk of an incident running out of control. ¶ CNN aired a story December 16, headlined: "General: South Korea Drill Could Cause Chain Reaction." ¶ F/A-18 pilot-turned Marine Corp General James Cartwright told the press in the Pentagon, "What we worry about, obviously, is if that it [the drill] is misunderstood or if it's taken advantage of as an opportunity. ¶ "If North Korea were to react to that in a negative way and fire back at those firing positions on the islands, that would start potentially a chain reaction of firing and counter-firing. ¶ "What you don't want to have happen out of that is ... for us to lose control of the escalation. That's the concern." ¶ Agence France-Presse on December 11 quoted former chief of US intelligence retired admiral Dennis Blair as saying that South Korea "will be taking military action against North Korea". ¶ New Korean war differs from other wars¶ Obama and the Americans seem to be incapable of realizing that North Korea is the wrong enemy, much less that a new Korean War would be fundamentally different from all other wars including the two world wars. ¶ Two things will distinguish a likely American Conflict or DPRK-US War from previous wars. ¶ The first essential difference is that the US mainland will become the main theater of war for the first time since the US Civil War (1861-1865), giving the Americans an opportunity to know what it is like to have war fought on their own land, not on faraway soil. ¶ The US previously prospered by waging aggressive wars on other countries. Thus far, the Americans could afford to feel safe and comfortable while watching TV footage of war scenes from Afghanistan, Iraq, Pakistan and Libya as if they were fires raging across the river. ¶ The utmost collateral damage has been that some American veterans were killed or returned home as amputees, with post traumatic stress disorder, only to be left unemployed and homeless. ¶ However, this will no longer be the case. ¶ At long last, it is Americans' turn to have see their homeland ravaged.¶ An young North Korea in 1950-53 was unable to carry the war all the way across the Pacific Ocean to strike back, but the present-day North Korea stands out as a fortress nuclear weapons state that can withstand massive American ICBM (Intercontinental ballistic missile) attacks and launch direct retaliatory transpacific strikes on the Metropolitan USA. ¶ The second essential difference is that the next war in Korea, that is, the American Conflict or the DPRK-USA War would be the first actual full-fledged nuclear, thermonuclear war that mankind has ever seen, in no way similar to the type of nuclear warfare described in science fiction novels or films. ¶ North Korea is unique among the nuclear powers in two respects: One is that the Far Eastern country, founded by legendary peerless hero Kim Il-sung, is the first country to engage and badly maul the world's only superpower in three years of modern warfare when it was most powerful, after vanquishing Nazi Germany and Imperial Japan. ¶ The other is that North Korea is fully ready to go the length of fighting [hu]mankind's first and last nuclear exchange with the US. ¶ The DPRK led by two Kim Il-sungs - the ever-victorious iron-willed brilliant commander Kim Jong-il and his heir designate Kim Jong-eun - is different from Russia under Nikita Khrushchev which backed down in the 1962 Cuban missile crisis. ¶ Khrushchev and his company never fought the Americans in war. As a rule, most countries are afraid to engage the Americans. As the case is with them, North Korea is the last to favor war with the Americans. ¶ However, it is no exaggeration to say that the two North Korean leaders are just one click away from ordering a retaliatory nuclear strike on the US military forces in Guam, Hawaii and metropolitan centers on the US mainland. ¶ On behalf of Supreme Leader Kim Jong-il, Kim Jong-eun will fire highly destructive weapons of like Americans have never heard of or imagined to evaporate the US. ¶ The North Koreans are too proud of being descendents of the ancient civilizations of Koguryo 2,000 years ago and Dankun Korea 5,000 years ago, to leave the Land of morning Calm divided forever with the southern half under the control of the trigger-happy, predatory US. The North Koreans prefer to fight and die in honor rather than kowtow to the arrogant Americans. ¶ At the expense of comforts of a better life, North Koreans have devoted more than half a century to preparing for nuclear war with the Americans. All available resources have been used to convert the whole country into a fortress, including arming the entire population and indigenously turning out all types of nuclear thermonuclear weapons, and developing long-range delivery capabilities and digital warfare assets. ¶ An apocalyptic Day After Tommorow-like scenario will unfold throughout the US, with the skyscrapers of major cities consumed in a sea of thermonuclear conflagration. The nuclear exchange will begin with retaliatory North Korean ICBMs detonating hydrogen bombs in outer space far above the US mainland, leaving most of the country powerless. ¶ New York, Washington, Chicago, San Francisco and major cities should be torched by ICBMs streaking from North Korea with scores of nuclear power stations exploding, each spewing as much radioactive fallout as 150-180 H-bombs.

### Plan

#### The Department of Defense should acquire electricity in the United States produced from solar power satellite rectenna conversion.

### Solvency

#### DOD wants SPS---procurement rapidly accelerates commercial development

Lemonick 9 – Michael D. Lemonick is the senior writer at Climate Central, a nonpartisan organization whose mission is to communicate climate science to the public. Prior to joining Climate Central, he was a senior writer at Time magazine, where he covered science and the environment for more than 20 years. He has also written four books on astronomical topics and has taught science journalism at Princeton University for the past decade. August 31st, 2009, "Solar Power from Space: Moving Beyond Science Fiction" e360.yale.edu/feature/solar\_power\_from\_space\_moving\_beyond\_science\_fiction/2184/

But the military’s interest in SBSP could give a major boost to the technology. According to Marine Corps Lt. Col. Paul Damphousse, Chief of Advanced Concepts for the National Security Space Office, the military is interested in SBSP for two main reasons.¶ The first, he said, is that “we’re **obviously interested in energy security**, and we’re also **interested in weaning ourselves off fossil fuels** because climate change could pose national security risks.” By being an early customer, the government can rapidly accelerate development of the technology. But there would also be a **tactical advantage to space-based solar**, Damphousse noted. When the military is operating in remote regions of countries like Iraq or Afghanistan, it uses diesel generators to supply forward bases with power.¶ “We have a significant footprint getting energy in,” says Damphousse, noting the need for frequent convoys of oil tankers, the soldiers to protect them, and air support — all of which is expensive and dangerous.¶ **Being able to tap into power beamed directly down from space would clearly have a lot of appea**l, says Damphousse, even if it were relatively costly. And **it’s not just useful for the battlefield, he says, but also for areas affected by natural disasters**, such as Hurricane Katrina.¶ For those reasons, Damphousse supports the idea of coordinated studies by the Pentagon and other agencies — such as NASA and the Department of Energy — that would have a stake in space-based power.

#### Procurement makes SPS economically feasible and catalyzes investment

NSSO 7 – National Security Space Office, Report to the Director, October 10, 2007, “Space-Based Solar Power As an Opportunity for Strategic Security; Phase 0 Architecture Feasibility Study” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf

FINDING:The SBSP Study Group found that industry has stated that the #1 driver and requirement for generating industry interest and investment in developing the initial operational SBSP systems is acquiring an anchor tenant customer, or customers, that are willing to sign contracts for high‐value SBSP services. Industry is particularly interested in the possibility that the DoD might be willing to pay for SBSP services delivered to the warfighter in forward bases in amounts of 5‐50 MWe continuous, **at a price of $1** or more per kilowatt‐hour. o Recommendation: The SBSP Study Group recommends that the DoD should immediately conduct a requirements analysis of underlying long‐term DoD demand for secure, reliable, and mobile energy delivery to the war‐fighter, what the DoD might be willing to pay for a SBSP service delivered to the warfighter and under what terms and conditions, and evaluate the appropriateness and effectiveness of various approaches to signing up as an anchor tenant customer of a commercially‐delivered service, such as the NextView acquisition approach pioneered by the National GeoSpatial‐imaging Agency. FINDING: The SBSP Study Group found that even with the DoD as an anchor tenant customer at a price of $1‐2 per kilowatt hour for 5‐50 megawatts continuous power for the warfighter, when considering the risks of implementing a new unproven space technology and other major business risks, the business case for SBSP still does not appear to close in 2007 with current capabilities (primarily launch costs). This study did not have the resources to adequately assess the economic viability of SBSP given current or projected capabilities, and this must be part of any future agenda to further develop this concept. Past investigations of the SBSP concept have indicated that the costs are dominated by costs of installation, which depend on the cost of launch (dollars per kilogram) and assembly and on how light the components can be made (kilograms per kilowatt). Existing launch infrastructure cannot close the business case, and any assessment made based upon new launch vehicles and formats are speculative. Greater clarity and resolution is required to set proper targets for technology development and private capital engagement. Ideally SBSP would want to be cost‐competitive with other baseload suppliers in developing markets which cannot afford to spend a huge portion of their GDP on energy (4c/kWh), and these requirements are extremely stringent, but other niche export markets may provide more relaxed criteria (35c/kWh), and **some customers, such as DoD, appear to be** spend**ing more than $1/kWh in forward deployed locations**. It would be helpful to develop a series of curves which examine technology targets for various markets, in addition to the sensitivities and opportunities for development. Some work by the European Space Agency (ESA) has suggested that in an “apples‐to‐apples” comparison, **SBSP may already be competitive with large‐scale terrestrial solar baseload power**. A great range of opinions were expressed during the study regarding the near‐term profitability. It is instructive to note that that there are American companies that have or are actively marketed SBSP at home and abroad, while another group feels the technology is sufficiently mature to create a dedicated public‐private partnership based upon the COMSAT model and has authored draft legislation to that effect. • **The business case is much more likely to close in the near future if the U.S. Government agrees to: o** Sign up as an anchor tenant customer, and o Make appropriate technology investment and risk‐reduction efforts by the U.S. Government, and o Provide appropriate financial incentives to the SBSP industry that are similar to the significant incentives that Federal and State Governments are providing for private industry investments in other clean and renewable power sources. • The business case may close in the near future with appropriate technology investment and risk‐reduction efforts by the U.S. Government, and with appropriate financial incentives to industry. Federal and State Governments are providing significant financial incentives for private industry investments in other clean and renewable power sources. o Recommendation: The SBSP Study Group recommends that in order to reduce risk and to promote development of SBSP, the U.S. Government should increase and accelerate its investments in the development and demonstration of key component, subsystem, and system level technologies that will be required for the creation of operational and scalable SBSP systems. Finding: The SBSP Study Group found that **a small amount of entry capital by the US Government is likely to** catalyze substantially more investment by the private sector**.** This opinion was expressed many times over from energy and aerospace companies alike. Indeed, there is anecdotal evidence that even the activity of this intermim study has already provoked significant activity by at least three major aerospace companies. Should the United States put some dollars in for a study or demonstration, it is likely to catalyze significant amounts of internal research and development. Study leaders likewise heard that the DoD could have a catalytic role by sponsoring prizes or signaling its willingness to become the anchor customer for the product.

#### **SPS-Alpha can be up and running in a few years– new tech ensures feasibility and low costs**

Mankins 12 – John C. Mankins, President of Artemis Innovation Management Solutions LLC is an internationally recognized leader in space systems and technology innovation, spent 25 years at NASA and CalTech's Jet Propulsion Laboratory. He holds undergraduate (Harvey Mudd College) and graduate (UCLA) degrees in Physics and an MBA in Public Policy Analysis (The Drucker School at Claremont Graduate University). Mr. Mankins is a member of the International Academy of Astronautics (IAA) and Chair of the Academy Commission III (Space Systems and Technology Development); and a member of the International Astronautical Federation (IAF), the American Institute of Aeronautics and Astronautics (AIAA), and the Sigma Xi Research Society. Editor/Authors are :Brian Wang, Director of Research. Sander Olson, Interviews and other articles Phil Wolff, Communications and social technologist. Alvin Wang. Computer, technology, social networking, and social media expert. June 7th, 2012, "A New Paradigm for Space-Based Solar Power," nextbigfuture.com/2012/06/new-paradigm-for-space-based-solar.html

Question: How exactly has the technology evolved since the 1970s? ¶ There have been a number of improvements. The **efficiency of solar photovoltaics has improved** from less than 10% efficiency to more than 30% efficiency now. I'm confident that within the next decade, solar photovoltaics could achieve efficiencies of up to 50%. There have also been **substantial improvements in key electronic components**, such as solid-state power amplifiers. The efficiencies have gone from 15% in the 1970s to **70% now**. With focused investments, we should be able to get devices with efficiencies approaching 80% by 2020. This will further increase the viability of space-based solar power. A wide range of other technologies have also improved dramatically, including **light-weight and high-strength materials, robotics, in-space propulsion and others.** ¶ Question: You are the chief architect behind the SPS-ALPHA design. What are the central aspects of this new paradigm? ¶ The SPS-ALPHA concept facilitates the design and development of a very large solar power satellite out of a large number of very small pieces. Each piece weighs perhaps 25-100 kilograms, but there are tens of thousands of pieces in the final product. **The beauty of this system is that all of the parts of the design can be manufactured readily in a standard factory – resulting in very low costs for the system hardware.** ¶ Question: So the power satellite would be composed of vast numbers of identical modules? ¶ Yes, the modules would be stackable – like pizza boxes – for ease of transportation to space, and then unstacked and assembled once they reach the operational orbit for the satellite. There might be about 6 or 8 different types of modular elements, and each type would be mass produced with from hundreds to tens of thousands of copies. They would initially be launched into a low Earth orbit, and from there transferred to a higher orbit for integration into the SPS platform. We are looking at using robotic systems to assemble the panels. ¶ Question: So your plan employs robots for most of the construction? ¶ Yes. The SPS-ALPHA architecture would only employ people on the ground to supervise the robots operating in space. The goal would be to assume the intervention of astronauts only in the event of a problem that could not be resolved using robots. As a rule of thumb, we expect that it may cost from 100-times to 1000-times more to have a suited astronaut perform a task in a high Earth orbit than to have a remotely-supervised robot do it. This field of technology has advanced rapidly in the past decade, and so we plan to employ robots extensively. ¶ Question: How long would it take to get a prototype system up and running? ¶ With sufficient funding, we could have a ground based, rudimentary prototype up and running by 2014. **An early prototype in orbit could be** built by 2017-2018. And in about a decade, a larger pilot plant could be in geosynchronous Earth orbit, generating 10 megawatts. The total cost for this roadmap could be several billion dollars, with most of the cost coming in the last few years. As a point of comparison, the pilot plant would be approximately the same size as the International Space Station, which cost $100 billion to manufacture, launch into space and assemble. **The cost savings would result from using standard, mass-produced pieces, standard launch systems and robotic assembly in space.**

#### Recent studies prove that SPS tech is feasible now – terrestrial solar fails

Garretson 12 – Lt Col Peter Garretson is an airpower strategist currently serving on the CSAF’s Strategic Studies Group (HAF/CK). His previous assignment was at the Institute for Defence Studies and Analyses in New Delhi as an Air Force Fellow examining Indo–US long-term space collaboration under the sponsorship of the Council on Foreign Relations. Prior to that he was the chief of future science and technology exploration for the HQ USAF Directorate of Strategic Planning (AF/A8XC), Spring 2012, "Solar Power in Space?" Strategic Studies Quarterly Spring, <http://www.au.af.mil/au/ssq/2012/spring/garretson.pdf>

As of 2010, the fundamental research to achieve technical feasibility for the SPS [solar-power satellites] was already accomplished. Whether it requires 5–10 years or 20–30 years to mature the technologies for economically viable SPS now depends more on the development of appropriate platform systems concepts and the availability of adequate budgets. —International Academy of Astronautics (IAA), 2011 The world needs a constant supply of uninterrupted electrical power to enable and sustain economic growth; power its cities, factories, and vehicles; and provide energy for heating, cooling, lighting, cooking, and desalination. Long term, it is desirable to transition from an energy system based on fossil fuels—an exhaustible resource which alters the composition of our atmosphere with unknown long-term effects on our climate— to a system based upon renewable sources. Many see solar power as the answer, because the resource is so vast and available. However, traditional solar power has limitations that make it less than a perfect match for our society. It is highly intermittent (only a 20-percent duty cycle) due to weather effects (clouds, rain, dust), and its low density requires vast tracks of land. Worst of all, it is not available at night, requiring vast storage or nonrenewable backup systems. Space-based solar is an innovation designed to retain[s] the advantages of traditional solar power while sidestepping the disadvantages. The basics of the idea are quite simple. Rather than cope with the unpredictability and intermittency of solar power on the ground, go where the sun always shines. In geostationary orbit (GEO), the sun shines constantly and is 36 percent stronger, allowing a solar array to collect almost 10 times the amount of energy as the same array installed at mid latitude on the ground (see fig.1). Power can then be transferred (beamed) directly to where it is needed. The technologies to do this are not magic or unfamiliar—they are the same elements used every day to emplace, power, and communicate with every existing satellite. Building the SBSP system would rely on the same familiar solar cells, radio transceivers, and rockets to propel them to GEO, only assembled on a grand different scale. In a mature system-of-systems, multiple solar-power satellites would reside in geostationary orbit, each collecting vast amounts of power and transmitting it through active electronic beam steering, like routers in a vast orbiting power internet. While appearing to hover above a particular location, each SPS could service multiple markets, providing power on demand to urban centers or remote locations. For example, a single satellite south of Baja California could service markets across most of North and South America; a satellite over the Indian Ocean could service markets as far apart as Africa and Indonesia, and from Diego Garcia to as far north as Russia. 1 Power in this system-of-systems would be transmitted using a technique called retrodirective phased array, where an encrypted pilot signal from the ground handshakes with the satellite’s active electronic beam-steering system to link transmitter and receiver. The beam itself would be in the ISM band (typically 2.45 or 5.8 GHz), so that it passes nearly full strength through the atmosphere, clouds, and rain. Because of low atmospheric losses (<2 percent), extremely efficient reconversion (>80 percent), and most of all, constant illumination, the beam can be safely kept at an amazingly low intensity (only one-sixth the intensity of sunlight) and yet be significantly more energy productive than a comparably sized terrestrial solar plant. The location and diameter of the beam are predictable and well confined. Unlike communications satellites—which, because of their small-aperture antennas, cast continent-sized footprints and must be separated by degrees (and thousands of miles) on orbit to deconflict signals—SPSs have very large apertures and therefore can send very narrow beams, allowing them to be spaced much closer together. The beam itself terminates on a receiver called a rectenna, with peak intensity in its center and tapering to nearly nothing at the periphery. The rectenna, about the size of a municipal airport, is a mesh of dipole antennas that capture all the incident energy from the beam. It is nevertheless 80 percent transparent to sunlight, allowing the land beneath to remain available for agricultural uses.

#### SPS is resilient, cost-effective, and efficient

Reed & Willenberg 4 – Head of the Welsom Space Consortium, and Harvey, PhD, Independent Review Team Leader for Space Power Research for NASA, Former Chief Scientist of the ISS (Kevin and Harvey, , "Early commercial demonstration of space solar power using ultra-lightweight arrays,” Acta Astronautica, Volume 65, Issues 9-10, accessed on Science Direct)

Future systems will be even more sensitive to specific power. A number of conceptual design architecture studies have been performed that offer promise for terrestrial electrical power generation by [SSP] space solar power, i.e. a constellation of large Earth-orbiting spacecraft that collect solar power, convert it to laser or microwave beams, and beam that power to terrestrial collectors that, in turn, convert that power to electricity.[1-3] To make this concept economically attractive, they must compete with current large power plants by economically generating Gigawatts (GW) of power. At 100 W/kg, such a power station must weigh 2-5 ∙ 107 kg or more – a tall order for launch vehicles that currently place no more than 2-3 ∙ 103 kg into geosynchronous orbit. Recent technology advances in the area of thin film photovoltaic arrays offer a solution to the mass limitations of high power arrays. Thin film arrays, while the efficiency is only around 9-12%, are so lightweight that they offer specific powers in excess of 1,000 W/kg - a factor of ten or more above the current state of the art. Since these arrays are deployable, they can be packaged with minimum mass and volume, and readily deployed in space with **near-term demonstrable technologies**. This section provides an introduction to this possibility. The next section will discuss the specific advantages of lightweight arrays. Section 3 will describe near-term applications in the 50-500 kWe power range, both in space and in the high altitude atmosphere, as well as future directions for space power satellites and high-power electric thrusters. Section 4 discusses recent and ongoing plans for prototype testing of thin-film arrays in civil and military applications as well as commercial "NewSpace" applications. In Section 5, we discuss some key process steps required for commercial development of space solar power and wireless power transmission, with specific focus on the development pathway for these solar arrays. A development Roadmap is described in Section 6. A short summary is presented in Section 7, followed by references. 2. ADVANTAGES OF ULTRALIGHTWEIGHT ARRAYS Since the beginning of Earth-orbiting satellites, solar array technology has gone through two or three generations, and is on the verge of a new generation. Most early satellites were powered with crystalline silicon arrays, with power levels generally below about 6 kilowatts (kWe). These silicon arrays were heavy and operated at low efficiency, i.e. the amount of power produced per unit area of solar array started around 10-12% at beginning of life. These crystalline silicon arrays also degraded rapidly, dropping to 8-10% efficiencies after several years in space, as a result of radiation-induced degradation of the photovoltaic silicon and atomic oxygen-induced discoloration of the cover glass which protects the silicon from these environmental factors. In the 1990s, the technology for many, if not most, satellite solar arrays converted from these original silicon arrays to compound semiconductors, which generally used gallium arsenide plus a second or third semiconductor to capture a greater share of the solar spectrum and convert it to electricity. These compound dual-junction and triple-junction semiconductors are much more resistant to radiation and more efficient, with efficiencies of 20-24%. More recently, the ability to separate different wavelengths of the solar spectrum and tailor the incident light onto a stretched lens of selected semiconductors (separating red, yellow, green, and blue wavelengths) has shown indications of efficiencies as high as 40-50%.[4-5] Yet even at this nearly theoretical limit of efficiency, the power density level will reach only 300 W/kg. Until recently, the focus of most solar array technology development has been toward more efficient, more radiation-resistant arrays. This focus has been driven primarily by the challenge of deployment of large arrays. This challenge has limited the total array area that can be launched into space, and therefore the way to higher power arrays has been higher efficiencies. These rigid, higher efficiency solar arrays come at the cost, however, of relatively high mass - with the best rigid arrays able to produce about 80-100 Watts per kilogram (W/kg) at 30% efficiency, and the stretched lens arrays promising about 150 W/kg but limited to a total of around 10 kW by deployment considerations. Two dominant performance metrics in the selection of solar array technologies are this power/mass ratio (i.e. the amount of power that can be produced for each kilogram of total mass) and the volume of the stowed array as it is launched. These are important because of the mass and volume limitations on the launch vehicle that places the array into space, and the high cost of launching this limited mass and volume. Using launch vehicles available today, these limit the total power available to satellites in geostationary orbit to about 18 kWe. Higher powers will be highly desirable as the user demands for communications services continue to increase. Recent advances in the ability to place photovoltaic materials on very thin film substrates have produced a new generation of solar arrays. These advances allow arrays to be stowed in the launch vehicle in very compact configurations, and easily deployed to much larger arrays than have heretofore been achievable. These new, thin film arrays are much lighter - around 1200 W/kg, including the deployment systems. Laboratory test cells have been produced by Institut de Microtechnique at the University of Neuchatel, Switzerland using LaRCTM-CP1 thin-film substrates produced by SRS Technologies in Huntsville, AL that have the highest power/mass ratio on record - 4300 W/kg![6] These thin film arrays can be stowed in a rolled or folded configuration in the launch vehicle and deployed in space by simple boom extension or roller mechanisms. A well-designed 50 kW space solar array and deployment system using rolled mechanisms with this specific power would weigh 32 kg with a payload volume the size of a suitcase. This low mass and payload volume, combined with high power density, can provide 50 kW+ space solar arrays at 25% of the cost of current rigid solar arrays. There are two approaches to thin film arrays: amorphous silicon (a-Si:H) and polycrystalline Cu(Ga,In)Se2 (CIGS). The Neuchatel partners have developed an array configuration that deposits amorphous silicon on SRS 6 µm-thick CP1TM polymer films, referred to as CP1/a-Si:H arrays. CIGS cells are generally deposited on 30 µm-thick metal foil substrates, a fact that assures that CIGS cells will be heavier than CP1/a-Si:H cells. Some basic comparisons between these solar arrays are summarized in Table 1. Using deployable thin-film arrays with specific powers in excess of 1,000 W/kg opens opportunities for large power levels in space. With current launch vehicles, this means that communications satellites can have 200 kWe or more in geosynchronous orbit, or that commercial platforms such as manufacturing sites or tourist destinations, can approach a MWe. With such possibilities, **this technology might drive the economics of [SSP] space solar power satellites into the profitable arena**, thereby contributing greatly to a non-petroleum-based worldwide electrical power grid. 3. APPLICATIONS Deployable thin-film arrays would have immediate applications with communications satellites and with high altitude aircraft. A 60 kWe array which can be rolled out in 20 kWe segments would greatly extend the useful lifetime of communications satellites – essentially tripling the array lifetime by rolling out 20 kWe of beginning-of-life (BOL) arrays at the end of the array's useful lifetime. An alternative application would be for much higher-power communications satellites, from 50 to 200 kWe, for higher data rates or power. A unique application may also be realized for recharging mobile batteries. Such an orbiting power platform may provide a source of electrical power for very distributed demands, such as for cellular phones and laptop computers. A 200 kWe solar array would have a mass of less than 200 kg. This would make a thin-film array attractive for still higher-power commercial applications, such as orbiting hotels – with expected demands in the 250 kWe to 1 MWe – and manufacturing sites. The latter would be either for sites for in-space construction of larger platforms, or for processing of materials in the microgravity environment of space. As the technology matures to the megawatt range, additional applications appear promising. For example, electric thrusters in the megawatt range would be attractive for human transportation to Mars and its moons. This technology can be developed in stages, perhaps using high altitude airships as platforms to demonstrate megawatt arrays. As the technology for high power thin film arrays matures, the logical next step would be solar power satellites. With a launch vehicle capable of placing 50,000 kg to geosynchronous orbit, 50 MWe platforms can be considered as building blocks for the GWe stations that would be required to provide a primary source of power for the electrical power grid. 4. DEVELOPMENT OF ULTRALIGHTWEIGHT ARRAYS Recent advances in the ability to place photovoltaic materials on very thin film substrates have produced a new generation of solar arrays. These advances allow arrays to be stowed in the launch vehicle in very compact configurations and easily deployed to much larger arrays than have heretofore been achievable. These new, thin film arrays are much lighter - around 1200 W/kg, including the deployment systems. Problematic to most thin-film solar arrays are radiation and atomic oxygen erosion. Test solar cells are made on CP1TM polyimide that is space-rated for 10 years in Geosynchronous Earth Orbit ( GEO), or SRS CORIN which is the only transparent uncoated commercial polyimide that will not erode in LEO. These flexible, 6 micron thick, thin film arrays, can be rolled or folded into a very low stowed volume in the launch vehicle configuration, and then deployed in space by simple boom extension or roller mechanisms. Such a typical 50 kW space solar array and deployment system would weigh 32 kg with a payload volume the size of a suitcase. This low mass and payload volume, combined with high power density, can provide 50 kW+ space solar arrays at 25% of the cost of current rigid solar arrays. The key technologies are ultra-thin, deployable arrays that generate power at acceptable efficiencies with high power density, and are resistant to atomic oxygen and radiation in the operational space environment.

# 2AC

## Solvency

### AT: Space Debris

#### Debris doesn't take out SPS

**Fan et al 11** – MAs from Caltech [\*William Fan, Harold Martin, \*James Wu, \*\*Brian Mok, “Space Based Solar Power: Industry and Technology Assessment”, http://www.pickar.caltech.edu/e103/Final%20Exams/Space%20Based%20Solar%20Power.pdf]

GEO Sun Tower: This architecture is similar to that of the MEO Sun Tower. However, it will have a geostationary Earth orbit (GEO) instead. The geostationary orbit allows a single satellite to supply power continuously to a given receiving station on Earth. This makes this architecture more versatile. Also, the total power will be greater due to the reduction in scanning loss. Due to the geostationary orbit, this structure will be deployed at a greater distance from earth, which will reduce encounters with space debris.

#### **Global launces inevitable---Asia space race**

Williams 2-1 – Carol J. Williams, February 1st, 2013, "Asian space race reflects sharpened U.S.-China rivalry" [www.latimes.com/news/world/worldnow/la-fg-wn-asia-space-race-global-focus-20130131,0,7945804.story](http://www.latimes.com/news/world/worldnow/la-fg-wn-asia-space-race-global-focus-20130131,0,7945804.story)

South Korea’s successful satellite launch this week served as the latest act of one-upmanship in an accelerating space race gripping Northeast Asia.¶ **Membership in the elite global space club is being pursued by wealthy countries that can afford** it as well as economic basket cases that cannot, a quest for political stature driven more by emotion and nationalism than economic promise.¶ What nations get out of creating their own space programs is a heady cocktail of national pride, technological muscle-flexing and the power to project military menace as a reminder to neighbors that they won’t back down from the region's mounting territorial disputes.¶ The intensified competition is also providing a stage for China to flaunt its growing aerospace capabilities and to underscore that manned flight and space-based surveillance will remain priorities despite U.S. efforts to bridle Beijing’s gallop into the final frontier.

#### **SPS only needs a few launches**

Salkever 9 – Alex Salkever, interviewing Cal Boerman, Solaren's Director of Energy Services, September 26th, 2009, "Plans for solar power from outer space move forward" [www.dailyfinance.com/2009/09/26/plans-for-solar-power-from-outer-space-move-forward/](http://www.dailyfinance.com/2009/09/26/plans-for-solar-power-from-outer-space-move-forward/)

How many launches will it take to the get the whole system up and orbiting?¶ We can do it with a small number of launches, only four. To get that, we had to come up with a design that was lightweight and innovative. We're still using a big rocket. Each launch will have a satellite or a piece of our system that will go up. Once we are up there, we will rely on concentrating the suns energy with mirrors to improve efficiency. **We'll have a large footprint but it's not acres of solar cells like NASA has depicted.** We have to use space-qualified photovoltaic solar cells that have a proven track record. **We'll use mylar or some other lightweight reflective material to construct mirrors** to concentrate the sun's energy.

### AT: Bird Flu

#### No impact to bird flu

Weil 6— **M.D. from Harvard Medical School, Director of the Program in Integrative Medicine of the College of Medicine, University of Arizona** (Andrew, “Is Bird Flu Overhyped?,” 15 January, “http://www.time.com/time/magazine/article/0,9171,1149398,00.html)

Anxiety about avian flu is spreading far faster than the disease. Watch enough reports on television about the outbreaks in Turkey, and you could worry yourself sick. In my opinion, the anxiety is unfounded. • At the moment, the H5N1 influenza virus is mainly a threat to birds. The virus can infect and kill other animals but only if they have close contact with infected birds. The big concern is that it will gain the ability to pass easily from person to person, possibly by exchanging genes with an ordinary flu virus in the body of some unlucky person infected with both. That has not happened yet, and until it does, there can be no pandemic. • Much has been made of the virulence and lethality of the avian-flu virus, but new findings suggest that mild and asymptomatic infections in humans may have gone unnoticed; the virus may turn out to be far less deadly than we have been led to believe. Even if it does mutate into a more transmissible form, its virulence would probably diminish over time. That is the general pattern of all influenza pandemics, including the terrible one of 1918.

In addition, we would have a chance to stop the epidemic spread of a mutated avian-flu virus by containing it at its point of origin. A few mining towns in Colorado were able to avoid the 1918 flu by barring outsiders for a few months during the epidemic. Australia mostly escaped because of a strict quarantine of incoming ships.

In 1918 scientists did not know what viruses were and did not understand how they caused disease. Today we know a lot about them, can make vaccines against them and have some effective antiviral drugs. We also have methods of monitoring disease outbreaks and communicating information about them that were unavailable in the past. There are plenty of health threats to worry about that are real and that we can take precautions against, among them the ordinary seasonal flu that is in full swing (and can still be warded off with a flu shot). We need to keep an eye on the avian flu. We do not need to lose sleep over it.

### Economy AO

#### SSA is key to satellite protection – it’s inevitable, it’s only a question of effectiveness

Weeden 9-10 – Brian Weeden, Bachelor's in Science (B.S.) in Electrical Engineering from Clarkson University and a Masters in Science (M.S) in Space Studies from the University of North Dakota. He is also a graduate of the International Space University Space Studies Program, has over a decade of professional technical and operations experience in the national and international space security arena. His wealth of technical knowledge has established him as a thought leader for providing critical analysis that supports development of space policy on a global scale. Prior to joining the Foundation, Mr. Weeden served nine years on active duty as an officer in the United States Air Force working in space and ICBM operations. As part of U.S. Strategic Command's Joint Space Operations Center (JSpOC), Captain Weeden directed the orbital analyst training program and developed tactics, techniques and procedures for improving space situational awareness. In his current role as Technical Advisor, Mr. Weeden conducts research on global space situational awareness, space traffic management, protection of space assets, and prevention of conflict in space. September 10th, 2012, "Going Blind: Why America is on the Verge of Losing its Situational Awareness in Space and What Can be Done About it" swfound.org/media/90775/going\_blind\_final.pdf

The United States, and indeed the world, is increasingly reliant on satellites in orbit around the Earth. **The total value of the space economy is currently estimated at $290 billion** 1 , which does not account for the large number of public goods such as national security, disaster warning and management, and environmental monitoring systems that also rely on satellites. Over the last several years, **there has been increased concern about the ability to protect critical satellites from manmade and environmental threats, as well as about the long-term sustainability of the most highly used regions of Earth orbit**. ¶ A key enabler for protecting satellites and ensuring the long-term sustainability of Earth orbit is space situational awareness (SSA). SSA is a complex topic that means many things to many people, but can be generally defined as information about the space environment and activities in space that can be used to operate safely and efficiently; avoid physical and electromagnetic interference; detect, characterize and protect against threats; and understand the evolution of the space environment. **SSA includes warnings about potential collisions between objects in space, solar storms and other types of space weather that could impact satellites or the Earth, and spacebased threats to Earth (including re-entering space debris and nuclear warheads).**¶ The U.S. government considers SSA to be an important national security priority. Top level policy documents highlight the importance of SSA and direct policy goals for improving it. The 2010 U.S. National Space Policy (NSP) states that the United States shall: Develop, maintain, and use space situational awareness information from commercial, civil, and national security sources to detect, identify, and attribute actions in space that are contrary to responsible use and the long-term sustainability of the space environment; The 2011 National Security Space Strategy (NSSS) provides further direction and guidance to the U.S. Department of Defense (DoD), which oversees SSA operations for the United States: Shared awareness of spaceflight activity must improve in order to foster global spaceflight safety and help **prevent mishaps, misperceptions, and mistrust**. The United States is the leader in space situational awareness (SSA) and can use its knowledge to foster cooperative SSA relationships, support safe space operations, and **protect U.S. and allied space capabilities and operation**s.¶ DoD will continue to improve the quantity and quality of the SSA information it obtains and expand provision of safety of flight services to U.S. Government agencies, other nations, and commercial firms. DoD will encourage other space operators to share their spaceflight safety data. DoD, in coordination with other government agencies, will seek to establish agreements with other nations and commercial firms to maintain and improve space object databases, pursue common international data standards and data integrity measures, and provide services and disseminate orbital tracking information, including predictions of space object conjunction, to enhance spaceflight safety for all parties.¶ 3¶ The U.S. military has responded to this policy guidance by increasing the priority of SSA and dedicating increased resources to the SSA mission. Air Force Space Command’s (AFSPC) 2012 list of top space and cyber priorities ranks SSA at number four, behind only nuclear survivable communications, launch detection and missile tracking, and position, navigation, and timing services.¶ 4¶ The U.S. military has also increased its current and planned spending on SSA. Figure 1 is a summary of spending by the DoD on SSA-related investments between 2008 and 2015. The investments are grouped into spending on new sensors, command and control of SSA sensors and space assets, life extension programs for existing SSA sensors, and other related investments such as research, development, test, and evaluation (RDT&E) of new technologies or risk mitigation programs. In total, **the U.S. military plans to spend more than $4 billion on SSA through 2015, two-thirds of it allocated for new sensors**.¶ **Despite this recognition of the importance of SSA and the high-level policy guidance directing improvements in SSA capabilities and increased sharing with other actors,** there has been little progress over the last decade **in solving some of the core problems**, and in particular, replacing the two systems at the heart of SSA—the Space Defense Operations Center (SPADOC, pronounced “spay-dock”) and the Correlation, Analysis, and Verification of Ephemerides Network (CAVENet). These two systems are used to create much of the data and analysis that form the foundation of the entire SSA effort, including processing observations on objects in orbit around the Earth, maintaining catalogs of space objects, and using these catalogs to perform analyses such as **predicting potential collisions between space objects 5 and detecting threats to U.S. space systems.** This data is used by other government entities for a variety of functions.

#### Satellites are key to the economy

AIAA 10 – Aerospace Industries Association of America, “Aerospace and Defense: The Strength to Lift America”, April, <http://www.nationalaerospaceweek.org/wp-content/uploads/2010/04/whitepaper.pdf>

Space systems drive our nation’s competitiveness, economic growth, and innovation. U.S. soldiers in the mountains of Afghanistan, farmers, bankers and emergency responders here at home all have a common reliance on a space infrastructure in orbit above the Earth. Everyday activities, taken for granted by many Americans, aresupported or even driven by space systems. These systems are hidden to us and rarely noticed unless the services they provide are interrupted. However, the lack of visibility of space systems doesn’t diminish their importance — both our nation’s economy and national security are tied directly to this critical infrastructure. Communications drive today’s commerce, and space systems are a chief global conduit of our nation’s commercial and national security communications. The Internet, e-mail and wireless devices have all become the standard for businesses and recreation. Direct-to-home television and satellite radio have become standard in many American homes and automobiles. These all depend on our satellite communications systems. Similarly, the Global Positioning System, originally designed for military use, is now relied on for banking transactions, ATMs, improved agriculture, air traffic and ground transportation systems and by emergency responders. All of these applications add up to substantial economic activity. Of $214 billion in aerospace industry sales in 2007, direct space system industry sales topped $40 billion.14 Total direct and indirect global space activity for 2008 was $257 billion.15 Even harder to quantify — but no less valuable — is the impact that technology spinoffs from space activities bring to our economy. In 2009 alone, NASA entered into more than 250 agreements with private and other external entities for development of dual-use technologies.16 Space is certainly becoming more contested, congested and competitive. More than 60 nations are engaged in space efforts and tens of thousands of man-made objects orbit the Earth. In January 2007, the Chinese used a ballistic missile to destroy an aging weather satellite. This anti-satellite test demonstrated the very real ability of a foreign power to attack and destroy space assets and resulted in a dangerous debris cloud. In addition, the February 2009 collision of a commercial U.S. satellite and Russian satellite showed that space systems not only face disruption from intentional attack, but are also at risk from unintentional events in an increasingly crowded environment. Using systems developed by America’s aerospace industry**,** the Defense Department currently tracks more than 21,000 man-made objects in the Earth’s orbit — many of which could threaten civil and national security space systems, as well as our nation’s efforts to increase the commercial use of space.17 In such an environment, investments in rapid reconstitution, sensors, tracking, threat assessment and other space protection and situational awareness capabilities are needed to mitigate the impacts of an unexpected catastrophic space system failure. The cost and difficulty involved in developing and deploying space systems as well as the severe consequences of their loss necessitates that our nation’s space infrastructure be adequately protected. Part of ensuring robust space capabilities means that America must routinely replace and update its space infrastructure. It is highly problematic — if not infeasible — to perform maintenance or even refuel them. Space systems have limited life spans and, at today’s pace of technology, can quickly become obsolete. Critical space systems that provide missile warning, global communications, positioning, navigation and timing and weather are in need of upgrade at a time when other nations are rapidly modernizing their own space infrastructure.

#### SPS solves resource scarcity and cosmic accidents - both guarantee extinction

**Collins and Autino 10** (Patrick, Professor of Life and Environmental Science @ Azabu University, and Adriano, Systems Engineer @ Andromeda Incorporated, “What the growth of a space tourism industry could contribute to employment, economic growth, environmental protection, education, culture, and world peace,” Acta Astronautica, Science Direct)

The major source of social friction, including international friction, has surely always been unequal access to resources. People ﬁght to control the valuable resources on and under the land, and in and under the sea. The natural resources of Earth are limited in quantity, and economically accessible resources even more so. As the population grows, and demand grows for a higher material standard of living, industrial activity grows exponentially. The threat of resources becoming scarce has led to the concept of ‘‘Resource Wars’’. Having begun long ago with wars to control the gold and diamonds of Africa and South America, and oil in the Middle East, the current phase is at centre stage of world events today [37]. A particular danger of ‘‘resource wars’’ is that, if the general public can be persuaded to support them, they may become impossible to stop as resources become increasingly scarce. Many commentators have noted the similarity of the language of US and UK government advocates of ‘‘war on terror’’ to the language of the novel ‘‘1984’’ which describes a dystopian future of endless, fraudulent war in which citizens are reduced to slaves. 7.1. Expansion into near-Earth space is the only alternative to endless ‘‘resource wars’’ As an alternative to the ‘‘resource wars’’ already devastating many countries today, opening access to the unlimited resources of near-Earth space could clearly facilitate world peace and security. The US National Security Space Ofﬁce, at the start of its report on the potential of space-based solar power (SSP) published in early 2007, stated: ‘‘Expanding human populations and declining natural resources are potential sources of local and strategic conﬂict in the 21st Century, and many see energy as the foremost threat to national security’’ [38]. The report ended by encouraging urgent research on the feasibility of SSP: ‘‘Considering the timescales that are involved, and the exponential growth of population and resource pressures within that same strategic period, it is imperative that this work for ‘‘drilling up’’ vs. drilling down for energy security begins immediately’’ [38]. Although the use of extra-terrestrial resources on a substantial scale may still be some decades away, it is important to recognise that simply acknowledging its feasibility using known technology is the surest way of ending the threat of resource wars. That is, if it is assumed that the resources available for human use are limited to those on Earth, then it can be argued that resource wars are inescapable [22,37]. If, by contrast, it is assumed that the resources of space are economically accessible, this not only eliminates the need for resource wars, it can also preserve the beneﬁts of civilisation which are being eroded today by ‘‘resource war-mongers’’, most notably the governments of the ‘‘Anglo-Saxon’’ countries and their ‘‘neo-con’’ advisers. It is also worth noting that the $1 trillion that these have already committed to wars in the Middle-East in the 21st century is orders of magnitude more than the public investment needed to aid companies sufﬁciently to start the commercial use of space resources. Industrial and ﬁnancial groups which proﬁt from monopolistic control of terrestrial supplies of various natural resources, like those which proﬁt from wars, have an economic interest in protecting their proﬁtable situation. However, these groups’ continuing proﬁts are justiﬁed neither by capitalism nor by democracy: they could be preserved only by maintaining the pretence that use of space resources is not feasible, and by preventing the development of low-cost space travel. Once the feasibility of low-cost space travel is understood, ‘‘resource wars’’ are clearly foolish as well as tragic. A visiting extra-terrestrial would be pityingly amused at the foolish antics of homo sapiens using longrange rockets to ﬁght each other over dwindling terrestrial resources—rather than using the same rockets to travel in space and have the use of all the resources they need! 7.2. High return in safety from extra-terrestrial settlement Investment in low-cost orbital access and other space infrastructure will facilitate the establishment of settlements on the Moon, Mars, asteroids and in man-made space structures. In the ﬁrst phase, development of new regulatory infrastructure in various Earth orbits, including property/usufruct rights, real estate, mortgage ﬁnancing and insurance, trafﬁc management, pilotage, policing and other services will enable the population living in Earth orbits to grow very large. Such activities aimed at making near-Earth space habitable are the logical extension of humans’ historical spread over the surface of the Earth. As trade spreads through near-Earth space, settlements are likely to follow, of which the inhabitants will add to the wealth of different cultures which humans have created in the many different environments in which they live. Success of such extra-terrestrial settlements will have the additional beneﬁt of reducing the danger of human extinction due to planet-wide or cosmic accidents [27]. These horrors include both man-made disasters such as nuclear war, plagues or growing pollution, and natural disasters such as super-volcanoes or asteroid impact. It is hard to think of any objective that is more important than preserving peace. Weapons developed in recent decades are so destructive, and have such horriﬁc, long-term side-effects that their use should be discouraged as strongly as possible by the international community. Hence, reducing the incentive to use these weapons by rapidly developing the ability to use space-based resources on a large scale is surely equally important [11,16]. The achievement of this depends on low space travel costs which, at the present time, appear to be achievable only through the development of a vigorous space tourism industry. 8. Summary As discussed above, if space travel services had started during the 1950s, the space industry would be enormously more developed than it is today. Hence the failure to develop passenger space travel has seriously distorted the path taken by humans’ technological and economic development since WW2, away from the path which would have been followed if capitalism and democracy operated as intended. Technological know-how which could have been used to supply services which are known to be very popular with a large proportion of the population has not been used for that purpose, while waste and suffering due to the unemployment and environmental damage caused by the resulting lack of new industrial opportunities have increased. In response, policies should be implemented urgently to correct this error, and to catch up with the possibilities for industrial and economic growth that have been ignored for so long. This policy renewal is urgent because of the growing dangers of unemployment, economic stagnation, environmental pollution, educational and cultural decline, resource wars and loss of civil liberties which face civilisation today. In order to achieve the necessary progress there is a particular need for collaboration between those working in the two ﬁelds of civil aviation and civil space. Although the word ‘‘aerospace’’ is widely used, it is largely a misnomer since these two ﬁelds are in practice quite separate. True ‘‘aerospace’’ collaboration to realise passenger space travel will develop the wonderful profusion of possibilities outlined above. 8.1. Heaven or hell on Earth? As discussed above, the claim that the Earth’s resources are running out is used to justify wars which may never end: present-day rhetoric about ‘‘the long war’’ or ‘‘100 years war’’ in Iraq and Afghanistan are current examples. If political leaders do not change their viewpoint, the recent aggression by the rich ‘‘Anglo-Saxon’’ countries, and their cutting back of traditional civil liberties, are ominous for the future. However, this ‘‘hellish’’ vision of endless war is based on an assumption about a single number—the future cost of travel to orbit—about which a different assumption leads to a ‘‘heavenly’’ vision of peace and ever-rising living standards for everyone. If this cost stays above 10,000 Euros/kg, where it has been unchanged for nearly 50 years, the prospects for humanity are bleak. But if humans make the necessary effort, and use the tiny amount of resources needed to develop vehicles for passenger space travel, then this cost will fall to 100 Euros/kg, the use of extra-terrestrial resources will become economic, and arguments for resource wars will evaporate entirely. The main reason why this has not yet happened seems to be lack of understanding of the myriad opportunities by investors and policy-makers. Now that the potential to catch up half a century of delay in the growth of space travel is becoming understood, continuing to spend 20 billion Euro-equivalents/year on government space activities, while continuing to invest nothing in developing passenger space travel, would be a gross failure of economic policy, and strongly contrary to the economic and social interests of the public. Correcting this error, even after such a costly delay, will ameliorate many problems in the world today. As this policy error is corrected, and investment in proﬁtable space projects grows rapidly in coming years, we can look forward to a growing world-wide boom. Viewed as a whole, humans’ industrial activities have been seriously underperforming for decades, due to the failure to exploit these immensely promising ﬁelds of activity. The tens of thousands of unemployed space engineers in Russia, America and Europe alone are a huge waste. The potential manpower in rapidly developing India and China is clearly vast. The hundreds of millions of disappointed young people who have been taught that they cannot travel in space are another enormous wasted resource. We do not know for certain when the above scenario will be realised. However, it could have such enormous value that considerable expenditure is justiﬁed in order to study its feasibility in detail [5]. At the very least, vigorous investment by both private and public sectors in a range of different sub-orbital passenger vehicle projects and related businesses is highly desirable. Fortunately, the ambitious and rapid investment by the Indian and Chinese governments in growing space capabilities may ﬁnally jolt the space industries of Russia, America, Europe and Japan out of their long economic stagnation, and induce them to apply their accumulated know-how to economically valuable activities—notably supplying widely popular travel services to the general public.

### 1AR XT

## 2AC Warming

### AT: Backstopping

#### US production high—cutting into global market

Kent 3/12 (Sarah, Wall Street Journal, “OPEC: U.S. Shale Oil to Cut Into Demand,” http://online.wsj.com/article/SB10001424127887323826704578356160577328022.html?mod=googlenews\_wsj)

The Organization of the Petroleum Exporting Countries cut its forecast of demand for its oil this year, citing growing production from U.S. shale deposits.¶ If the scaled-back forecast proves correct, OPEC could be on track to have its lowest share of the global oil market in more than 10 years. OPEC's move comes as industry experts increasingly question whether the producers' group, which has had a decisive influence on the oil market since the 1970s, can maintain its position amid a boom in U.S. oil

production resulting from shale- rock drilling technology.¶ Senior figures in OPEC initially played down the threat of the shale-oil boom, but in its most recent market report, published Tuesday, OPEC said expected increases in North American oil production would trim another 100,000 barrels a day from the forecast demand for its crude this year, putting it 350,000 barrels a day below its level in 2012.¶ According to calculations by The Wall Street Journal based on historical data and the current forecasts from OPEC, if the group only pumps enough to satisfy demand for its crude this year, it would be supplying 33.1% of expected overall oil demand this year, down from 35% in 2012 and the lowest level in 11 years.¶ Demand for OPEC's own oil is now expected to fall to 29.7 million barrels a day in 2013, compared with 30.1 million barrels a day in 2012, the group said.¶ OPEC production sometimes exceeds demand for its crude, implying that some of the oil it sells is put into storage rather than consumed.¶ In 2013, non-OPEC oil supply is expected to grow by 1 million barrels a day in total, OPEC said. This is due mainly to growing production in the U.S., which is forecast to hit its highest level since 1985, it said.¶ Rising U.S. oil production is expected to continue pressuring OPEC. A study by the International Energy Agency in October forecast that by 2020 U.S. oil output could overtake that of OPEC's kingpin, Saudi Arabia, forcing the producer group to shift its trading patterns.¶ Africa's largest OPEC member, Nigeria, has already seen its oil exports to the U.S.almost halve between 2011 and 2012, according to data from the U.S. Energy Information Administration.

#### No backstopping – no capacity

Forbes 11(Forbes magazine, “Spare Capacity Dwindles, Alaska Looks Better,” http://blogs.forbes.com/greatspeculations/2011/07/15/spare-capacity-dwindles-alaska-looks-better/)

Heck, Barron’s had a cover story a few days ago about oil reaching $150 by next spring. It cited some of the same data we cited four months ago, about “spare capacity” — or lack thereof. “Spare capacity,” we pause to remind you, is the ability of oil producers to jump-start new oil production within 30 days and keep it up for at least 90 days. According to Morgan Stanley, “spare capacity” will be tapped out in two years… and that’s based on figures before the war in Libya took that nation’s 1.5 million barrels per day offline. With existing fields declining, and Washington keeping new fields off-limits, Big Oil is bailing on Alaska — or at least some of its historically prolific regions. Chevron, for instance, decided recently to dump its holdings in the Cook Inlet area. “The decision comes as production from Cook Inlet oil and gas fields is declining,” reports the Anchorage Daily News, “typically, a period when big energy companies lose interest in their investments and smaller operators jump in.” For those smaller operators, there’s a surprising amount of oil yet to be tapped. “Nearly all of the operating oil and gas fields in Cook Inlet derive from exploration done in the 1950s and 1960s,” explains *Petroleum News*. Then the giant Prudhoe Bay field was discovered and everyone ran off to work there instead. “As a consequence,” the trade publication goes on to say, “only limited exploration of Cook Inlet has taken place in more recent decades.” That’s not the only incentive for a small operator to work over a place like Cook Inlet. “Some 80% of state revenues depend on oil and gas extraction,” says Chris. “It employs thousands of people. Those people in turn support shops, restaurants, and the whole wheel that is a community. “So the state government created some sweetheart deals for oil and gas companies to spend money here. Among these goodies is a 40% state refund on money spent for drilling and exploration costs — paid in cash to the operator. There are other laws in place that could refund as much as 20% of other costs and 25% of net losses incurred.” “For a small operator looking to get a sweet return on a moderate-sized pot of money, Alaska is like the El Dorado of oil and gas.” The realities of shrinking spare capacity are becoming more evident by the day. The International Energy Agency warns that unless OPEC can raise production by 1.5 million barrels a day — about the same as that lost Libyan production — global demand oil demand will start to outrun available supply between now and year-end. Thus, “If there is not enough supply to match the 89 million barrels of oil the global economy is expected to burn every day,” says former CIBC World Markets chief economist Jeff Rubin, “world oil prices have only one direction to go.” “With no obvious end in sight to the Libyan conflict**,”** Mr. Rubin continues, “and sectarian violence against oil fields and refineries suddenly on the rise in Iraq ahead of the scheduled U.S. troop withdrawal, the prospects are not promising for OPEC to increase supplies. “This is even more evident given the region’s largest producer, Saudi Arabia, has little more to offer other than unwanted sour, heavy oil to add to the global supply mix.” It’s not that the Saudi sheiks aren’t trying. Production in the kingdom rose nearly 4% last month, to 9.7 million barrels per day. Thing is, only half of that increase hit the international market. The rest went to Saudi Arabia’s own refineries for “power generation and water desalination plants during the peak summer season,” according to an IEA report out yesterday. Two more factors spurring oil demand: power shortages in China and Japan. Because of drought in China, hydropower plants can’t generate as much electricity. Diesel generators are making up the difference. Diesel is also making up the difference in Japan after the Fukushima disaster. Two-thirds of the country’s nuclear capacity is offline and won’t be coming back online anytime soon. Thus, oil stands to be a profitable play for some time to come even if what passes for a “recovery” in the United States ends up stalling out. How to play it? “About one-fifth of the domestically produced oil in the U.S. comes from Alaska,” observes Chris Mayer, who’s been examining the investing possibilities. “But these assets have been in long decline. Production of crude oil is down more 70% from its high in the 1980s.”

#### It’s impossible

Oweiss 4 – Ibrahim M. Oweiss is an oil economist. He taught at Georgetown University and at Harvard University [“The Invisible Hand and the Price of Oil” October 23rd ]

In analyzing world market of crude oil, one can expect a trend of higher prices than the current level. There may be some ups and downs but the overall trend is on the rise. The reason is that oil production has almost reached the maximum yet world oil consumption is now ahead of what can be supplied. Prince Bandar Bin Sultan (op-ed The Washington Post August 15, 2004) argued that high oil prices are not in the best interests of Saudi Arabia or the world’s economy. Hence Saudi Arabia has always attempted to stabilize the price of crude oil through its production policy. After the second oil shock in 1979, it is a fact that Saudi Arabia increased its oil production resulting in a downward trend of the price of crude oil in world markets. While it may be in the best political interests of Saudi Arabia to pump more oil than an optimum rate of extraction, it is not in the economic interests of neither Saudi Arabia nor the world’s economy to manipulate oil production in an attempt to provide stability in oil markets. As oil is a depleted natural resource, its value when extracted in the future is higher than at present times. Saudi Arabia ought to pursue a production policy compatible with its own economic interests. Its development is based on the conversion of its subsoil resources into other assets such as plants, equipment, education, technology and others. Obviously the conversion process can be carried on at different rates. An optimum rate is that at which oil should be pumped so that the present discounted value of the income created in the conversion process is to be maximized. Saudi Arabia has sold and is selling far more oil than it would sell if these basic economic principles were observed. The excess – the difference between the volume of oil actually supplied and the volume should be supplied in the strict observance of the national economic interests of Saudi Arabia – is in fact a subsidy it grants the western world, Japan and other oil-importing nations. Yet, Saudi Arabia will not be able to produce more than what it technically can. Hence, it cannot flood world markets when world demand exceeds the maximum that can be produced. World demand for crude oil is increasing because of the almost double digit growth rate of China being now an oil importer and the high rate of growth of India as well as for other known factors. In the meanwhile oil traders are fearful from sabotage of oil pipelines in the aftermath of the US war against Iraq in 2003. All such factors will keep putting an upward trend on the price of oil until demand starts to decrease.

#### It does not turn the case

Henriques & Sadorsky 8 (Irene, and Peter, Schulich School of Business in Canada, “Oil prices and the stock prices of

alternative energy companies,” http://isites.harvard.edu/fs/docs/icb.topic741392.files/EnergyStockPrices.pdf, Energy Economics 30 (2008) 998–1010)

Simulation results show the stock prices of alternative energy companies to be impacted by shocks to technology stock prices but shocks to oil prices have little significant impact on the stock prices of alternative energy companies. These results add to a small but growing literature showing that oil price movements are not as important as once thought because investors may view alternative energy companies as similar to other high technology companies. These results should be of use to investors, managers and policy makers.

### AT: Russia

#### No economy impact

Goodrich and Zeihan 9 [Lauren Goodrich, Stratfor's Director of Analysis and Senior Eurasia analyst, and Peter Zeihan, Vice President of Analysis at Stratfor, “The Financial Crisis and the Six Pillars of Russian Strength,” March 3 2009, <http://www.stratfor.com/weekly/20090302_financial_crisis_and_six_pillars_russian_strength>]

Thus, while Russia's financial sector may be getting torn apart, the state does not really count on that sector for domestic cohesion or stability, or for projecting power abroad. Russia knows it lacks a good track record financially, so it depends on -- and has shored up where it can -- six other pillars to maintain its (self-proclaimed) place as a major international player. The current financial crisis would crush the last five pillars for any other state, but in Russia, it has only served to strengthen these bases. Over the past few years, there was a certain window of opportunity for Russia to resurge while Washington was preoccupied with wars in Iraq and Afghanistan. This window has been kept open longer by the West's lack of worry over the Russian resurgence given the financial crisis. But others closer to the Russian border understand that Moscow has many tools more potent than finance with which to continue reasserting itself.

#### **Russia’s economy is declining now – diversification solves**

Bloomberg 12-14 – By Henry Meyer & Agnes Lovasz, December 14th, 2012, "Russia Faces Economy Trap as Oil Decline Looms, EBRD Says" [www.bloomberg.com/news/2012-12-13/russia-at-risk-from-dwindling-oil-reserves-european-bank-says.html](http://www.bloomberg.com/news/2012-12-13/russia-at-risk-from-dwindling-oil-reserves-european-bank-says.html)

‘Petro-State’¶ “The problem of being a petro-state is that **natural resource trends corrupt the institutions**,” Sergei Guriev, rector of the New Economic School in Moscow and a government adviser who contributed to the EBRD report, said in an interview. “This is what is called the **resource curse**. This is a trap, where democratic political and economic institutions do not develop **because rents coming from natural resources provide incentives to the elite not to develop institutions**.”¶ Russia’s economy grew at 7 percent a year on average during Putin’s 2000-2008 presidencies then contracted almost 8 percent in 2009 after crude prices plunged to $34 a barrel from $147. The current resource-based economy can’t deliver the growth rate of 5 percent to 6 percent that Russia needs over the next few decades, Putin said in his Dec. 12 address.¶ ‘Non-State Capitalism’¶ Russia is facing a fourth-straight quarter of slowing growth as weakening demand from China and Europe hurts exports and a surge in inflation saps consumer purchasing power. Gross domestic product will advance 3.5 percent in 2012, according to the government, slowing from last year’s 4.3 percent expansion. GDP will expand 3.5 percent next year, according to the median estimates of 35 economists in a Bloomberg survey last month.¶ “**A real change in the structure of the economy**, the creation of new industrial sectors and the restoration of our leadership in traditional ones, the development of small and medium-sized businesses -- **these are key issues**,” Putin said. “I am sure that at the center of the new economic model should be economic freedom, private property and non-state capitalism.”

### AT: Co2

#### SPS creation only emits a nebulous amount of CO2 and it's offset by the carbon-free power it creates

**Asakura**, Professor @ Azabu University, **2k** (Asakura, Keiichiro, Collins, Patrick, Nomura, Koji, Hayami, Hitoshi, and Yoshioka, Kanji, Department of Environmental Policy @ Azabu University, " CO2 Emission from Solar Power Satellite through its Life Cycle: Comparison of Power Generation Systems using Japanese Input-Output Tables," July, http://policy.rutgers.edu/cupr/iioa/AsakuraCollinsNomuraHayami&Yoshioka\_LifeCycleCO2.pdf, EMM)

In this paper we have analyzed the CO2 emission likely to be produced by a system of Solar Power Satellites in as much detail as possible, based on the DOE/NASA Reference System. Based on this analysis, in order to satisfy Japan's present electricity supply, some 18 SPSs of 5 GW output would be needed, which we have estimated would release some 470 million tons of CO2. Japan currently releases some 1.2 billion tons of CO2 per year, so it is clear that a large amount of CO2 is released when the SPS system is constructed. However, the overall CO2 output is of the same order as nuclear power stations at 20 kg per kWh. This is about 1/60 of the output of coal- red power stations, and 1/30 of the CO2 output of LNG- red power stations. Furthermore, the SPS-Breeder scenario shows signifcant improvement in CO2 emissions at only 11g per kWh. Of course SPS is a future technological system, and potential problems concerning various parts and components remain to be resolved, but our result suggests that the SPS is one of the most effective alternative technology for further CO2 reduction in electric power generation. One of the ways to solve Earth-wide environmental problems is to generate electric power in environmentally clean ways. The SPS system may give us the opportunity to solve this problem and to initiative the escape from a 'closed-Earth' industrial-economic system.

## 2AC Space Radar

### 2AC Radio DA

#### No link

Hashimoto 11(Kozo, Fellow @ the Paleological Association of Japan and Research Institute for Sustainable Humanosphere, Kyoto University, " Frequency Allocations of Solar Power Satellite and International Activities," May, IEEE, EMM)

F. Effects on Radio Propagation From a view point of the safety to biological objects, the power density of SPS is limited to less than 100 mW/cm 2 at the center of the receiving site, where the density is maximum. No effect on radio propagation has been known at this level although further experimental evaluation is required. IV. POTENTIAL INTERFERENCES OF SPS The recent contribution [6] introduces some interference analyses for the NASA/DOE model [9] and the JAXA model [1]. Key parameters for these models are shown in Table I. Some results are briefly introduced. In terrestrial radio relay links, if harmonics of the SPS beam are phase.

#### Companies will coordinate to avoid disruption

Smith 8– PhD Student @ University of Reading M.V., Lt. Col, PhD student in the strategic studies program under Professor Colin Gray at the University of Reading in the UK, winner of the National Space Society’s 2008 Space Pioneer Award, Chief of Future Concepts (Dream Works) the Pentagon, http://spacesolarpower.wordpress.com/2008/08/31/parking-slots-and-frequencies/

How does a company obtain a geostationary parking slot for a SBSP satellite? Parking slots are allotted internationally, by the International Telecommunications Union (ITU). However, the ITU only allocates orbital slots to countries, and not to private sector companies. Companies must negotiate with countries who hold the rights to orbital slots of interest. They must establish an agreement whereby space-based solar power satellites can thereafter occupy the countries’ allocated orbital slot(s). This is a common and standard practice by companies operating communications satellites in the geostationary belt. Space-based solar power p [SBSP] companies will follow these routine and well established procedures to acquire orbital parking slots. When satellites are located close to each other, their up-link and downlink frequencies and polarisations are to be coordinated, so that there is no interference. Sometimes this requires that existing frequencies or polarisations be altered by existing satellites, to accommodate a new entrant. The ITU which allocates the orbital slots (to countries who in turn may grant use of their slots to commercial ventures) requires that all players coordinate their frequencies so that there is no disruption of service. The new entrant is obliged to ensure that their transmissions will not disrupt existing services.

#### Asteroid detection efforts will inevitably fail

**NATIONAL RESEARCH COUNCIL 09** (Committee to Review Near-Earth Object Surveys and Hazard Mitigation Strategies, National Research Council, Near-Earth Object Surveys and Hazard Mitigation Strategies: Interim Report, The National Academies Press, http://www.nap.edu/openbook.php?record\_id=12738&page=1)

Congress directed NASA to ask the National Research Council to review NASA’s near-Earth object programs. This interim report addresses so me of the issues associated with the survey and detection of NEOs. However, the committee continues its information collection and deliberations and will address a broader range of issues in its final report, due for delivery at the end of 2009. During its study so far, the committee has determined that the issues of survey and detection and characterization2 and mitigation are closely linked and should be addressed as a whole. For example, NEOs detected by ground-based telescopes can be better tracked by the Arecibo Observatory when within its range. Thus this observatory plays a key role in determining physical characteristics of NEOs, important in determining how to mitigate the effects of NEOs on Earth. In part because of this interrelationship, and because the interim report does not address mitigation issues, the committee has deferred proposing an optimum approach to the survey and detection problem until its final report. The final report will contain findings and recommendations for survey and detection, characterization, and mitigation of near-Earth objects based on an integrated assessment of the problem. This interim report contains five findings: Finding: Congress has mandated that NASA discover 90 percent of all [NEOs] near-Earth objects 140 meters in diameter or greater by 2020. The administration has not requested and Congress has not appropriated new funds to meet this objective. Only limited facilities are currently involved in this survey/discovery effort, funded by NASA’s existing budget. Finding: The current near-Earth object surveys cannot meet the goals of the 2005 NASA Authorization Act directing NASA to discover 90 percent of all [NEOs] near-Earth objects 140 meters in diameter or greater by 2020.

### No Asteroid Strikes

#### Plan solves asteroid deflection

**Mahan 7 -**  founder of Citizens for Space Based Solar Power (Rob, SBSP FAQ, based on a Bright Spot Radio interview from December 28th, 2007, http://c-sbsp.org/sbsp-faq/)

Are there other reasons you believe we should be developing [SBSP] space-based solar power? Yes, several very important ones. U.S. manufacturing and technology companies are concerned about being able to hire enough capable employees to replace the experienced workforce, a large percentage of which will be elgible to retire within the next ten years. Our domestic “intellectual feedstock” is very low, which is one of many reasons we haven’t built any new nuclear facilities in the last twenty-five years. Like the Apollo and other U.S. space programs did so many years ago, space-based solar power will inspire new generations of U.S. science and technology graduates. The U.S. domestic manufacturing base is badly eroded, and while some economists say that we are moving towards a service-based economy, common sense tells me that we should regain our independence and self-sufficiency in many areas necessary to support our society. Now that what seems like the majority of our clothing, computers, cars, oil, toys and electronics are imported, space-based solar power will support the development of new domestic manufacturing industries. We will also benefit from spin-offs similar to the original space program (microelectronics, internet, velcro, Tang, etc.) Better earth-based solar power efficiences will be gained. Low cost and reliable access to space will support many new industries. Perhaps a space tourism industry will be the forerunner of space colonization. Manufacturing in zero gravity and the hard vacuum of space will yield new materials and new products. Moon and asteroid based operations, such as the mining of natural resources from the Moon and asteroids will provide a platform for planetary protection from NEO (meteor / asteroid) strikes.

#### No Asteroid strikes

Murraco 11 (Michael, “Asteroid 2009 DD45 Barely Misses Earth June 1, 2011”, Mount Washington Valley Astronomy, 6/3, http://mwvastronomy.net/2011/06/asteroid-2009-dd45-barely-misses-earth-june-1-2011/])

What has kept the Earth “safe” at least the past 65 million years, other than blind luck is the massive gravitational field of Jupiter, our cosmic guardian, with its stable circular orbit far from the sun, which assures a low number of impacts resulting in mass extinctions by sweeping up and scatters away most of the dangerous Earth-orbit-crossing comets and asteroids.

## 2AC “In the US” T

#### We meet---we procure energy produced IN the US---we only incentivize what is topical

#### We meet---rectennas would be in the US

Snead 8 – James Michael Snead, senior member of the American Institute of Aeronautics and Astronautics, past chair of the Space Logistics Technical Committee, published in Aerospace America, the Air Force Air and Space Power Journal, the International Society of Logistics’ Logistics Spectrum magazine, the Journal of AstroPolitics, and the online Space Review, graduate of the Air Force Institute of Technology with Master's Degrees in Aerospace Engineering, November 19th, 2008, “The End of Easy Energy and What to Do About It,” National Space Society, <http://mikesnead.net/resources/spacefaring/white_paper_the_end_of_easy_energy_and_what_to_do_about_it.pdf>

Possible rectenna locations in the United States 2.45/5.8 GHz SSP During the initial SSP studies, Rice University conducted a preliminary assessment of the continental United States to determine where the rectennas could be located. The initial assessment concluded that about 40% of the continental United States could be used to locate rectennas. Fifteen exclusion variables were used: inland waters, metropolitan areas, other populated areas, marshlands, perennially flooded lands, military reservations, waterways, designated habitats of endangered species, topography unacceptable, atomic energy commission lands, and lands excluded by three dimensions of electromagnetic compatibility problems. Further refinement of these criteria reduced the initial 40% estimate to about 17% or about 530,000 sq. mi.209 Noting that a rectangular area enclosing the elliptical rectenna and safety zone comprises about 100 sq. mi.,210 the suitable land in the United States could, therefore, support over **5,000 rectennas,** substantially greater than the approximately 250 SSP platforms that would likely be used.211

#### Counter-interp---in means within

The Chambers Dictionary, 2006 Chambers Harrap Publishers Ltd. Page 750

In – prep. Expressing the relation of a thing to that which surrounds, encloses, includes, or conditions it, with respect to the time place, time, or circumstance; or to that which  is assumed, held, maintained , or the relation of a right or possession to the person who holds or enjoys it

#### Counter-interpretation---energy production is creation of electricity for final consumption

DOCC 9 the Department of Climate Change on behalf of the Council of Australian Governments (COAG) Expert Group on Streamlining Greenhouse and Energy Reporting. "National Greenhouse and Energy Reporting Streamlining Protocol" www.climatechange.gov.au/~/media/publications/greenhouse-report/nger-streamlining-protocol.pdf

7.1 Energy production¶ Under the NGER Act corporations are required to report on all energy produced by facilities.¶ ‘Energy production’ is defined in NGER Regulation 2.23: Production of energy, in relation to a facility, means any one of the following:¶ (a) the extraction or capture of energy from natural sources for final consumption by or from the operation of the facility or for use other than in operation of the facility;¶ (b) the manufacture of energy by the conversion of energy from one form to another form for final consumption by or from the operation of the facility or for use other than in the operation of the facility.

Appendix C provides a list of reportable fuels and energy commodities under Schedule 1 of the NGER Regulations.

\*National Greenhouse and Energy Reporting System (NGER) is a 2007 Australian GHG reporting scheme

#### This takes place at rectennas in the US

URSI 5 – International Union of Radio Science (URSI), November 2005, "Supporting Document for the URSI White Paper on Solar Power Satellite Systems," [www.ss.ncu.edu.tw/~ursi/record/WP\_SPS\_supdoc\_051129.pdf](http://www.ss.ncu.edu.tw/~ursi/record/WP_SPS_supdoc_051129.pdf)

The rectenna is extremely efficient in the energy conversion. The 82% of **the energy received** at the ground **is converted to** usable electricity. The microwave beam averages 8% of the power of full sunlight. The maximum energy rate at the center of the radio beam is ¼ of the maximum sunlight energy rate, as measured at high noon in the desert. Thus the total SPS energy arriving at the rectenna site would be a fraction of the solar energy that arrives at each square meter of the site. However, unlike the sunlight, most of this SPS energy will be recoverable, and will be available 24 hours per day. This results in an average output of almost 1500 Wh/day/m2 for a rectenna at the equator 19 compared to only 600 Wh/day/m2 for terrestrial photovoltaics.5

#### SPS collects solar, rectennas convert it to electricity

Powersat 12 – Powersat Corporation, 2012, "Energy market drivers behind Space Solar Power (SSP)" [www.powersat.com](http://www.powersat.com)

Space-based solar power is a method of collecting solar energy so that it can be distributed for use all over the earth. With this amazing technology, space-based solar power is the future of power generation.

#### Counter-interp---“in the US” includes possessions

Department of Defense 5(Dictionary of Military and Associated Terms. US Department of Defense 2005., <http://www.thefreedictionary.com/United+States>)

UNITED STATES: Includes the land area, internal waters, territorial sea, and airspace of the United States, including the following: a. US territories, possessions, and commonwealths; and b. Other areas over which the US Government has complete jurisdiction and control or has exclusive authority or defense responsibility.

#### We meet---SPS is in GSO slots that the USFG owns

Smith 8 – PhD Student @ University of Reading M.V., Lt. Col, PhD student in the strategic studies program under Professor Colin Gray at the University of Reading in the UK, winner of the National Space Society’s 2008 Space Pioneer Award, Chief of Future Concepts (Dream Works) the Pentagon, http://spacesolarpower.wordpress.com/2008/08/31/parking-slots-and-frequencies/

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#### Counter-interpretation---of means from a source

Dictionary.com 13 “of” accessed 3-27, http://dictionary.reference.com/browse/of

preposition¶ 1.¶ (used to indicate distance or direction from, separation, deprivation, etc.): within a mile of the church; south of Omaha; to be robbed of one's money.¶ 2.¶ (used to indicate derivation, origin, or source): a man of good family; the plays of Shakespeare; a piece of cake.

#### Prefer it

#### Grammar---key to precision and predictability---multiple anchor points in the resolution gives it coherent meaning---prevents arbitrary definitions

#### Aff and Neg ground---“extraction” allows affs that mine a little more uranium without creating electricity---that kills link ground. Forcing the aff to be entirely throughout is impossible because energy plants can’t cover the entire US. The word substantial prevents tiny cases

#### Education---SPS is key

Medin 10 – Kristin Medin Chief Industrial Designer, NewSpace DesignLabs, Winter 2010, "Disruptive Technology: A Space-Based Solar Power Industry Forecast,"" Online Journal of Space Communication, Issue Number 16, spacejournal.ohio.edu/issue16/medin.html

Abstract¶ Space-based solar power (SBSP) is an emerging industry whose objective is to relieve the world of its crippling dependence on fossil fuels. However, beyond energy and climate change, **this business is rarely considered for its potentially positive impact on future society.** Large-scale efforts at commercialization of innovations have long been dependent on collaborations between government and private sectors, addressing public need. What the Transcontinental Railroad did for the American economy in the 1800's is an example: this technological breakthrough spawned the Industrial Revolution. In the 2000's, space technologies and their industries have demonstrated the potential for a similar revolutionary influence. As the globe continues to face political, commodity and economic strife, technologies such as SBSP will introduce unforeseen solutions that will help to sustain global peace, improve quality of life and create important new breakthroughs of the future. Presuming SBSP becomes a viable industry, future generations can look forward to greater global collaboration leading to more efficient access to space, space commercialization and careers beyond our horizon, the result of the disruptive solar power satellite.¶ Lessons from History¶ Beyond the first decade of the 21st century, nations of the world now face escalating pressures in international political affairs, economic instability and resource scarcity compounded by early stage effects of climate change. Though not all civilians are directly affected, rising fuel costs combined with the virtual collapse of the stock market and the job market have left many wondering when and how things will get better. Those most affected by this turbulence include young adults entering college who look forward to entering the workforce. For them, it seems harder to plan for the career of tomorrow and know how to leverage their skills, education and passion into meaningful employment.¶ The reassuring message of this paper is that there is a world of perpetual opportunity ahead. This is not the first time in history that sobering events have presented themselves to individuals and to nations, nor will it be the last. Were our combined governments and space-oriented industries to draw on the lessons from history, and agree to develop, launch and commercialize the technology of solar power satellite, for example, a fully realized space industry could change the nature of education, jobs and resources available.¶ Disruptive Technologies¶ A first step is to define and illustrate the potential significance of space-based solar power for the future evolution of civilization. Using historical precedence is one way to make the argument for solar power satellites in terms of types of government support and private industry initiatives and investment needed. For example, the indirect benefits of SBSP can be presented in the context of future population growth, increasing requirements for electrical power, declining natural resources and heightened environmental and other risks.¶ Advancements in human civilization can be marked by the appearance of disruptive technologies, those unanticipated innovations that rapidly surpassed current state-of-the-art and dramatically improved quality of life. Development of the printing press illustrated this principle as the rapid reproduction of books enabled public literacy and the invention of steam engines for trains and ships enabled faster travel and quicker distribution of information. Advancements associated with transporting commodities launched revolutions that forever changed society.¶ When the United States of America was in its infancy, and its populations were clustered predominantly on its eastern Atlantic coast, the development of a Transcontinental Railroad enabled the import and export of goods to and from its western Pacific Coast. Instead of waiting for ships to sail around the tip of South America, goods were loaded onto the railroads and shipped across the continent. What is important to remember about this example is that the construction of the Transcontinental Railroad was backed by the government, but operated as a commercial enterprise initiated by the private sector.[1]¶ With the comparatively quicker exchange of commodities between the east and west coasts, entrepreneurs found themselves with increased access to the materials needed to achieve their vision. The completion of the Transcontinental Railroad sped along the American industrial ascendancy. The rail innovation encouraged the manufacturing of products for distant markets, prompting mass production. The development of new water, coal and oil powered machines helped to fabricate the items that made life seem more civilized. From the mid-1800's to the turn of the century, the mass-production of goods - ranging from hairpins to horseless carriages - and the introduction of new technologies affecting the lifestyle of average citizens marked a time when there was a significant leap in socioeconomic well being.¶ Space Technologies¶ A more recent analogy is the attention given to space. With the development of the National Aeronautics and Space Administration (NASA) of the U.S. government, the country in the1960's established its first space faring agenda. Over five short decades, the USA and other nations have seen space technologies evolve from small probes to the launch and assembly of an International Space Station in low earth orbit (LEO).[2] Much like the Transcontinental Railroad, the development of operational infrastructures in space was initially backed by the government.¶ In the early 1980's, Society Expeditions, a travel company known for its exotic cruises and eco tours, commissioned the Phoenix Reusable Launch Vehicle (RLV) to take tourists to space beginning in 1992. But, the Challenger shuttle explosion in 1986 made the government and the commercial markets more cautious, causing a delay in the progress of tourism services in the private sector.[3] In 1994, a visionary named Peter Diamandis created the X-Prize Foundation on the premise that it should not cost millions to travel to space. The best known of these prizes, dubbed the Ansari X-Prize, was for the development of an RLV that could launch, fly to sub-orbital space and return to land on the same runway from which it took off, and repeat the trip within two weeks. These were thought to be the tough but necessary criteria for a sustainable private spaceflight industry. That prize was claimed by Burt Rutan of Scaled Composites a full decade later.[4]¶ Satellite technologies, successfully leveraged by entertainment, telecommunication, defense and other terrestrial enterprises, have proven to be disruptive in the way earth-bound businesses broadcast programming, acquire and manage information and maintain surveillance of earth and sky. We can barely conjure memories of life before high definition TV, satellite weather reports, cars with geopositioning systems, cell phones and wireless Internet.¶ **Now, multiple nations are exploring the prospects for launching a new breed of satellites designed to harvest solar power in space**, transmitting it from geosynchronous orbit to terrestrial receivers. If these plans turn out, solar power satellites will radically change the ways we harness and distribute energy. Solar power from space is far more efficient than terrestrial capture due to the filtering effects of our atmosphere and the day and night cycles experienced everywhere on earth**. Solar power is thought to be our most likely candidate for a clean-base, renewable and dependable source for energy.** According to Dr. Feng Hsu, Technical Lead and Manager over Integrated Risk Management at NASA, Goddard, roughly 350,000,000 terawatt hours of energy falls towards earth per year.[5]¶ SMSP has obvious selling points, but this development presents advantages of a higher order. That is, the implementation of solar power satellites has the prospect of enabling development of other technologies, which can send waves of creative innovation throughout global society. Is it hard to imagine its implications for international peace keeping? Wars are fought over access to energy. Sun's energy is abundant and free, if we can learn how to tap it. Is it hard to imagine that capturing and delivering sun's energy to global users is a global business, and that thousands of careers and millions of jobs will be created in the process of bringing it to reality?¶ Already, teams of engineers, economists and business people are figuring out the logistics of launching and assembling massive solar arrays in space. Study teams are seeking to find the least controversial and the most effective means of transmitting wireless power from space to ground and for designing the terrestrial infrastructure needed to distribute that power, potentially to all human civilization.

#### We internal link turn limits---extraction is limitless

Natural Gas.org No Date – “Processing Natural Gas" [www.naturalgas.org/naturalgas/processing\_ng.asp](http://www.naturalgas.org/naturalgas/processing_ng.asp)

**Natural gas, as it is used by consumers, is much different from the natural gas that is brought from underground up to the wellhead.** Although the processing of natural gas is in many respects less complicated than the processing and refining of crude oil, it is equally as necessary before its use by end users.¶ The natural gas used by consumers is composed almost entirely of methane. However, natural gas found at the wellhead, although still composed primarily of methane, is by no means as pure. Raw natural gas comes from three types of wells: oil wells, gas wells, and condensate wells. Natural gas that comes from oil wells is typically termed 'associated gas'. This gas can exist separate from oil in the formation (free gas), or dissolved in the crude oil (dissolved gas). Natural gas from gas and condensate wells, in which there is little or no crude oil, is termed 'nonassociated gas'. Gas wells typically produce raw natural gas by itself, while condensate wells produce free natural gas along with a semi-liquid hydrocarbon condensate. Whatever the source of the natural gas, once separated from crude oil (if present) it commonly exists in mixtures with other hydrocarbons; principally ethane, propane, butane, and pentanes. In addition, raw natural gas contains water vapor, hydrogen sulfide (H2S), carbon dioxide, helium, nitrogen, and other compounds. To learn about the basics of natural gas, including its composition, click here.¶ Natural gas processing consists of separating all of the various hydrocarbons and fluids from the pure natural gas, to produce what is known as 'pipeline quality' dry natural gas. Major transportation pipelines usually impose restrictions on the make-up of the natural gas that is allowed into the pipeline. That means that before the natural gas can be transported it must be purified. While the ethane, propane, butane, and pentanes must be removed from natural gas, this does not mean that they are all 'waste products'.¶ In fact, associated hydrocarbons, known as 'natural gas liquids' (NGLs) can be very valuable by-products of natural gas processing. NGLs include ethane, propane, butane, iso-butane, and natural gasoline. These NGLs are sold separately and have a variety of different uses; including enhancing oil recovery in oil wells, providing raw materials for oil refineries or petrochemical plants, and as sources of energy**.**

#### Reasonability---competing interpretations are a race to the bottom to arbitrary exclude the aff

## Albedo CP

#### Perm do both

#### Perm do plan and geoengineering

#### Perm do plan and reasonable defense plan

### 2AC Geoengineering CP V2.0

#### Peer review studies show that injections reduce the albedo-indicts their authors

Alterskjaer Kristjansoon and Seland 11 (10/31 peer reviewed journal under the atmospheric chemistry and physics K. department of geoscience at the university of oslo. J.E. Norwegian meteorological institute. <http://www.atmos-chem-phys-discuss.net/11/29527/2011/acpd-11-29527-2011-print.pdf>)jc

In earlier studies Latham et al. (2008) and Jones et al. (2009) estimated the radiative forcing resulting from seeding of marine clouds by assuming a homogeneous and ﬁxed CDNC value of 375 cm −3 or 1000 cm −3 in seeded clouds. Figure 5 shows the annually averaged CDNC around 930 hPa after cloud seeding and clearly indicates that as5 suming a ﬁxed value is inappropriate. The resulting CDNC ﬁeld is highly non-uniform, which was also found by Korhonen et al. (2010). This explains why the resulting radiative forcing (Fig. 4) does not have the same geographical pattern as that of Latham et al. (2008), discrepancies being especially large in the Mid- and the West-Paciﬁc. The radiative forcing shown in Fig. 4 also include areas that experience a positive 10 forcing and Fig. 5 shows that even though we emit about 70 times more sea salt than what was suggested by Latham et al. (2008), the average CDNC over ocean is below their assumed value of 375 cm −3 in seeded conditions. There may be several reasons for this. The NorESM model includes droplet nucleation based on aerosol number concentration, size distribution and cloud supersaturation. Our results show that increasing 15 the number of sea salt particles in the atmosphere afects both the cloud supersaturation (Fig. 6a) and the pre-existing aerosol concentration (Fig. 6b), in addition to aﬀecting the concentration of CCN directly. The maximum supersaturation reached is reduced because of an increased competition eﬀect following sea salt injections. Independent of whether the added sea salt particles are large enough to become activated to cloud 20 droplets, they will swell and create a moisture sink in an updraft. The reduced maximum supersaturation leads to an increase in the critical minimum size of particles that can activate to become cloud droplets. This may inhibit activation of both the added sea salt and the pre-existing aerosols that would activate without sea salt injections. The sea salt injections will also inﬂuence the concentration of particulate sulfate (SO4 25 ) in the atmosphere. When gaseous sulphuric acid reaches saturation two things can happen; it can either condense on pre-existing particles or it can nucleate to form new particles. The added sea salt particles greatly increase the total surface area of atmospheric aerosols, allowing more condensation to occur, reducing the both the nucleation of new SO4 particles and the lifetime of SO4 as more is washed out with the 29541 Discussion Paper | Discussion Paper | Discussion Paper | Discussion Paper | sea salt. Both the eﬀect on supersaturation and the eﬀect on the SO4 concentration lead to a reduced eﬀectiveness of sea salt injections. The areas that show a positive forcing at TOA from cloud seeding in Fig. 4 have a large static stability, and therefore increasing sea salt emissions led to a very large 5 increase in aerosol number concentration at these sites. The increased competition eﬀect resulting from the added sea salt reduces the cloud droplet nucleation and therefore the cloud albedo.

#### Geoengineering fails and causes global instability

Vidal 13 – John Vidal, January 8th, 2013, "Rogue geoengineering could 'hijack' world's climate" www.guardian.co.uk/environment/2013/jan/08/geoengineering-hijack-world-climate/print

The world's climate could be hijacked by a rogue country or wealthy individual firing small particles into the stratosphere, claims a warning that comes not from a new Hollywood movie trailer but a **sober report from the World Economic Forum (WEF)**.¶ The deployment of **independent, large-scale "geoengineering" techniques aimed at averting dangerous warming warrants more research because it could** lead to an international crisis **with** unpredictable costs to agriculture, infrastructure and global stability, said the Geneva-based WEF in its annual Global Risks report before the Davos economic summit later this month. It also warned that ongoing economic weakness is sapping the ability of governments to tackle the growing threat of climate change.

#### Hacks proposal new geoengineering ideas all the time---be very skeptical

Discover News 12-13 – Discovery News, December 13th, 2012, "Geoengineering Schemes Split Scientists" news.discovery.com/earth/global-warming/geoengineering-climate-change-121021.htm

In the past, proponents of geo-engineering have proposed things like orbiting space-based sunshades to shield the Earth, putting up huge reflective balloons or dumping tons of rust particles into the ocean to capture CO2. That happened in 1991 when Mt. Pinatubo erupted and dumped an estimated 40,000 tons of iron dust into the world's oceans, which did in fact slightly lower carbon levels.¶ Of course, it's never been tried on a global scale on purpose.¶ **"There are lots of reasons why geo-engineering is not an ideal solution,"** said MacMartin. "Certainly emissions reductions are a lot safer. But we don't know all the consequences of geoengineering are, and what the consequences that not doing it are. We might wind up in situation that some form of geoengineering is better than not doing it."¶ That might have been the working theory behind George's plan, which was first revealed in The Guardian.¶ George said that he was the world's leading champion of geo-engineering, and was also planning to profit from his plan to dump 100 metric tons of iron sulfate in the ocean. The Canadian tribal group who contracted with George said on Friday that they weren't too happy about the plan.¶ BLOG: Geoengineering Soaring To New Heights¶ "**The consequences of tampering with nature at this scale are not predictable and pose unacceptable risks to the marine environment,**" read the statement from the Council of Haida Nation. "**Our people along with the rest of humanity depend on the oceans and cannot leave the fate of the oceans to the whim of the few**."¶ Rutgers University climate scientist professor Al Robock remains skeptical of global climate-tweaking projects for both scientific and ethical reasons. "We have to learn what the benefits and risks of proposed schemes are," he said.¶ Seeding the stratosphere can also damage the Earth's protective ozone layer, although the exact amount isn't clear. That was another side effect of the Pinatubo eruption.

### Reasonable Defense

Preventing Sequestration doesn’t solve Space Radar development---the 1AC proves SPS is key

## 2AC Politics DA---Immigration

#### Won’t pass---and gun control and budget pounds

Altman 3/20 [Alex Altman, Washington correspondent for TIME, “Four Hurdles That Could Block Immigration Reform,” http://swampland.time.com/2013/03/20/four-hurdles-that-could-block-immigration-reform/]

The next few months offer the best chance in a generation for the two parties to solve a problem that has bedeviled Congress like few others. Both sides agree the U.S. immigration system is broken. Both would seem to gain from a deal that clears a pathway out of legal oblivion for the nation’s 11 million illegal immigrants. Support is building for a landmark pact. But while negotiations are progressing in both the House and Senate, an agreement is a long way off. As the talks grow more detailed, obstacles to a deal may begin to emerge:¶ Problem #1: The Gang of Eight¶ The first snag lurks in the Senate, where the so-called Gang of Eight has huddled privately since the election in hopes of hammering out a bill. Members have crafted a set of measures that would create a pathway to citizenship for the nation’s estimated 11 million undocumented immigrants within about 13 years while requiring them to register with federal authorities, pay back taxes and fines, learn English and undergo background checks. The deal, both sides agree, would also beef up border security and determine how the future flow of immigrants will be regulated to match the needs of the economy.¶ The Gang’s closed conclaves have been marked by Vatican-style secrecy, often a sign of progress in a town where silence is rare. The Gang’s members – Republicans Marco Rubio, Lindsey Graham, John McCain and Jeff Flake, and Democrats Chuck Schumer, Dick Durbin, Bob Menendez and Michael Bennet – have, by all accounts, developed a rapport. “You can tell by the tone of their voices,” says an elected Democrat briefed on the progress of the private talks.¶ But the broad themes are the easy part. The full bill will stretch to hundreds of pages, each peppered with detailed provisions that could spike it. Members bring clashing political imperatives and ideologies to the talks. Rubio, for example, is trying to repair the GOP’s tattered image with Hispanic voters without sparking a backlash among the movement conservatives he’d need in a presidential bid. Graham, who faces a probable primary challenge in 2014, has a habit of basking in the bipartisan spotlight before bolting when negotiations intensify. The measure of the Gang of Eight’s success isn’t whether they are aligned at the start of their talks. It’s whether they are all aligned at the end.¶ Problem #2: The Lobbyists¶ A few years ago, an impasse between the leaders of the Chamber of Commerce and the AFL-CIO helped scupper an immigration-reform bill backed by President George W. Bush. At that time, business and labor could not agree on how many visas to grant low skilled workers who make the construction, agriculture and hotel and restaurant industries hum. The Chamber wanted cheap labor, but didn’t want workers to stay; unions were concerned about protecting citizens’ jobs. Soon after, reform collapsed.¶ This time the two groups have nurtured an unlikely alliance. “There has been a sea change,” says a labor source close to the discussions. Nudged by Graham and Schumer, the two lobbies released a set of shared principles, including one stating that Americans should get “first crack” at available jobs and that businesses should have the flexibility to hire to meet the demands of the market. But history could repeat itself again. The two sides call for a new federal agency charged with setting visa levels, but they have yet to agree on who’s eligible or how the new bureau will work. The issue of future flow has been a stubborn sticking point before. And it is as easy to imagine conservatives balking at efforts to create a new government agency as it is to foresee unions drawing a line at a small number of foreign workers.¶ Problem #3: House Republicans¶ Even if Senate negotiators can come up with a package to get 60 votes in the upper chamber, “the question continues to be, how does it get through the House?” says Frank Sharry, an expert on immigration reform. As in the Senate, a bipartisan cluster of eight representatives from across the ideological spectrum have been secretly meeting for months. Congressman Luis Gutierrez, an Illinois Democrat who has long been a leader on immigration reform, is full of praise for the new tack taken by his Republican counterparts. But, he acknowledges, “You still have to put those votes on the board, and that’s going to be a real, real test in the House of Representatives.”¶ For their part, Republicans say the party’s old dogma, which held that illegal immigrants should self-deport and then go to the back of the line, is not viable policy. Even many immigration hard-liners say they want to help shape comprehensive reform. “It’s time for us to belly up to the bar,” says Ted Poe, the Texas Republican who chairs the House immigration reform caucus. But for conservatives, amnesty remains a dirty word. “A bill that’s basically amnesty, that says you’re here and you’re going to be a citizen — those two things are not going to come out of this conservative House,” says Poe. Even citizenship is charged enough that Republican Senator Rand Paul, who gave a speech March 19 backing a path to legalization for undocumented immigrants, avoided using the term. Many House Republicans, including several in the Judiciary Committee through which a bill must pass, have a long history of antipathy to amnesty, and only a grassroots rebellion to fear as next year’s primaries approach.¶ Then there is the reality that even if Republicans were to be widely supportive of amnesty, very few of those new citizens are likely to abandon the Democratic Party anytime soon. “Republicans face a choice: do they ditch their principles and go all out in a failing attempt to outpander Democrats?” asks Rosemary Jenks, director of government relations at NumbersUSA, which advocates for lower immigration levels. “It’s becoming very clear to Republicans in Congress that this is not going to get them the Hispanic vote.”¶ Problem #4: The Democrats¶ Little discussed but also looming is the possibility that Democrats drag their feet on reform. Liberals will balk if the path to citizenship is too long or too onerous, or if enforcement provisions are too rigid. Many conservatives also suspect that Democratic power brokers, despite their daily hammering of Republicans to get moving on immigration reform, would privately prefer to keep the issue as a cudgel than actually pass a law. Barack Obama “wants to make a bill come out of the Senate that is so far out there that it would never pass, so that he can blame us for not being compassionate and use the issue to take back the House in 2014,” says a House Republican. Even some liberals see this as a plausible scenario. “There’s always a lingering doubt in my mind,” admits one House Democrat. Obama knows that putting his fingerprints on the deal is an easy way to kill it; when a draft of his proposal leaked in the press, he called Republican negotiators individually to apologize. But if negotiations in Congress bog down, he may not be so hands off.¶ By all accounts, negotiators are making genuine progress toward a landmark deal that builds on a foundation laid during its last fumbled attempts. But lawmakers still have to thread a bill through a thicket of obstacles in a bitterly divided Congress. Sources close to the negotiations say they expect both chambers to introduce legislation in early April, giving Congress several months to haggle out a pact before members scatter for their summer recess. It sounds like plenty of time, but it’s not. Immigration will have to jockey for attention this spring with gun control, budgets and a potential grand bargain on tax and entitlement reform. Meanwhile, the human cost of the political stalemate is high. Each day, 1,400 undocumented immigrants are deported.

#### Perez nomination pounds immigration

US News 3-21-13, Ron Bonjean, “Tread Carefully, GOP—The Perez Nomination Is a Trap”, http://www.usnews.com/opinion/blogs/ron-bonjean/2013/03/21/perez-nomination-could-be-a-trap-for-the-gop

While the GOP continues to try to thread the needle over amnesty, pathways to citizenship and a guest worker program, the White House made a politically brilliant move which could help keep Republican poll numbers in the gutter. President Obama nominated Thomas E. Perez, who heads the Civil Rights Division at the Justice Department, to be the next Secretary of Labor which has provoked a fight with some Senate Republicans about voting rights, immigration and discrimination.

#### **Obama will XO immigration reforms**

Lillis 2-16 – Mike Lillis, February 16th, 2013, "Dems: Obama can act unilaterally on immigration reform" thehill.com/blogs/regwatch/administration/283583-dems-recognize-that-obama-can-act-unilaterally-on-immigration-reform

President Obama can – and will – take steps on immigration reform in the event Congress doesn't reach a comprehensive deal this year, according to several House Democratic leaders.¶ While the Democrats are hoping Congress will preclude any executive action by enacting reforms legislatively, they say the administration has the tools to move unilaterally if the bipartisan talks on Capitol Hill break down. Furthermore, they say, **Obama stands poised to use them.**¶ **"I don't think the president will be hands off on immigration for any moment in time**," Rep. Xavier Becerra (D-Calif.), the head of the House Democratic Caucus, told reporters this week. "**He's ready to move forward if we're not**."¶ Rep. Joseph Crowley (N.Y.), vice chairman of the Democratic Caucus, echoed that message, saying Obama is "not just beating the drum," for immigration reform, "he's actually the drum major."¶ "There are limitations as to what he can do with executive order," Crowley said Wednesday, "but he did say that if Congress continued to fail to act that he would take steps and measures to enact common-sense executive orders to move this country forward."¶ Rep. Raul Grijalva (D-Ariz.), who heads the Congressional Progressive Caucus, said there are "plenty" of executive steps Obama could take if Congress fails to pass a reform package. "The huge one," Grijalva said, is "**the waiving of deportation**" in order to keep families together.¶ "Four million of the undocumented [immigrants] are people who overstayed their visas to stay with family," he said Friday. "So that would be, I think, an area in which … there's a great deal of executive authority that he could deal with."¶ The administration **could also waive visa caps**, Grijalva said, to ensure that industries like agriculture have ample access to low-skilled labor.¶ "Everybody's for getting the smart and the talented in, but there's also a labor flow issue," he said.

#### Timeframe is more than 10 years

Navarrette 2-19 – Ruben Navarrette, CNN Contributor, February 19th, 2013, "Guest worker issue may kill immigration reform" [www.cnn.com/2013/02/19/opinion/navarrette-immigration-reform/index.html](http://www.cnn.com/2013/02/19/opinion/navarrette-immigration-reform/index.html)

How long? The undocumented could immediately apply for a special protective status to avoid deportation, but it would take them about eight years to get legal permanent residency (a green card) and another four or five years to become a U.S. citizen.

#### Congressional support for SPS

Morring 7 – Frank Morring, expert at Aviation Week & Space Technology, August 20th, 2007, “Space Solar Power: Climate, Economy, National Security Drive Another Look At SSP; Experts see warming, economic concerns and energy security as reasons to build SSP” Proquest Search

Another factor that might build support in Congress and the Executive Branch is the effect building an SSP system would have on competitiveness. "Here in the U.S. **we continue to be concerned about competitiveness**, particularly in light of the migration of many high-tech industries overseas, and how [to] provide long-term economic and science and technology strength in the U.S. [It's] an ongoing challenge," Mankins says.

#### The DOD supports SPS and shields it

Hurst 8 – executive editor and writer for ecopolitology and Cleantechnica (Timothy B. December 21, 2008, Red Green & Blue, “Will Obama Champion Space-Based Solar Power?” <http://redgreenandblue.org/2008/12/21/will-obama-champion-space-based-solar-power/>)

But there has also been some discussion that Obama could make cuts at NASA, if for no other reason than something has got to be cut somewhere. Although funding NASA may not be a top priority for Obama, a strong argument could be made that investment in SSP research program would sync with his focus on building a clean energy economy. It also helps that the idea has been supported by Defense Department officials who see SSP applications in the transmission of electricity to remote locations to support military actions. I’m not suggesting that Obama will use the cover of the Defense Departmen**t to expand solar research**, but used as part of a strategy that promotes economic growth and environmental health, it may be a strategic choice that has some political legs. Whatever political method the Obama administration uses to hammer on the clean energy agenda, it is clear that Obama’s will be a science-based administration. And as recently as yesterday, Obama reiterated that his administration would not stifle hard-to-swallow science, but nurture it. Obama said in his weekly address: “Today more than ever before science holds the key to our survival as a planet and the security and prosperity as a nation. It’s time once again that we put science at the top of our agenda and restore America’s place as the world leader in science and technology.” If that includes a robust Space-Based Solar Program, we’ll have to wait and see.

#### No spillover

Judson Berger 3-4, 2013, “Recurring budget crises could put squeeze on Obama's second-term priorities,” Fox News, <http://www.foxnews.com/politics/2013/03/04/recurring-budget-crises-could-put-squeeze-on-obama-second-term-priorities/#ixzz2OknXmt3G>

Rep. Luis Gutierrez, D-Ill., a vocal advocate for immigration reform, voiced confidence Monday that the administration and Congress could handle the busy agenda. ¶ "The spirit of bipartisan cooperation that is keeping the immigration issue moving forward has not been poisoned by the sequester and budget stalemate, so far," he said in a statement. "The two sets of issues seem to exist in parallel universes where I can disagree with my Republican colleagues strenuously on budget matters, but still work with them effectively to eventually reach an immigration compromise. ... I remain extremely optimistic that immigration reform is going to happen this year." ¶ Immigration reform efforts are still marching along despite the budget drama. Obama met last week on the issue with Sens. John McCain, R-Ariz., and Lindsey Graham, R-S.C., who both are part of a bipartisan group crafting legislation.

#### Infrastructure pounds

Katie Fahrenbacher 3-15, “Obama starts unveiling his plans for climate change, clean energy,” 3/15/13, http://gigaom.com/2013/03/15/obama-starts-unveiling-his-plans-for-climate-change-clean-energy/

President Obama called for stronger action on climate change and support of clean energy research during his State of the Union speech, and now he’s showing his cards for how he might carry that out. On Friday Obama is expected to propose funneling $2 billion worth of federal leases for oil and gas companies into research and deployment of cleaner vehicles, reports the New York Times. At the same time, Bloomberg reports that Obama could also use a law from the Nixon-era to tell federal agencies that they need to consider climate change impacts before approving infrastructure projects like oil pipelines. ¶ The moves show how Obama is getting creative at a time when Congress isn’t likely to approve budget increases for clean energy support, or other policies like a cap and trade program or carbon tax. The stimulus package, which injected some $90 billion into clean energy projects and incentives, has largely been spent or the funds expired, so clean energy companies and projects are facing a steep drop in federal support in 2013. ¶ Yet, many will note that the moves are piece meal and not as aggressive as Obama originally proposed when he first ran for office. And some of Obama’s concessions to the natural gas and oil industry will likely anger environmentalists and some clean energy advocates. The Washington Post reports that the Obama administration plans to rewrite its proposal to regulate greenhouse emissions using the Environmental Protection Agency, making the proposal weaker and potentially delaying regulations. ¶ The proposal for using $2 billion in federal leases will emerge over the coming weeks. Obama brought up this plan in the State of the Union speech, calling it an Energy Security Trust that will drive new research and technology to shift our cars and trucks off oil for good. Obama said “If a non-partisan coalition of CEOs and retired generals and admirals can get behind this idea, then so can we.” ¶ The use of the infrastructure law is a new idea, and will no doubt prove controversial. A manufacturing association told Bloomberg that the notion had them “freaked out.” The law originally was used to protect water, air and soil from infrastructure projects that could have negative environmental effects.

#### Aviation taxes pound

Sullivan 3-26-13, Andy, Oman Observer Reporter, “Obama’s tax move against jet loophole hits turbulence”, http://main.omanobserver.om/node/158306

First came the recession, throwing thousands out of work. Then came the drought, choking crops and draining reservoirs. Then came the president, arguing that the private-plane buyers who fuel this city’s economy benefit from an unfair tax break.¶ President Barack Obama’s proposal to reduce that tax break has won wide support among Democrats who see it as an example of how the US tax code is too generous to the wealthy. But what looks like a loophole in Washington appears much different in this prairie city of 400,000, where leaders of all political stripes worry that Obama’s rhetoric is already undermining an industry that accounts for 1 in 10 jobs in the region.¶ “I’m certainly disappointed that he would do something of this nature,” said Wichita Mayor Carl Brewer, a Democrat who displays Obama’s portrait on his office wall. “As long as you’re doing something to threaten my aviation industry ... I’ll continue to speak out against it.”¶ Brewer’s vow could serve as an early warning for Obama and lawmakers in Congress as they try to streamline the US tax code in order to lower rates or narrow trillion-dollar deficits. The idea of eliminating perks in the nation’s tax laws may sound appealing in the abstract. But many changes — particularly to provisions that have helped to create jobs — are likely to spur bipartisan blowback from places like Wichita that are still struggling to emerge from the country’s deepest recession in 80 years.

#### PC not key and winners win

Hirsh 2-7 – Michael, chief correspondent for National Journal; citing Ornstein, a political scientist and scholar at the American Enterprise Institute and Bensel, gov’t prof at Cornell, "There's No Such Thing as Political Capital", 2013, [www.nationaljournal.com/magazine/there-s-no-such-thing-as-political-capital-20130207](http://www.nationaljournal.com/magazine/there-s-no-such-thing-as-political-capital-20130207)

But the abrupt emergence of the immigration and gun-control issues illustrates how suddenly shifts in mood can occur and how political interests can align in new ways just as suddenly. Indeed, the pseudo-concept of political capital masks a larger truth about Washington that is kindergarten simple: You just don’t know what you can do until you try. Or as Ornstein himself once wrote years ago, “Winning wins.” In theory, and in practice, depending on Obama’s handling of any particular issue, even in a polarized time, he could still deliver on a lot of his second-term goals, depending on his skill and the breaks. Unforeseen catalysts can appear, like Newtown. Epiphanies can dawn, such as when many Republican Party leaders suddenly woke up in panic to the huge disparity in the Hispanic vote.¶ Some political scientists who study the elusive calculus of how to pass legislation and run successful presidencies say that political capital is, at best, an empty concept, and that almost nothing in the academic literature successfully quantifies or even defines it. “It can refer to a very abstract thing, like a president’s popularity, but there’s no mechanism there. That makes it kind of useless,” says Richard Bensel, a government professor at Cornell University. Even Ornstein concedes that the calculus is far more complex than the term suggests. Winning on one issue often changes the calculation for the next issue; there is never any known amount of capital. “The idea here is, if an issue comes up where the conventional wisdom is that president is not going to get what he wants, and he gets it, then each time that happens, it changes the calculus of the other actors” Ornstein says. “If they think he’s going to win, they may change positions to get on the winning side. It’s a bandwagon effect.”

#### DOD shields

Appelbaum 12 – Binyamin, Defense cuts would hurt scientific R&D, experts say, The New York Times, 1-8, http://hamptonroads.com/2012/01/defense-cuts-would-hurt-scientific-rd-experts-say

Sarewitz, who studies the government's role in promoting innovation, said the Defense Department had been more successful than other federal agencies because it is the main user of the innovations that it finances. The Pentagon, which spends billions each year on weapons, equipment and technology, has an unusually direct stake in the outcome of its research and development projects.¶ "The central thing that distinguishes them from other agencies is that they are the customer," Sarewitz said. "You can't pull the wool over their eyes."¶ Another factor is the Pentagon's relative insulation from politics, which has allowed it to sustain a long-term research agenda in controversial areas**.** No matter which party is in power, the Pentagon has continued to invest in clean-energy technology, for example, in an effort to find ways to reduce one of its largest budget items, energy costs.

### AT: Food

#### Labor shortages do not impact food prices

Martin 7 (Philip Martin, Professor of California Resource Economics, University of California, Davis, November 2007, Farm Labor Shortages: How Real? What Response, http://www.cis.org/node/637)

The final point is "What does it all mean to consumers?" And in the answer is not very much. Consumers spend on average about one dollar a day on fresh fruits and vegetables, of that one dollar about eighteen cents goes to farmers. That is farmers get a very small share of that one dollar spent on a pound of apples or a head of lettuce and of course farmers don't give all of what they get to farm workers. Labor costs are typically less than a third of farmer's revenue, so that means on a one dollar head of lettuce or a one dollar pound of apples, farm worker wages and benefits are about six cents. So the little exercise that I worked out is to say: "what would happen if wages rouse for farm workers at the same rate that they did at the end of the Bracero Program in the 1960's?" And at that time when the Bracero Program ended there was a scramble for workers in the mid 1960's, there was a lot of mechanization, and the United Farm Workers and their first contracts with grape growers got a 40% wage increase. So a 40% wage increase in one year, taking the wages from $1.25 and hour to $1.75 and hour. If there were to be another 40% wage increase and assuming there was no mechanization in response, that is that entire wage increase would be passed on to consumers. You can see that the instead of six cents in a one dollar pound of apples or a head of lettuce it would be eight and a half cents and if you multiply that out for a family, for its spending on fresh fruits and vegetables, the increase costs would be about eight dollars a year. So it's a relatively small increase in cost. Primarily because people don't spend very much on fresh fruits and vegetables, and then farmers don't get a very big share of what they do spend and then farm workers get a relatively small share, well they get a third, of what farmers revenue is. So the overall impact on consumers of changes in farm wages is very small. And I would suspect that most people, most consumers, would not realize that we had hurricanes in Florida in the last several years, which drastically reduced the acreage in production of oranges. Or that we had a freeze in California in January of 2007 that similarly sharply reduced production of fruits and vegetables. Or there was a freeze in the Carolinas and Georgia this year that reduced production of peaches and other crops. So in general consumers tend to be pretty insulated from what can be relatively sharp drops or sharp changes in production. Primarily because the fruits and vegetables come from many places and normally if they don't come from one place they will come from another and prices don't change very much. So those are the one, two, three, four things: no definition, production is up, the complications surrounding mechanization, and the relatively small role of farm wages in consumer budgets. So I think at this point it might be instead of me keeping talking to respond to questions.

### AT: Economy

#### No economic benefit to legalization

Hill et al. 10 – Laura E. Hill is a research fellow at the Public Policy Institute of California. She has been a research associate at The SPHERE Institute and a National Institute of Aging postdoctoral fellow. She holds a Ph.D. in demography from the University of California, Berkeley AND\*\*\* Magnus Lofstrom is a research fellow at the Public Policy Institute of California. He also holds appointments as a research fellow at the Institute for the Study of Labor (IZA) at the University of Bonn and as a research associate at the Center for Comparative Immigration Studies at the University of California, San Diego. He has also served as a researcher and has taught at IZA and at the University of California, Irvine. He received his Ph.D. in economics from the University of California, San Diego. AND\*\*\* Joseph M. Hayes is a research associate at the Public Policy Institute of California, where he studies migration and population change throughout the state. He has studied migration in the Central Valley, the families of newly arrived immigrants to California, and the state’s prison population. He holds an M.S. in agricultural economics from the University of Wisconsin, Madison. 2010, “Immigrant Legalization Assessing the Labor Market Effects,” Public Policy Institute of California, [www.ppic.org/content/pubs/report/R\_410LHR.pdf#ppic](http://www.ppic.org/content/pubs/report/R_410LHR.pdf#ppic)

Legalization of the estimated 12 million unauthorized immigrants residing in the United States would lead to both **economic benefits and costs for the nation.** **Some arguments for comprehensive immigration reform suggest that legalizing immigrants will help end the current recession.** This seems unlikely. Our research suggests that earlier findings from the IRCA era may overstate anticipated earnings from a new reform, at least in the short run. ¶ We do expect occupational mobility to improve for formerly unauthorized immigrants with higher skill levels. When compared to the continuously legal, their occupational earnings growth was about 9 to 10 percent. These higher-skill unauthorized immigrants are more likely to be overstayers than crossers, but unauthorized immigrants with college degrees are found in both groups. **Lower-skill unauthorized immigrants are not likely to experience strong occupational mobility as a result of a legalization program** (although their occupational earnings grow over time in the United States). It will be important that any new legislation give legalized immigrants incentives to improve their skills, especially in English. ¶ The majority of studies investigating the effect of legalizing immigrants on natives’ earnings suggest that the effects are slightly negative for workers with low skill levels. Since we find no improvements in occupational mobility or wages for the lowest skill levels in the short run, we do not expect that legalizing immigrants would place any increased pressure on the wages of low-skill natives or low-skill legal immigrants. Tax revenues may increase, although **many unauthorized immigrants already file federal and state tax returns and pay sales and payroll taxes.** We found that about 90 percent of unauthorized immigrants filed federal tax returns in the year before gaining LPR status. We expect that increases in **tax revenues** resulting from increased earnings among the formerly unauthorized would be modest.

#### No chance of war from economic decline---best and most recent data

Daniel W. Drezner 12, Professor, The Fletcher School of Law and Diplomacy, Tufts University, October 2012, “The Irony of Global Economic Governance: The System Worked,” <http://www.globaleconomicgovernance.org/wp-content/uploads/IR-Colloquium-MT12-Week-5_The-Irony-of-Global-Economic-Governance.pdf>

The final outcome addresses a dog that hasn’t barked: the effect of the Great Recession on cross-border conflict and violence. During the initial stages of the crisis, multiple analysts asserted that the financial crisis would lead states to increase their use of force as a tool for staying in power.37 Whether through greater internal repression, diversionary wars, arms races, or a ratcheting up of great power conflict, there were genuine concerns that the global economic downturn would lead to an increase in conflict. Violence in the Middle East, border disputes in the South China Sea, and even the disruptions of the Occupy movement fuel impressions of surge in global public disorder.

The aggregate data suggests otherwise, however. The Institute for Economics and Peace has constructed a “Global Peace Index” annually since 2007. A key conclusion they draw from the 2012 report is that “The average level of peacefulness in 2012 is approximately the same as it was in 2007.”38 Interstate violence in particular has declined since the start of the financial crisis – as have military expenditures in most sampled countries. Other studies confirm that the Great Recession has not triggered any increase in violent conflict; the secular decline in violence that started with the end of the Cold War has not been reversed.39 Rogers Brubaker concludes, “the crisis has not to date generated the surge in protectionist nationalism or ethnic exclusion that might have been expected.”40

None of these data suggest that the global economy is operating swimmingly. Growth remains unbalanced and fragile, and has clearly slowed in 2012. Transnational capital flows remain depressed compared to pre-crisis levels, primarily due to a drying up of cross-border interbank lending in Europe. Currency volatility remains an ongoing concern. Compared to the aftermath of other postwar recessions, growth in output, investment, and employment in the developed world have all lagged behind. But the Great Recession is not like other postwar recessions in either scope or kind; expecting a standard “V”-shaped recovery was unreasonable. One financial analyst characterized the post-2008 global economy as in a state of “contained depression.”41 The key word is “contained,” however. Given the severity, reach and depth of the 2008 financial crisis, the proper comparison is with Great Depression. And by that standard, the outcome variables look impressive. As Carmen Reinhart and Kenneth Rogoff concluded in This Time is Different: “that its macroeconomic outcome has been only the most severe global recession since World War II – and not even worse – must be regarded as fortunate.”42

### AT: Biotech

### Volcano Defense

#### No super volcanoes and it won't cause extinction

MSNBC 11 "Supervolcanoes won't destroy Earth in 2012," 12/29, http://www.msnbc.msn.com/id/45818146/ns/technology\_and\_science-science/t/supervolcanoes-wont-destroy-earth/#.T9wS0LXOzyA

But is another supervolcano eruption on the way? At the dawn of the new year, researchers say: Don't hold your breath.

Catastrophic consequences

Supervolcanoes are capable of eruptions dwarfing anything ever recorded by man, spewing out thousands of times more magma and ash. A supervolcano eruption would have consequences similar to those from the impact of a mile-wide asteroid, potentially killing millions of people and disrupting climate and ecosystems by blotting out the sun with ash and cooling the Earth.

The largest supervolcano blast of the past 25 million years may have been the most recent one: the explosion of Mount Toba in Sumatra some 74,000 years ago. Scientists say Toba released a staggering 700 cubic miles of magma and a thick layer of ash over all of South Asia. By comparison, the famous explosion of the volcanic Indonesian island of Krakatoa in 1883 released about 3 cubic miles of magma.

There are roughly a dozen supervolcanoes today, some of them lying at the bottom of the sea. One, however, is in the middle of the United States.

The most recent giant eruption of the volcanically active area underlying Yellowstone National Park created the oval-shaped, 40- by 25-mile Yellowstone caldera. These energetic underpinnings are what fuel the park's famous geysers. [ Infographic: The Geology of Yellowstone ]

Minuscule odds

There is evidence that volcanic activity in Yellowstone will eventually lead to a colossal eruption capable of covering half the United States in 3 feet of ash. However, experts agree that super-eruptions are exceedingly rare, and the odds that one will occur in our lifetimes are vanishingly small.

In all, geologists have identified the remnants of about 50 super-eruptions. This may sound like a lot until it is put into the context of the full span of geologic history. Research suggests there is a super-eruption every 700,000 years or so, on average.

Scientists regularly monitor volcanically active regions globally, and there is absolutely no sign of a super-eruption looming anytime soon, said climate scientist Drew Shindell at the NASA Goddard Institute for Space Studies in New York, who has studied what super-eruptions might do to climate.

## 2AC Weaponization DA

### 2AC Weaponization DA

#### **Weaponization inevitable globally**

Bridge 12-10 – Robert Bridge, writer for RT, December 10th, 2012, "Space militarization: Coming to a galaxy near you" rt.com/politics/space-militarization-us-russia-699/print/

The United States is moving toward the militarization of space and this will change the face of war in the near future, an academician with the Russian Academy of Engineering Sciences has warned.¶ Judging by recent developments, **the idea of** formidable space weapons **prowling the last frontier is no longer limited to the realm of science fiction**.¶ The US has published tactical guidelines over the past three years on the use of force in outer space, while systems that may be used as orbiting weapons are undergoing rigorous test flights, said Yuri Zaitsev, Academic Advisor with the Russian Academy of Engineering Sciences.¶ In a security document released in October, the US Department of Defense (DoD) said that its space-related activities are designed to “maintain and enhance the national security advantages afforded by the use of outer space.”¶ Among its numerous stated objectives, the DoD report said it is US policy to “proactively seek opportunities to cooperate with allies and selected international partners in developing space architectures and in **designing, acquiring, and** operat**ing military space systems**.”¶ Zaitsev said that America’s push to militarize space may include the use of both nuclear and conventional weapons, which could have dangerous and dramatic implications for future warfare.¶ "**The** U**nited** S**tates, as well as some other leading powers, is attempting to gain supremacy** in [space],” Zaitsev explained. “This will enable their aerospace operations at the very beginning of a war to initiate strikes on strategic facilities throughout the [targeted] country.”¶ **During this year’s UN General Assembly, the US conspicuously refused to support a resolution to halt the militarization of space.**¶ In a vote on a resolution titled ‘Prevention of an Arms Race in Outer Space,’ 169 member-states, including the Russian Federation, voted in favor of the draft resolution stating, “[The] exploration and use of space…shall be for peaceful purposes…carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development.”¶ Only **the United States and Israel abstained from voting on the document**, rendering it effectively toothless.¶ Washington’s refusal to cede control of space likely stems from its increasing reliance on space-based systems: An estimated 90 percent of the US Military reportedly uses or depends on space-based systems.¶ The Russian academic referred the shock over China’s successful targeted destruction of an old orbiting weather satellite in 2007.¶ "The Americans were frightened by the Chinese tests of anti-satellite weapons,” Zaitsev said. “It is quite possible that the US may soon initiate negotiations on anti-satellite systems."¶ Zaitsev also said that the United States and its allies may attempt to regulate space activity to its advantage.¶ "The United States and the European Union are working out a draft code of conduct in outer space," he said. "This document may regulate space activity in the interests of the United States and its allies and may discriminate [against] other states, including Russia.”¶ “**Russia and China are unlikely to sign this document, which means** military confrontation in outer space will intensify**,”** Zaitsev warned.

#### US weaponization deters arms races

Dolman 12– Everett, PhD and Professor of Comparative Military Studies @ US Air Force School of Advanced Air and Space Studies and Recipient of Central Intelligence’s Outstanding Intelligence Analyst Award, “ New Frontiers, Old Realities,” Spring, http://www.au.af.mil/au/ssq/2012/spring/dolman.pdf

And in such circumstances, the United States certainly would respond. Conversely, if the United States were to weaponize space, it is not at all sure that any other state or group of states would find it rational to counter in kind. The **entry cost** to provide the necessary infrastructure **is still too high**—hundreds of billions of dollars, at minimum. The **years of investment needed to achieve** a comparable **counterforce capability**—essentially from scratch—**would provide more than ample time for the** United States **to entrench itself** in space and readily counter preliminary efforts to displace it. The tremendous effort in time and resources would be worse than wasted. Most states, if not all, would opt not to counter US deployments directly. They might oppose American interests with asymmetric balancing, depending on how aggressively it uses its new power, but the likelihood of a hemorrhaging arms race in space should the United States deploy weapons first—at least for the next few years—is remote. This reasoning does not dispute the fact that US deployment of weapons in outer space would represent the addition of a potent new military capacity, one that would assist in extending the current period of American hegemony well into the future. Clearly this would be threatening, and America must expect severe condemnation and increased competition in peripheral areas. But such an outcome is less threatening than another, particularly illiberal authoritarian state doing so. Although there is obvious opposition to the current international balance of power, the majority of states seem to regard it as at least tolerable. A continuation of the status quo is thus minimally acceptable, even to states working toward its demise. As long as the United States does not employ its power arbitrarily, **the situation would be accommodated initially and grudgingly accepted over time.** Mirror-imaging does not apply here. An attempt by China to dominate space would be part of an effort to break the sea-air dominance of the United States in preparation for a new international order with the weaponizing state at the top. Such an action would challenge the status quo rather than seek to perpetuate it. This would be disconcerting to nations that accept the current international order—including the venerable institutions of trade, finance, and law that operate within it. Simultaneously, it would be intolerable to the United States. As leader of the current system, the United States could do no less than engage in a perhaps ruinous space arms race, save graciously deciding to step aside and accept a diminished world status. 19 Seizing the initiative and securing low-Earth orbit now, while the United States is dominant in space infrastructure, would do much to stabilize the international system and prevent an arms race in space. The enhanced ability to deny any attempt by another nation to place military assets in space and to readily engage and destroy terrestrial antisatellite capacity would make the possibility of large-scale space war or military space races less likely, not more. So long as the controlling state demonstrates a capacity and a will to use force to defend its position, in effect expending a small amount of violence as needed to prevent a greater conflagration in the future, the likelihood of a future war in space is remote. Moreover, if the United States were willing to deploy and use a military space force that maintained effective control of space and did so in a way that was perceived as tough, nonarbitrary, and efficient, such an action would serve to discourage competing states from fielding opposing systems. It could also set the stage for a new space regime, one that encourages space commerce and development. Should the United States use its advantage to police the heavens and allow unhindered peaceful use of space by any and all nations for economic and scientific development, over time its control of low-Earth orbit could be viewed as a global asset and a public good. In much the same way the British maintained control of the high seas in the nineteenth century, enforcing international norms against slavery while protecting innocent passage and property rights, the United States could prepare outer space for a long-overdue burst of economic expansion.

#### Double bind – if there’s weaponization now, it’s non-unique – if there’s arms control now, the plan would be deployed peacefully and would not cause weaponization

#### Unilateralism causes cooperation, not backlash

Stone 11 – Christopher Stone, Space policy analyst and strategist, space/missile officer with Air Force Space Command Reserve Component, “American leadership in space: leadership through capability,” The Space Review, Monday, March 14, 2011, pg. <http://www.thespacereview.com/article/1797/1>

When it comes to space exploration and development, including national security space and commercial, I would disagree somewhat with Mr. Friedman’s assertion that space is “often” overlooked in “foreign relations and geopolitical strategies”. My contention is that while space is indeed overlooked in national grand geopolitical strategies by many in national leadership, space is used as a tool for foreign policy and relations more often than not. In fact, I will say that the US space program has become less of an effort for the advancement of US space power and exploration, and is used more as a foreign policy tool to “shape” the strategic environment to what President Obama referred to in his National Security Strategy as “The World We Seek”. Using space to shape the strategic environment is not a bad thing in and of itself. What concerns me with this form of “shaping” is that we appear to have changed the definition of American leadership as a nation away from the traditional sense of the word. Some seem to want to base our future national foundations in space us[e]ing the important international collaboration piece as the starting point. Traditional national leadership would start by advancing United States’ space power capabilities and strategies first, then proceed toward shaping the international environment through allied cooperation efforts. The United States’ goal should be leadership through spacefaring capabilities, in all sectors. Achieving and maintaining such leadership through capability will allow for increased space security and opportunities for all and for America to lead the international space community by both technological and political example. The world has recognized America as the leaders in space because it demonstrated technological advancement by the Apollo lunar landings, our deep space exploration probes to the outer planets, and deploying national security space missions. We did not become the recognized leaders in astronautics and space technology because we decided to fund billions into research programs with no firm budgetary commitment or attainable goals. We did it because we made a national level decision to do each of them, stuck with it, and achieved exceptional things in manned and unmanned spaceflight. We have allowed ourselves to drift from this traditional strategic definition of leadership in space exploration, rapidly becoming participants in spaceflight rather than the leader of the global space community. One example is shutting down the space shuttle program without a viable domestic spacecraft chosen and funded to commence operations upon retirement of the fleet. We are paying millions to rely on Russia to ferry our astronauts to an International Space Station that US taxpayers paid the lion’s share of the cost of construction. Why would we, as United States citizens and space advocates, settle for this? The current debate on commercial crew and cargo as the stopgap between shuttle and whatever comes next could and hopefully will provide some new and exciting solutions to this particular issue. However, we need to made a decision sooner rather than later. Finally, one other issue that concerns me is the view of the world “hegemony” or “superiority” as dirty words. Some seem to view these words used in policy statements or speeches as a direct threat. In my view, each nation (should they desire) should have freedom of access to space for the purpose of advancing their “security, prestige and wealth” through exploration like we do. However, to maintain leadership in the space environment, space superiority is a worthy and necessary byproduct of the traditional leadership model. If your nation is the leader in space, it would pursue and maintain superiority in their mission sets and capabilities. In my opinion, **space superiority does** not imply a wall of orbital weapons preventing other nations from access to space, nor does it **preclude international cooperation** among friendly nations. Rather, it indicates a desire as a country to achieve its goals for national security, prestige, and economic prosperity for its people, and to be known as the best in the world with regards to space technology and astronautics. I can assure you that many other nations with aggressive space programs, like ours traditionally has been, desire the same prestige of being the best at some, if not all, parts of the space pie. Space has been characterized recently as “congested, contested, and competitive”; the quest for excellence is just one part of international space competition that, in my view, is a good and healthy thing. As other nations pursue excellence in space, we should take our responsibilities seriously, both from a national capability standpoint, and as country who desires expanded international engagement in space. If America wants to retain its true leadership in space, it must approach its space programs as the advancement of its national “security, prestige and wealth” by maintaining its edge in spaceflight capabilities and use those demonstrated talents to advance international prestige and influence in the space community. These energies and influence can be channeled to create the international space coalitions of the future that many desire and benefit mankind as well as America. Leadership will require sound, long-range exploration strategies with national and international political will behind it. American leadership in space is not a choice. It is a requirement if we are to truly lead the world into space with programs and objectives “worthy of a great nation”.

#### SPS creates cooperation through the NSP

Garretson 12 – Peter Garretson, Lieutenant Colonel of the USAF serving on CSAF's Strategic Studies Group, Spring 2012 "Solar Power in Space?" Strategic Studies Quarterly Spring

Our current National Space Policy articulates the top three space-related goals as: • Energize competitive domestic industries to participate in global markets and advance the development of satellite manufacturing, satellite-based services, space launch, terrestrial applications, and increased entrepreneurship; • Expand international cooperation; and • Strengthen stability in space. It continues by articulating several foundational activities important to the nation: • Strengthen US leadership in space-related science, technology, and industrial bases. Encourage an innovative and entrepreneurial commercial space sector. • Enhance capabilities for assured access to space. Develop launch systems and technologies necessary to assure and sustain future reliable and efficient access to space, in cooperation with US industry. • Develop and retain space professionals. Promote and expand publicprivate partnerships to foster educational achievement in science, technology, engineering, and mathematics (STEM) programs; embrace innovation to cultivate and sustain an entrepreneurial US research and development environment. • Strengthen interagency partnerships. • International cooperation. Strengthen US space leadership. Facilitate new market opportunities for US commercial space capabilities and services, including commercially viable terrestrial applications that rely on government-provided space systems.6 SBSP can be seen as a desirable strategy to achieve these national-level goals, consistent with the foundational activities, and with desirable effects for the USAF and the DoD. Fundamentally, a successful SBSP program would transform our industrial base and competitiveness and be at least as significant for American STEM programs as were the post-Sputnik and Apollo expansions in aerospace engineering. It would greatly expand the role of commercial space, and the effect on assured access and launch would be profound. Its natural confluence of challenges in space, energy, and security offers exciting options to further interagency partnerships between NASA, DOE, DoD, FAA, FCC, EPA, DOC, and DOS. It presents excellent opportunities for the United States to lead in international cooperation.

#### DOD guts Obama space multilateralism now

Mackey 12 – Craig A. Mackey graduated from the American University School of International Service in December of 2011 with a M.A. in International Affairs. He previously earned a B.A. with honors in 2008 from Virginia Tech University, majoring in History and Political Science and minoring in ancient Latin. He also graduated from the American University Washington College of Law in May of 2011 with a J.D. focused primarily on International Law. He passed the Virginia Bar Examination in July 2011 and was admitted to the Virginia State Bar in October of 2011. Fall 2012, "The Celestial Security Dilemma: The United States, the People's Republic of China, and the Militarization of Outer Space,"www.american.edu/sis/jis/upload/JIS\_F2012.pdf

In 2010, President Obama unveiled a new US national space policy, which appeared to signal a renewed American willingness to consider multilateral efforts to ensure a stable space environment. The 2010 space policy calls for US leadership in space - related international fora, reassuring allies of US commitments to collective self - defense and preserving the outer space environment through the responsible use of s p a c e . 127 The 2010 space policy also announces US support for the UN Space Debris Mitigation Guidelines. 128 Despite its professed support for multilateral cooperation in outer space, the 2010 policy also emphasizes US pursuit of “space situational awareness” (SSA) and calls upon the Secretary of Defense to “develop capabilities, plans, and options to deter, defend against, and, if necessary, defeat efforts to interfere with or attack U.S. or allied space systems. ” 129 Thus, **the Obama Administration’s avowed support for multilateral diplomacy in space appears to have** stalled in light of US national security considerations.

#### Weapons are not destabilizing

Lopez 12 – Laura Delgado Lopez, expert at the Institute for Global Environmental Studies, Arlington, Virginia, master's degree in international science and technology from George Washington University, 2009 Truman Scholar and a Northrop Grumman Fellow at GWU's Space Policy Institute, bachelor's in political science, March 6th, 2012, "Predicting an Arms Race in Space: Problematic Assumptions for Space Arms Control" [www.tandfonline.com/doi/pdf/10.1080/14777622.2012.647391](http://www.tandfonline.com/doi/pdf/10.1080/14777622.2012.647391)

If space weapons are taken to be destabilizing, then the context preceding their deployment requires a condition of stability in the arrangement of power in the international space system. Space doves thus assume that despite unrivaled U.S. leadership in space—investing more resources and employing more space capabilities than any other nation, even the quickly-progressing China 35 —the fact that it lacks space weapons makes it an equal player in space. This argument assumes that if the United States were to deploy weapons in space, it would acquire a resource (power) of such magnitude that it would destabilize the system, 36 forcing other countries to respond in kind and seek a new condition of stability.¶ But is there balance in the international space system? No. First, if balance requires at least more than one bloc of power, where is the parity in resources? **In 2010, the U.S. space budget accounted for 23% of global space activity, versus 8% of non-U.S. space budgets combined. 37 Likewise, since the United States waged its first space war in the 1990s, space capabilities have been a key enabler of its asymmetrical advantage in warfare. While it is true that many other countries now participate in space, few have independent access on their own. The fact that astronauts from several countries were grounded along with the U.S. Space Shuttle fleet, but for the Russian Soyuz, points to an unbalanced distribution of power as it pertains to space**.¶ If, on the other hand, stability is assumed not through the resources power paradigm, but through comparable vulnerabilities, the imbalance becomes even starker. The United States is both more vulnerable and less vulnerable than other countries in space, depending on which way one looks at it. If one considers dependability, and the important role that space plays in day-to-day activities in the United States versus in other countries (considering their indigenous capabilities) then its vulnerability and disadvantage are highlighted. But if one considers the vulnerability of a space system by itself, a country with a single or only a handful of satellites could be crippled by a single attack, whereas several U.S. systems—like the Global Positioning System—would be able to survive or recover more easily because of the size of its constellations.¶ The current space environment does not reflect stability; on the contrary, the system is tilted. **It would be more appropriate to argue that U.S. space weapons deployment would widen the existing gap and effectively rule out the influence of other countries in this domain.** For countries that are only beginning to access space or are not yet able to participate, the presence of weapons may be seen as a threat to their own activities, particularly when considering the prohibitive effects of debris-causing weapons. These considerations aside, however, **while space weapons could reduce the likelihood of many countries catching up to the United States,** it would be a mistake to assume that these weapons would be the destabilizing element in the system.

# 1AR

### T Ev

#### Under their interpretation, no aff is topical---the US imports coal, oil, and gas

EIA 12-17 – EIA, December 17th, 2012, "Energy Perspectives: United States energy imports decline while energy exports increase" [www.eia.gov/todayinenergy/detail.cfm?id=9230](http://www.eia.gov/todayinenergy/detail.cfm?id=9230)

In 2011, the United States consumed more than 97 quadrillion Btu (quads) of energy, despite only producing about 78 quads. The difference—about 18 quads—reflects the balance of imports and exports of energy. Petroleum, which includes crude oil as well as petroleum products, accounted for a majority of both energy imports and exports.¶ The United States imported almost three times as much energy as it exported in 2011, a ratio that is much lower than the import peak in 2002, when energy imports were more than eight times energy exports. Imports have exceeded exports in every year since 1952.¶ Petroleum made up about 86% of energy imports in 2011. Canada supplied the largest share of these petroleum imports. The next biggest sources of U.S. petroleum imports in 2011 were Mexico, Saudi Arabia, Venezuela, and Nigeria, in that order. Overall, about 40% of U.S. petroleum imports came from countries in the Organization of the Petroleum Exporting Countries (OPEC), while 60% came from non-OPEC countries such as Canada, Mexico, Russia, and Brazil. Most of these petroleum imports were crude oil as opposed to petroleum products.¶ Besides petroleum, most of the remaining energy imports were natural gas (12%). All other fuel sources, including coal, coal coke, biofuels, and electricity, combined to account for about 2% of energy imports in 2011.

### 1AR Oceans Ev

#### CO2 acidifies the oceans---causes extinction

Romm 9 Joe, Fellow at American Progress and is the editor of Climate Progress, holds a Ph.D. in physics from MIT, “Imagine a World without Fish: Deadly ocean acidification — hard to deny, harder to geo-engineer, but not hard to stop — is subject of documentary,” http://thinkprogress.org/romm/2009/09/02/204589/a-sea-change-imagine-a-world-without-fish-ocean-acidification-film/

Global warming is “capable of wrecking the marine ecosystem and depriving future generations of the harvest of the seas” (see Ocean dead zones to expand, “remain for thousands of years”). A post on ocean acidification from the new Conservation Law Foundation blog has brought to my attention that the first documentary on the subject, *A Sea Change:* Imagine a World without Fish, is coming out. Ocean acidification must be a core climate message, since it **is** hard to deny and **impervious** **to** the delusion that **geoengineering** is the silver bullet. Indeed, a major 2009 study GRL study, “Sensitivity of ocean acidification to geoengineered climate stabilization” (subs. req’d), concluded: The results of this paper support the view that climate engineering will not resolve the problem of ocean acidification, and that therefore deep and rapid cuts in CO2 emissions are likely to be the most effective strategy to avoid environmental damage from future ocean acidification. If you want to understand ocean acidification better, see this BBC story, which explains: **Man-made pollution is raising ocean acidity at least 10 times faster than previously thought**, a study says. Or see this *Science* magazine study, “Evidence for Upwelling of Corrosive “Acidified” Water onto the Continental Shelf” (subs. req’), which found Our results show for the first time that a large section of the North American continental shelf is impacted by ocean acidification. Other continental shelf regions may also be impacted where anthropogenic CO2-enriched water is being upwelled onto the shelf. Or listen to the Australia’s ARC Centre of Excellence for Coral Reef Studies, which warns: The world’s oceans are becoming more acid, with potentially devastating consequences for corals and the marine organisms that build reefs and provide much of the Earth’s breathable oxygen. The acidity is caused by the gradual buildup of carbon dioxide (CO2) in the atmosphere, dissolving into the oceans. Scientists fear it could be lethal for animals with chalky skeletons which make up more than a third of the planet’s marine life”¦. Corals and plankton with chalky skeletons are at the base of the marine food web. They rely on sea water saturated with calcium carbonate to form their skeletons. However, as acidity intensifies, the saturation declines, making it harder for the animals to form their skeletal structures (calcify). “Analysis of coral cores shows a steady drop in calcification over the last 20 years,” says Professor Ove Hoegh-Guldberg of CoECRS and the University of Queensland. “There’s not much debate about how it happens: put more CO2 into the air above and it dissolves into the oceans. “When CO2 levels in the atmosphere reach about 500 parts per million, you put calcification out of business in the oceans.” (Atmospheric CO2 levels are presently 385 ppm, up from 305 in 1960.) I’d like to see an analysis of what happens when you get to 850 to 1000+ ppm because that is where we’re headed (see U.S. media largely ignores latest warning from climate scientists: “Recent observations confirm “¦ the worst-case IPCC scenario trajectories (or even worse) are being realised” “” 1000 ppm). The CLF post notes: Dr. Jane Lubchenco, Administrator of the National Oceanic and Atmospheric Administration (NOAA) warns that an acidic ocean is the “equally evil twin” of climate change. Scott Doney, a senior scientist at the Woods Hole Oceanographic Institution noted in a public presentation that “New England is the most vulnerable region in the country to ocean acidification.” In June, dozens of Academies of Science, including ours and China’s, issued a joint statement on ocean acidification, warned “Marine food supplies are likely to be reduced with significant implications for food production and security in regions dependent on fish protein, and human health and wellbeing” and “Ocean acidification is irreversible on timescales of at leasttens of thousands of years.” They conclude: Ocean acidification is a direct consequence of increasing atmospheric CO2 concentrations. To avoid substantial damage to ocean ecosystems, deep and rapid reductions of global CO2 emissions by at least 50% by 2050, and much more thereafter are needed. We, the academies of science working through the InterAcademy Panel on International Issues (IAP), call on world leaders to: “¢ Acknowledge that ocean acidification is a direct and real consequence of increasing atmospheric CO2 concentrations, is already having an effect at current concentrations, and is likely to cause **grave harm to important marine ecosystems as CO2 concentrations reach 450 ppm and above;** “¢ Recognise that reducing the build up of CO2 in the atmosphere is the only practicable solution to mitigating ocean acidification; “¢ Within the context of the UNFCCC negotiations in the run up to Copenhagen 2009, recognise the direct threats posed by increasing atmospheric CO2 emissions to the oceans and therefore society, and take action to mitigate this threat; “¢ Implement action to reduce global CO2 emissions by at least 50% of 1990 levels by 2050 and continue to reduce them thereafter. If we want to save life in the oceans “” **and save ourselves**, since we depend on that life “” the time to start slashing carbon dioxide emissions is now.

### 1AR Econ Defense

#### No conflicts resulted from the recession – disproves the impact

Barnett 9**—**senior managing director of Enterra Solutions LLC (Thomas, The New Rules: Security Remains Stable Amid Financial Crisis, 25 August 2009, http://www.aprodex.com/the-new-rules--security-remains-stable-amid-financial-crisis-398-bl.aspx)

When the global financial crisis struck roughly a year ago, the blogosphere was ablaze with all sorts of scary predictions of, and commentary regarding, ensuing conflict and wars -- a rerun of the Great Depression leading to world war, as it were. Now, as global economic news brightens and recovery -- surprisingly led by China and emerging markets -- is the talk of the day, it's interesting to look back over the past year and realize how globalization's first truly worldwide **recession has had** virtually **no impact** whatsoever **on** the **international security** landscape. None of the more than three-dozen ongoing conflicts listed by GlobalSecurity.org can be clearly attributed to the global recession. Indeed, the last new entry (civil conflict between Hamas and Fatah in the Palestine) predates the economic crisis by a year, and three quarters of the chronic struggles began in the last century. Ditto for the 15 low-intensity conflicts listed by Wikipedia (where the latest entry is the Mexican "drug war" begun in 2006). Certainly, the Russia-Georgia conflict last August was specifically timed, but by most accounts the opening ceremony of the Beijing Olympics was the most important external trigger (followed by the U.S. presidential campaign) for that sudden spike in an almost two-decade long struggle between Georgia and its two breakaway regions. Looking over the various databases, then, we see a most familiar picture: the usual mix of civil conflicts, insurgencies, and liberation-themed terrorist movements. Besides the recent Russia-Georgia dust-up, the only two potential state-on-state wars (North v. South Korea, Israel v. Iran) are both tied to one side acquiring a nuclear weapon capacity -- a process wholly **unrelated to** global **economic trends**. And with the United States effectively tied down by its two ongoing major interventions (Iraq and Afghanistan-bleeding-into-Pakistan), our involvement elsewhere around the planet has been quite modest, both leading up to and following the onset of the economic crisis: e.g., the usual counter-drug efforts in Latin America, the usual military exercises with allies across Asia, mixing it up with pirates off Somalia's coast). Everywhere else we find serious instability we pretty much let it burn, occasionally pressing the Chinese -- unsuccessfully -- to do something. Our new Africa Command, for example, hasn't led us to anything beyond advising and training local forces. So, to sum up: •No significant uptick in mass violence or unrest (remember the smattering of urban riots last year in places like Greece, Moldova and Latvia?); •The usual frequency maintained in civil conflicts (in all the usual places); •Not a single state-on-state war directly caused (and no great-power-on-great-power crises even triggered); •No great improvement or disruption in great-power cooperation regarding the emergence of new nuclear powers (despite all that diplomacy); •A modest scaling back of international policing efforts by the system's acknowledged Leviathan power (inevitable given the strain); and •No serious efforts by any rising great power to challenge that Leviathan or supplant its role. (The worst things we can cite are Moscow's occasional deployments of strategic assets to the Western hemisphere and its weak efforts to outbid the United States on basing rights in Kyrgyzstan; but the best include China and India stepping up their aid and investments in Afghanistan and Iraq.) Sure, we've finally seen global defense spending surpass the previous world record set in the late 1980s, but even that's likely to wane given the stress on public budgets created by all this unprecedented "stimulus" spending. If anything, the friendly cooperation on such stimulus packaging was the most notable great-power dynamic

caused by the crisis. Can we say that the world has suffered a distinct shift to political radicalism as a result of the economic crisis? Indeed, no. The world's major economies remain governed by center-left or center-right political factions that remain decidedly friendly to both markets and trade. In the short run, there were attempts across the board to insulate economies from immediate damage (in effect, as much protectionism as allowed under current trade rules), but there was no great slide into "trade wars." Instead, the World Trade Organization is functioning as it was designed to function, and regional efforts toward free-trade agreements have not slowed. Can we say Islamic radicalism was inflamed by the economic crisis? If it was, that shift was clearly overwhelmed by the Islamic world's growing disenchantment with the brutality displayed by violent extremist groups such as al-Qaida. And looking forward, austere economic times are just as likely to breed connecting evangelicalism as disconnecting fundamentalism. At the end of the day, the economic crisis did not prove to be sufficiently frightening to provoke major economies into establishing global regulatory schemes, even as it has sparked a spirited -- and much needed, as I argued last week -- discussion of the continuing viability of the U.S. dollar as the world's primary reserve currency. Naturally, plenty of experts and pundits have attached great significance to this debate, seeing in it the beginning of "economic warfare" and the like between "fading" America and "rising" China. And yet, in a world of globally integrated production chains and interconnected financial markets, such "diverging interests" hardly constitute signposts for wars up ahead. Frankly, I don't welcome a world in which America's fiscal profligacy goes undisciplined, so bring it on -- please! Add it all up and it's fair to say that this global financial crisis has proven the great resilience of America's post-World War II international liberal trade order.

### 1AR Plan Solves Aerospace

#### Plan solves aerospace workforce

Mankins, President of SPA and Former NASA Scientist, 9 (John, Preeminent Global Expert on SSP, SPA = Space Power Association, President of ARTEMIS Innovation Management Solutions, Worked @ NASA for 25 Years, “To boldly go: the urgent need for a revitalized investment in space technology,” 5-18, <http://www.thespacereview.com/article/1377/1>)

Unfortunately, the US investment in advanced research and technology for space exploration and development has been reduced to historically low levels, and concurrently has been focused more narrowly than ever before on immediate system designs and development projects. In many respects, the current budget is little more than an “advanced development” program with minimal opportunity for innovation and essentially no possibility that an invention arising from civil space research and technology programs could influence system design decisions, inform budget estimates or inspire new, more ambitious space program goals. The challenge today Space has never been more important to our national security than it is today. The opportunities for truly profound scientific discoveries through space exploration have never been greater. And the pace of international development of new capabilities for space operations has never been faster. Federal budgets for advanced research and technology to enable future space exploration and development have been reduced in scope and focused on near-term system developments to the point that US preeminence in space activities is in question. NASA’s advanced space research and technology budget was over $2 billion in fiscal year (FY) 2005, with a focus on objectives five to ten years in the future and with the purpose of informing program and design decisions, while retiring both technical and budget risks of those future programs. The President’s FY 2007 budget for NASA exploration technology declined to less than $700 million, and of that only a small fraction (perhaps less than $200 million) still addressed longer-term objectives. The corresponding budgets in 2008 and 2009 were further reduced. Little to none of the remaining investment deals with enabling fundamentally new goals or objectives, or dramatically reducing expected costs. With these funding levels and program goals, it is unlikely that the US will maintain leadership in space exploration beyond the current generation of projects—all of which are founded on the “seed corn” harvested from past investments in innovative new space capabilities. Further, declining support for space research and technology is creating an innovation vacuum in the US as small business opportunities evaporate, and funding for universities and students vanishes. This trend jeopardizes America’s long-term leadership in space exploration and development, and damages our ability to achieve important national security goals. History Since the conclusion of the Apollo program in the early 1970s, the US space program has experienced varying levels of support from national leaders in the White House and the US Congress. Moreover, during most of that time human exploration beyond low Earth orbit has been “off the agenda”, with the exception of the short-lived Space Exploration Initiative (SEI) of 1989–1993. During the same period, US robotic exploration has had a number of tremendous successes, primarily involving the outer planets (e.g., Voyager spacecraft, Galileo, and more recently, Cassini), but also the inner solar system (e.g., Viking on Mars, Magellan at Venus), and the recent series of Mars missions (e.g., Pathfinder/Sojourner, Mars Observer, Spirit and Opportunity). However, these programs have tended to reflect one-of-a-kind successes with a minimal number of spacecraft and missions using common systems or technologies, resulting in continuing very high costs. Various attempts to create a foundation of common technologies and modular spacecraft have failed. Similarly, attempts to bridge the gap between robotic mission systems technologies and human space flight technologies (e.g., “Platform Z” from the early Space Station Freedom program) have failed. The most notable successes in this vein arose from the in-space assembly and spacecraft servicing capabilities of the Space Shuttle, first in the early 1980s with the Solar Max servicing mission, then with the series of hugely successful Hubble Space Telescope servicing missions, and finally with the assembly of the International Space Station. However, these achievements were far more the exception than the rule. For the most part human and robotic exploration systems and technologies became increasingly isolated beginning in the 1970s. More recently Following the Columbia tragedy in 2003, the direction of the US space program was again the subject of intense discussion (led by the White House) and including various agencies and organizations. The result, announced in January 2004, was the “Vision for Space Exploration” (VSE). The VSE as formulated originally was much more than a new justification for human space flight. Rather, the Vision addressed the full range of human and robotic exploration, as well as a revitalization of advanced space research and technology with far-reaching implications. The original VSE strategy placed strong emphasis on studies, research, and technology developments that would in time inform decisions regarding architectures and systems for (1) a Space Shuttle replacement; (2) annual robotic technology missions to the Moon; (3) a human return to the Moon to establish a permanent presence; (4) new space observatories to explore the universe beyond our solar system; (5) a campaign of robotic missions to Mars and beyond; and more. With current funding levels and program goals, it is unlikely that the US will maintain leadership in space exploration beyond the current generation of projects—all of which are founded on the “seed corn” harvested from past investments in innovative new space capabilities. However, in 2005 NASA shifted to a dramatically different approach to exploration and related technology developments with the results of the Exploration Systems Architecture Study. ESAS results placed exclusive emphasis on a US human lunar return and in an attempt to accelerate the first operational capability for the “crew exploration vehicle”—a capsule-based Space Shuttle replacement. To achieve this focus, numerous strategic changes were necessary. References to other aspects of space science and exploration were dropped, as was integrated planning of human and robotic exploration missions. For example, the initially planned annual campaign of robotic technology missions to the Moon was reduced to a single orbiter and one lunar lander mission, and these retained little or no role in guiding design decisions for human lunar systems. Also, to avoid technology-related risks, a range of lifecycle cost-related architectural options were eliminated from consideration, including in-space assembly of lunar transportation systems, in-space fueling and servicing, reusable lunar transportation systems, and others. The result was a family of systems for low Earth orbit access and a return to the Moon that involved a re-sized, Apollo-like architectural approach, with a heavy-lift launch vehicle and expendable transportation system elements. Significant shifts in agency budgets followed these new strategic directions, including drastic reductions in advanced space research and technology development, and a redefinition of remaining investments as “technology development”, focused on already-made design decisions. This shift in strategy was epitomized by NASA’s elimination of the NASA Institute of Advanced Concepts (NIAC) on the grounds of budget constraints, despite that fact that NIAC represented less than one third of one percent of the agency’s annual budget. The real point was that NIAC no longer had a legitimate role given NASA’s new approach to innovation: low engineering risk designs, and modest technology developments focused on those designs. Unfortunately, the elimination of design-to-cost and investments in longer-term innovation have come with a price. By recent estimates, the transportation-related cost of a single human mission to the Moon using the present, low-technology design solution will exceed $5 billion; transportation for two crewed lunar missions per year would require approximately 60% of NASA’s annual budget. Moreover, in-house agency subject matter expertise has been severely affected, as has the Agency’s contribution to US space technology leadership. Overall, the ambitious goals that were articulated by the White House in 2004 have been pushed into the indefinite future. A permanent human outpost of the Moon, development of lunar resources, deployment of large space observatories, and ambitious missions to the outer planets: all of these have been pushed out into the future by 20 years or more. Moreover, it is difficult to envision how such goals could ever be achieved using current systems concepts and concomitant prohibitively high costs. Only new systems concepts, enabled by focused space research and technology developments, can change this assessment. At the same time, real progress continues to be made by the international space community, grounded in steady investments in new technologies and systems—and resulting in regular accomplishments in space systems. The international flotilla of robotic space missions to the Moon illustrates this point: the US contribution of a single orbiter and a future lander are largely indistinguishable from the missions of other countries. Without an adequate strategy for, and more robust investment in, advanced space research and technology, long-term US preeminence in space exploration and development is doubtful. The Office of Naval Research (ONR) of the US Department of Defense (DOD) provides a useful example for how long-term but focused government research and technology advancement may be pursued. In particular, the ONR uses four complementary program strategies: a foundation of in-house subject matter expertise, sustained basic research and technology investments, development and demonstration of prototypes, and a focus on future capabilities. The concept of “Future Naval Capabilities” (FNCs) is used by the ONR to focus advanced research and technology (R&T) efforts around novel systems and concepts of operations. FNCs allow a range of R&T investments to be coordinated around specific new capabilities—even though the details of those systems designs have not yet been finalized, nor development programs approved. Also, the ONR uses the concept of “Innovative Naval Prototypes” (INPs) to orchestrate a range of ongoing R&T and draw the results of those efforts into nearer-term demonstrations of working prototypes and test-beds. INPs are characterized by ambitious technical objectives, and their potential to truly transform future naval operations. In addition, the ONR has preserved for over 60 years a commitment to long lead, discipline-oriented research and technology development. These investments have been responsible for advances in areas as diverse as materials, electronics, communications, power, and others—but all leading toward naval preeminence. And finally, DOD investments have maintained a foundation of in-house subject matter expertise at the Naval Research Laboratory (NRL) and other installations. Over the years, these in-house experts have enabled more effective technology investment decisions and, working with civilian and uniformed leaders better system acquisition decisions. Novel technologies and systems concepts must be matured and validated before decisions are made regarding the detailed designs of future space systems. There are a variety of business models that might be considered for space research and technology development. However, the strategies used by the ONR for its investments seem especially appropriate to the long-term character of the challenge of space exploration and development. For civil space exploration and development, these would be: (1) maintenance of in-house NASA subject matter expertise in relevant technologies; (2) sustained, discipline-oriented investment in basic research and technology at NASA centers, universities, and small businesses; (3) development and demonstration of transformational systems prototypes in partnerships involving NASA, major industry and others; and (4) a sustained focus on future space capabilities. And the results of these investments must be harvested before designs are finalized and system acquisition programs started. Assessment It is hardly consistent with the aspirations of Americans to “go where everyone has been before…” However, it is fantasy to suppose that the civil space program can affordably accomplish ambitious goals and objectives in space using systems concepts and technologies of the last century. Novel technologies and systems concepts must be matured and validated before decisions are made regarding the detailed designs of future space systems. In fact, numerous reports over a period of decades have established the criticality of a robust and focused investment in advanced research and technology, including the findings of several National Commissions, committees of the National Academy of Sciences, and others. Stable, robust, long-term federal investments in advanced research and technology for future civil space capabilities—funded at a level sufficient to assure US preeminence in space science, exploration, and utilization—are critical if we are to meet the challenges of this century: achieving ambitious goals in science and exploration, delivering on the promise of space to contribute to a strong national economy, maintaining a skilled aerospace workforce, and providing the foundations for future national security. It is time for the Congress and the White House—recognizing the challenges facing this nation’s space sector—to articulate and implement a strategy to revitalize advanced space research and technology and to make a sustained commitment to the implementation of that strategy. The recently chartered national study on the future of human space exploration, chaired by Norm Augustine, should take up this task. What should be done? The following actions are needed now: The federal government should revitalize its investment to invent and develop innovative new technologies for space science, exploration, and development, consistent with assuring US preeminence in space activities and industry’s ability to adopt these innovations for application in future space missions and markets. A balanced distribution should be created in the allocation of revitalized advanced space research and technology funding among more basic research efforts, technology maturation, and demonstrations of new technologies. These investments should be guided by the goal of creating ambitious new “future space capabilities”—well-enough defined to inform technology investments, but flexible enough to allow the results of those investments to influence designs, reduce costs, and enable new and more ambitious science goals. In establishing these investments, NASA must seek and embrace inputs from outside the agency (including other agencies, industry, academia) to develop, review, and recommend NASA advanced space research and technology plans, programs, and strategies. NASA in-house space research and technology (performed by engineers and technical specialists) should be restored, in balance with increased external research (by industry and academia). Funding for university research should also be targeted toward producing graduates with advanced degrees to support the follow-on work that will be undertaken by industry. We need to reconsider what makes an ambitious space program worth a substantial investment of public dollars—and consider again the historical and future importance of advancing space technology and developing truly new and valuable space capabilities for the public, the nation, and the world. To achieve the purposes for which it was created, NASA must maintain the excellence of its workforce and their expertise in a wide array of cutting-edge new technologies. As they enter the workforce, it will be impossible to attract the “best and the brightest” to federal service without a foundation of cutting-edge research and technology program opportunities. Moreover, a healthy NASA workforce, armed with appropriate skills and secure in its future, will provide better oversight for technical system procurement and program management. This competence will result in better performing systems, better ability to meet schedule, more productive interactions with other stakeholders in the aerospace enterprise, and more efficient use of taxpayer dollars. Although NASA must accommodate changing priorities and budgets, it must also ensure that it does not lose the important skills and knowledge currently possessed by its workers. NASA also must continue to ensure that the NASA workforce gains the new competencies needed in the aerospace industry of the future. In order accelerate the transition of novel technologies into transformational future space capabilities NASA must invest in demonstrations of innovative space prototypes on the ground and in space. Innovative space prototypes should be implemented in coordination with the DoD, academia, and industry; and wherever possible with co-funding with the private sector in order to speed the application of these new capabilities in creating new space industries. To implement these recommendations effectively, focused and timely near term action is essential: The National Academy of Sciences (National Research Council) should be chartered to conduct an independent, visionary study to identify 6–12 transformational “future space capabilities” that would—if developed—enable a wide range of new, ambitious, and affordable space exploration and development. These future space capabilities would in turn drive planning for government and industry research and technology investments. The Administration should develop—in consultation with the US Congress, and using NASA as its executive agent—a strategic research and technology development roadmap that establishes a baseline for achieving these goals, including objectives, schedules, milestones and budgets. This roadmap should be used to provide the basis for future US investments in advanced space research and technology development and demonstrations. The US space program needs more than a national discussion of what human exploration should do next: International Space Station research versus lunar outposts versus asteroid sorties versus human Mars missions, and so on. These are important questions. Even more, however, weneed to set in place basic policies that can endure from one administration to the next. We need to reconsider what makes an ambitious space program worth a substantial investment of public dollars—and consider again the historical and future importance of advancing space technology and developing truly new and valuable space capabilities for the public, the nation, and the world.

### 1AR Gun Control

#### Spending capital to pass a controversial guns agenda

Fox News 3-28, <http://www.foxnews.com/politics/2013/03/28/obama-moves-to-hame-congress-into-approving-gun-control-package/>

President Obama moved Thursday to put the muscle of the White House and his network of supporters behind a gun control package tracking toward the Senate floor, calling on voters to pressure Congress into backing it as the proposal runs into resistance on Capitol Hill. ¶ The president, in a set of brief remarks from the White House Thursday surrounded by the mothers of shooting victims, raised concern that the shock from the Newtown elementary school shooting could soon fade. ¶ "Less than 100 days ago that happened. ... Shame on us if we've forgotten," Obama said. "I haven't forgotten those kids. Shame on us if we've forgotten." ¶ Amid signals from Washington that the Senate bill could be losing momentum and high-dollar ad campaigns on both sides, the president was there to deliver a message to wavering lawmakers. "Don't get squishy," he said. ¶ Obama, accusing opponents of drumming up "fear," urged supporters to call members of Congress and pressure them into backing the package. ¶ Republican Sen. Mike Lee, of Utah, ripped the president for the remarks, suggesting he was exploiting the Newtown tragedy. ¶ "The proposals the president is calling for Congress to pass would primarily serve to reduce the constitutionally protected rights of law-abiding citizens while having little or no effect on violent crime," Lee said in a statement. "It is deeply unfortunate that he continues to use the tragedy at Newtown as a backdrop for pushing legislation that would have done nothing to prevent that horrible crime." ¶ Lee said he and his conservative colleagues plan to ensure that any of the firearms proposals require a 60-vote threshold in order to proceed. This could be a high hurdle for the Senate to clear. ¶ Already, Senate Majority Leader Harry Reid dropped from the main package a proposal to renew and expand the expired assault weapons ban. ¶ The base bill will instead cover universal background checks, strengthened punishments for illegal trafficking and more money for school security. ¶ Items like school security enjoy broad support. But the move to include private sales -- including gun show purchases -- in the background check system remains controversial in some circles. Plus the assault weapons ban, which Republicans most adamantly oppose, is still expected to get a vote as an amendment to the main bill. ¶ The National Rifle Association, during and after Obama's remarks, tweeted a flurry of comments criticizing the latest Obama push. The group accused him of campaigning "against guns to please the fringe." ¶ Both sides of the gun debate are stepping up their effort to sway Congress. While the NRA has been vocal since the start of the process, New York Mayor Michael Bloomberg just launched a $12 million ad buy in support of the legislation.

### 1AR Cyber Defense

#### No impact to cyber-terror---won’t cause military conflict

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As for cyber serving as a stand-alone war-fighting domain, there you'll find the debates no less theological in their intensity. After serving as senior managing director for half a dozen years at a software firm that specializes in securing supply chains, I'm deeply skeptical. Given the uncontrollable nature of cyberweapons (see: Stuxnet's many permutations), I view them as the 21st century's version of chemical weapons -- nice to have, but hard to use. Another way to look at it is to simply call a spade a spade: Cyberwarfare is nothing more than espionage and sabotage updated for the digital era. Whatever cyberwar turns out to be in the national security realm, it will always be dwarfed by the industrial variants -- think cyberthieves, not cyberwarriors. But you wouldn't know it from the panicky warnings from former Defense Secretary Leon Panetta and the generals about the imminent threat of a "cyber Pearl Harbor."

Please remember amid all this frenetic scaremongering that the Pentagon is never more frightened about our collective future than when it's desperately uncertain about its own. Given the rising health-care costs associated with America's aging population and the never-ending dysfunction in Washington, we should expect to be bombarded with frightening scenarios of planetary doom for the next decade or two. None of this bureaucratic chattering will bear any resemblance to global trends, which demonstrate that wars have grown increasingly infrequent, shorter in duration, and diminished in lethality. But you won't hear that from the next-warriors on the Potomac.